V-4 CENTRAL FLORES PRIORITY ZONE

Model Sites: Kalimati/Wuring, Paga and Paupanda

1 Background of the Central Flores Priority Zone

1.1 Situation of Priority Zone

1.1.1 Natural Conditions

(1) Conditions Surrounding the Location

This model site is comprised of the Sikka district located in eastern Flores and adjacent Ende district to the west. The northern coasts of both districts face the Flores Sea, while their southern coasts face the Savu Sea and Indian Ocean.

Maumere is the gateway to Flores Island, with regular flights operating daily to Denpasar and Kupang. Frequent vessels also travel the sea routes between Makassar and Bima, making Flores Island the largest distribution center for both regularly scheduled and unscheduled shipments. The Kalimati (Maumere) site faces north and is located along the central coastline of the city of Maumere, the capital of Sikka district. Because the city extends down to the coastline, the model site is close to the city, and a port is located on the western side of the site. The area around the coastline sustained massive damage in an earthquake and tidal wave that occurred in 1992. Most of the facilities along the coast were destroyed, and the coastline receded by several tens of meters. The remnants of buildings destroyed by that earthquake and tidal wave have been left in the water beyond the current coastline.

The Wuring site is a simple fishing village located about 3km from Maumere city, and belongs to the city of Wolomarang in Arok sub-district. The sub-village was completely destroyed by that earthquake and tidal wave, and residents temporarily moved to Nangafure as part of the government's relocation plan, but later the fishermen took the initiative to rebuild the sub-village.

The Paga site belongs to Paga sub-district, and is located along the southern coast facing the Savu Sea and Indian Ocean. The fishing village is comprised of Paga and Maurole sub-villages, and the site of the planned improvements runs along the national highway that runs between Ende and Maumere, about 1.5km east of the Paga sub-village.

Ende, on the other hand, is an old city that was once the heart of Flores Island. The people of Ende constitute the oldest ethnic group on the island, having arrived there even before the Portuguese. Ende (Flores Island's southern gateway) also has regular flights to Denpasar via Bima, and regular vessels between Sumba Island and the provincial capital of Kupang. It is known as a town of merchants.

The Ende site is located in the coastal area of Ende city, the capital and economic and transportation center of Ende district. This coastal area is comprised of the expansive sandy beach that extends north to south. From the south, it continues through the existing PPI Ende (Paupanda), Mbongawani, the newest town in the district, and to the port. The markets in existing PPI Ende (Paupanda) and Mbongawani are about 800m away. Ende Island is located about 10km out into the sea southwest of Ende and belongs to the Ende sub-district.

(2) Weather Conditions

The year in both Sikka district and Ende district can be divided into two seasons: the dry season from May to September and the wet season from October to April. The average annual temperature in Sikka district is 26° to 28°C, and the dry season rather than the wet season tends to have the most extreme low and high temperatures. The annual humidity is about 70 percent in the dry season and nearly 90 percent in the wet season, with large fluctuations throughout the year. The average annual temperature in Ende district, meanwhile,

is 26° to 29°C, and weather conditions closely match Sikka district. However, while the lowest temperatures are recorded during the dry season, and the highest temperatures are recorded during the wet season. Temperatures tend to be higher during the wet season. Humidity is high year round at 80 to 90 percent, with little fluctuation throughout the year.

In Sikka district, the average number of rainy days during the wet season exceeds 20 days, but is 0 to 3 days during the dry season when there is little rainfall. During the wet season, the average monthly rainfall is 300 to 400mm, and the average annual rainfall is about 1,600mm. Maumere, where the Wuring site is located, has fewer rainy days and less rainfall than the district averages. Although Paga sub-district, where Paga is located, has about the same number of rainy days as Maumere, it gets about 2,500mm of rainfall annually, suggesting that heavy rains bring a great deal of rainfall in a short period of time. Rainfall in the Ende district is about the same as in Sikka district (for details see Tables 7.4.1 to 7.4.6, Appendix 7).

According to the wind observation findings at Maumere Airport (annual averages from 1995-2000), most winds blow from the north and southwest, with the most frequent direction for average wind speeds being WSW-ESE. The average annual wind speed is 3 to 5 m/sec., but winds from the south and west are usually 7 to 8 m/sec., with winds exceeding 10 m/sec. being virtually nonexistent (for details see 7-4-7 to 7.4.1, Appendix 7 Tables).

(3) Topographical and Geological Conditions

Maumere (Kalimati) is located in the coastal area of the city center, and the surrounding coastline is a gently sloping beach of pebbles and sand. The sea bottom continues at an average slope of about 1/6 to a depth of 40 to 50m. The northern coastal area of Sikka district, which centers on Maumere, sustained extensive damage in the abovementioned earthquake and tidal wave of 1992, and massive damage was done to the Maumere coast, which is the city's coastline. The remnants of structures damaged by the 1992 earthquake have been left untouched in the sandbar that extends out beyond the coastline. Here the waves form currents that hinder the manoeuvrability of fishing boats. The tidal wave also significantly damaged fishing villages, and under each government's relocation policies, fishermen on Babi Island moved to Nangahare while Wuring fishermen moved to Nangafure where they formed new fishing villages. Wuring is comprised of a sub-village protruding about 600m out into a shallow part of the sea. The seabed is formed of coral and sandy soil. The eastern side of the sub-village is deep enough to allow fishing boats to drop anchor even during low tide, but the sea bottom is shallow near the end of the village. The Paga site on the other hand, which is located along the southern coast, has a sandy beach that stretches about 1km and faces south. The width of the beach is about 50m even at mid-tide (+1.77m), and a reef that is located in the southern part of the sea shelters the beach from oncoming waves.

Ende has a wide sandy beach that extends north to south, and the sea bottom near the shoreline is dotted with coral reefs. Because coral reef accumulations have formed a sandbar in the area around the existing PPI jetty from the shore line to the end of the jetty, it is difficult for fishing boats to dock there. During low tide, long-period waves create currents over the coral reef sandbar, making it impossible for fishing vessels to approach.

(4) Ocean Conditions

The northern coastal zone faces the Flores Sea and its usual tranquillity is broken only by wind and waves caused by the western winds (north-west monsoon). The eastern winds (south-east monsoon) are stronger than the western, but because the site is located in the innermost part of the bay, it is not affected by the waves from these winds. The southern

coastal zone, by contrast, is greatly impacted by the swelling waves from the Savu Sea and Indian Ocean, and waves caused by the western winds (north-west monsoon) and south-eastern winds (south-west monsoon) are quite large. Because Maumere (Kalimati) is located in the innermost part of the bay, wind and waves come from the western winds (Musim Barat), but the site is not affected by waves from the open sea. Because the port facilities located on the western side of Kalimati serve to cut off the waves, fishing boats can drop anchor close to the port and land their catch when there are western winds, but the operation takes more time than when the winds are calm. As mentioned in "Part II Present Conditions," Section 2.1.1 Natural Conditions, according to the plan for PPI Maumere (Nangafure) located west of Maumere, the recurrence probability for wave heights is a wave (northern) with a height of 1.6m is likely to occur every 20 years. Because topographical maps indicate that the fetch is short, the wave period is estimated to be 5 to 10 seconds. As in Wuring, waves are affected by western winds, but because the surrounding water is shallow, the wave height is estimated to be smaller than in Kalimati. According to the wind observation findings at Maumere Airport (see Appendix 7), most winds come from the north and southwest, with the most frequent direction for average wind speeds being WSW-ESE. Because of this, and considering the coastal topography, it is predicted that winds and waves will come from the northwest. Because Paga faces the southern coast, it is pounded by harsh waves when the southeast winds blow from May to July (south-west monsoon) when long-period waves hit the shore. However, a reef in the sea west of the coastline keeps high waves from reaching the coast, making it possible for fishing boats to drop anchor offshore. The tide level (HWL +3.54), field survey results, and interviews with fishermen suggest that waves can be expected to reach heights of nearly +5.5 to 6.0 during periods of severe waves. Like Paga, Ende also lies along the southern coast, and thus is also subjected to the strong long-cycle waves caused by the south-eastern winds (south-west monsoon) that blow from May to July. Waves and swells from the open sea also come ashore from the east. The tide level observation data for each site are shown below.

Tide Level

Site	LWL	MWL	HWL	Source
Maumere (Kalimati)	±0.00	+1.43	+2.88	Ocean depth field survey measurements
Wuring	±0.00	+1.45	+2.90	Ocean depth field survey measurements
Paga	±0.00	+1.77	+3.54	Ocean depth field survey measurements
Ende (Paupanda)	±0.00	-	+3.45	Provincial Fisheries Office materials

(5) Land Usage Conditions

Because Maumere (Kalimati) is located along the coast in the Maumere city center, it is a bustling area, lined with shops and full of people. Fisheries activities are currently carried out along the beach at the river mouth (Kalimati), but the District Fisheries Office finished the reclamation work for a 2,300m^2 fisheries activities area along the nearby coastline in 2001. Before the 1992 earthquake, the reclaimed area along the coastline was solid land, but the earthquake destroyed the coastal facilities, and the remnants of the structures that were destroyed remain in the water along the coast.

Wuring is a simple fishing village, and about 500 or more elevated houses line the 600m arterial roads that run through the center of the village. There is no land in the village besides the arterial road and the adjacent residential area, except on the side of the fish-landing site. In recent years, reclamation and housing construction using simple rock revetments have increased along the arterial road, but homes located far from the arterial road form clusters built completely over the water. The sea bottom is exposed during low tide, but at high tide, the areas between the houses become canals (waterways), and small non-motorized fishing boats (sampan) are used to travel between houses. The garbage

accumulated in the sub-village drainage at low tide is carried out to sea when the high tides come in and then recede, so garbage does not accumulate along the arterial road. Most of the open spaces in the sub-village (which are submerged during high tide) are owned by individuals, and there are no publicly owned open spaces.

Paga is located along the national highway that vertically intersects Flores Island. The national highway runs along the coast, and the width of the area from the highway to the coast is about 50 to 100m. The cooperative-owned area between the highway and the coast is quite dilapidated and is currently home to the unused cooperative facilities.

Ende is located on an expansive sandy beach that extends north to south. The existing PPI Ende (Paupanda) is located there, and facilities centered around the District Fisheries Office have been built on about 1 ha of land.

1.1.2 Social Infrastructure

(1) Road Transportation Conditions

As stated earlier, Maumere, the district capital, serves as the transportation center for Sikka district, and is situated along the national Trans Flores Highway that vertically intersects Flores Island from Larantuka on the eastern end to Labuan Bajo in the west. It is also the starting point for many of the arterial roads that lead to other locations in Sikka district. Maumere Airport, which is located in the outskirts of Maumere, is Flores Island's largest airport, and has daily flights to Denpasar on Bali Island. There is also a port located in the western part of the city, which serves as a hub for maritime routes that go outside of the zone. Unscheduled transport boats from the islands north of Maumere (4GT, L=12m, B=2m fishing boats, Pelau Sukun: 5, Pelau Besar: 4, Pelau Parmahan: 15, Pelau Koja: 5) use Kalimati for pick up and drop off island passengers and to refuel. Regularly scheduled transport boats only use the nearby port on trips to Pelau pamana. The main line of movement in Wuring sub-village is the road through the center of the sub-village (B 5m, built jointly by the government and residents after the 1992 earthquake). Houses are built around this central road, and houses far from it are only connected to it by a simple bamboo bridge. The overall level of sub-village transportation convenience is poor. Since most of the houses in the sub-village are elevated, small boats (sampan) serve as the main form of transportation connecting the fishing boats anchored on the sea with these houses. The construction of the central road was promoted as a joint effort with the government in which the district government supplied the materials and local residents donated the money (houses along the road cost Rp.250,000/house while houses far from the road cost Rp.50,000/house) and the labour. Paga, as mentioned earlier, has no road transportation problems because the national highway traverses it along the coastline.

Ende is located in a coastal area separated from the city center, but has a paved road of about 4-5m wide connecting it to the city center and the arterial road. It thus has no significant road problems. Ende also has a ferry port and commercial port that provide waterway transport across a wide area. The airport located in the city is used by small aircraft that offer several flights per week to Kupang, Sumba Island, and Bima on Sumbawa Island. Private vessels operate between Ende and Ende Island, serving as the main means of transport for Ende islanders.

(2) Condition of Public Facilities

Maumere, the capital of Sikka district, provides the major public facilities for the region. There are public markets in the interior areas away from the city center, but the morning markets for fresh fish and vegetables located along the area roads are centered on

the beach at the river mouth area of Maumere. Because Wuring is close to Maumere, it relies on Maumere for its major public facilities. The site itself has a small cargo port, a primary school, and a city hall located along the arterial road at the entrance of the sub-village, but it does not have such facilities as a meeting hall or facilities for use by local residents and fishermen. Public facilities for Paga are located in a sub-village about 1.5km to the west, and include a sub-district administrative office, a village administrative office, an elementary school, and a meeting hall, but the areas where improvements are planned have neither public facilities nor a meeting hall for fishermen.

Like Maumere, Ende is a district capital that provides major public facilities for the region. Ende Island, however, does not have waterworks facilities, a situation which makes it difficult for residents to obtain household water. Residents must transport water from wells on the island to water jugs located at each house.

The water, electricity, and communications infrastructure at each site are summarized below.

Electricity, Water Supply, and Communications

Site	Electricity	Water Supply	Communications
Maumere	Power supplied from the PLN (24hr)	PDAM water pipes have been installed along the arterial road.	Telephone facility is functional.
Wuring	Power supplied from the PLN (24hr)	PDAM water pipes have been installed along the arterial road. However, water is only supplied to about 50 percent of individual houses.	Telephone facility is functional.
Paga	Power supplied from the PLN (24hr)	Village-operated water system. But water pipes were destroyed by flooding. Shared wells are available.	Telephone facility is functional.
Ende	Power supplied from the PLN (24hr)	PDAM water pipes have been installed along the arterial road. Eastern sub-village uses well water.	Telephone facility is functional.
Ende Island	Power supplied from the PLN (24hr)	No water supply system. Water comes from wells on the island.	Telephone facility is functional.

1.1.3 Fishery Related Facilities

Existing fishery facilities consist of PPIs located in Nangafure, located 13km west of Maumere city in Sikka district, and in Paupanda in Ende, the capital city of Ende district.

PPI Nangafure is located in the front part of the village that was newly constructed by fishermen relocation policies after the 1992 earthquake, but basic fishing port facilities were planned for the purpose of accommodating large fishing boats. It is hardly used because it cannot accommodate small fishing boats and because a distribution system has not yet been developed due to the lack of functional fishing port facilities. It is only used by one ton or smaller fishing boats for landing their catch on the beach. Because the army occupies part of the coast including the jetty, fishermen cannot use it.

Landing facilities using the jetty in front of the Fisheries Office have been built at PPI Ende (Paupanda), but they are not used today.

(1) Facilities at Maumere (Kalimati): Problems and Solutions

Before the 1992 tidal wave disaster, Kalimati was an active fishery region with a District Fisheries Office and private fisheries companies. These facilities were all destroyed by that disaster, however, and have yet to be reconstructed. The beach, which had landing facilities used by fisheries companies before the disaster, is now used by fishermen to land their fish, and the area has been left alone as an open-air market. Because there are no landing facilities, fishing boats have to drop anchor at sea and use small non-motorized fishing boats (sampan) to transport their fish catch to shore. A private ice-making plant

(which produces 2.5 tons/day) in the port region adjacent to the beach is used by fresh fish distributors.

Also, a private skipjack pole and line fishing company and dried Eastern little tuna plant have moved into other locations in Maumere city, and their fish supply is provided by the boats they operate or through consignments with local fishermen.

As shown in the table below, the Sikka District Fisheries Office reclaimed some land for fishery operations (A = 100m × 23m = 2,300m^2) in Kalimati in the fall of 2001, and in 2002 plans to install a jetty, market, and offices there.

Outline of Sikka District Fisheries Office Plan

Construction schedule	Facility	Size	Description
Completed in 2001	Land	A=2,300m3 (23m x 100m)	
"	Wastewater ditch	1	
To be completed in 2002	Jetty	L=25m, B=7m	T-style jetty, starting depth of ±0.00m
"	Connecting jetty	L=7m, B=5m	Jetty-type
"	Retail market	A=300m^2 (30m x10m)	Buildings
"	Office	A=80m^2 (8m x 10m)	Buildings
To be completed in 2003 or later	Storage warehouse	A=48m^2 (8m x 6m)	Buildings
"	Ice facility	A=48m^2 (8m x 6m)	Buildings
"	Simple workshop	A=24m^2 (4m x 6m)	Buildings
"	Fuel station	A=24m^2 (4m x 6m)	Buildings
"	On-site road	L=137m, B=5m	
"	Fence	1	

However, considering the current fisheries activities and the area's future function and role, this plan has the following problems.

Problems with the Sikka District Fisheries Office Plan

Section	Problem
Site scale	The site area is small, and does not meet the area requirements calculated for the functions it is supposed to serve (see Appendix 4).
Fish handling functions	Because the facility will not have fish handling facilities, maintaining freshness when handling fresh fish will be difficult.
Collection and shipping functions	Because a loading/unloading workspace for fish shipments has not been secured, these operations will have to be done on the same lines of movement as other activities.
Site revetment	The site revetment is a simple structure that would hardly be able to withstand the kind of conditions that occurred during the 1992 earthquake.
Jetty	Because the planned depth at the jetty is to be ±0.0m and given the size of the fishing boats used (1-15 GT), fishing boats will not be able to use the jetty except at high tide (HWL + 2.44).
Water area	The remnants of structures destroyed in the 1992 quake have been left in the sandbar beyond the coastline. As a result, the waves have formed currents that hinder the maneuverability of the fishing boats.
Accommodation of small fishing boats	Because the existing site revetment is a sloped concrete revetment, small fishing vessels can only use (moor at) the facility during high tides.

Lying outside of Maumere, Wuring is a sub-village densely populated with houses built out over the water. Because of the difficulty of procuring land in the sub-village and because all fishing boats except for small angling boats, land at Maumere, fishery facilities are non-existent.

(2) Facilities in Paga

There are also no fisheries facilities in Paga.

(3) Existing Fishery Facilities in Ende (Paupanda): Problems and Solutions

As mentioned above, PPI Ende (Paupanda) was constructed in 1991 in Ende. It is the site of the Ende District Fisheries Office and the fishery facilities described below.

Existing Facilities at PPI in Paupanda

No.	Facility	Size	Description
(1)	Jetty	L= 60m, B=7m	T-shaped jetty-type, crown height of +4.95m
(2)	Connecting jetty	L=152m, B=7m	Jetty-type
(3)	On-site road	L=130m, B=9m	With ditches along both sides, roadway section B=7m
(4)	District Fisheries Office	A=180m^2 (14.5m x 12.5m)	
(5)	Warehouse, restroom	A= 50m^2 (9.3m x 5.4m)	
(6)	Water tank	A= 7.4m^2 (2.0m x 3.7m)	Capacity: 10.6 tons
(7)	Water tank	A= 3.1m^2 (1.4m x 2.2m)	
(8)	Warehouse (electricity)	A= 27m^2 (7.0m x 3.8m)	
(9)	Well	unit	
(10)	Fuel tank	A= 13m^2 (2.6m x 5.0m)	Unusable due to corrosion
(11)	Fish handling shed (TPI)	A1=275m^2 (12.5m x 22.0m) A2=164m^2 (16.4m x 10.0m) A= A1+A2 = 441m^2	Fish handling site Building
(12)	Cooperative office	A= 110m^2 (7.0m x 15.7m)	
(13)	Landing facilities	A= 120m^2 (14.3m x 8.4m)	Currently being used as a residence for the manager

Note: Facilities (4) to (10) above are located in the Fisheries Office zone. Facilities (11) to (13) are located in the lower southern zone. The north side of the on-site road is undeveloped and unused.

However, because these facilities have the following problems, they are not presently being used.

Problems of PPI Paupanda

Section	Problems
Tide level response	Because the jetty crown is at a height of +4.95, it is difficult for 5 GT-class fishing boats, which describes most fishing boats, to land and load or unload. It is virtually unusable except at high tide.
Long-period wave countermeasures	Because there are no breakwaters for incoming long-period waves, fishing boats are tossed around and it is difficult for them to approach the jetty.
Vessel maneuver area	Coral reefs dot the area from the jetty to the coastline, hindering fishing boat maneuverability. Since the jetty is unusable, especially when there are long-period waves, current operations require the use of small non-motorized fishing boats to ship cargo to shore. However currents in the coral reef areas make those areas impassable.
Distribution functions	Because there are no ice facilities or fresh fish storage facilities for fresh fish distribution, a distribution system cannot be developed with the use of traders.
Fisheries support functions	Facilities that perform such fisheries support functions as fuel supply, water supply, fishing boat and fishing gear repair, and processing have not been built.

Because there are no fishing boat repair facilities, the fishermen around Ende land at the sandy beaches of Aejeti village on eastern Ende Island to perform repairs.

1.2 Fisheries Conditions

1.2.1 Overview of Fishing Village

The population of this zone is about 200,000 (comprised of about 110,000 around Maumere, 25,000 around Paga, and 65,000 around Ende), with the main ethnic groups being the Sikkanese, the Endenese, and the Lio. The majority of the population is Catholic, but a large Muslim population also resides on the outskirts of Ende. While most of the fishermen along the northern coast are Bugis or Bajo, ethnic groups that originated in Sulawesi, the population in Paga along the southern coast consists of both Lio (Catholic) and Endendese (Muslim). In Ende, most of the population is Endenese (Muslim).

This zone contains three model sites (Maumere/Wuring, Paga, and Ende). Since Maumere and Ende are urban landing sites, fish is landed by fishing boats from several nearby fishing villages that straddle the sub-district (Kecamatan). The numbers of RT, households, and fishermen households for each of the villages (areas) that are affected by each model site are shown below (for details see Table 1-9, Appendix 1).

Model site	Administrative province	No of administrative villages (regions)	No. of fishing sub-villages	No. of RT (fishermen household RT)	No. of households (no of fishermen households)	No. of fishermen groups	No. of women's groups	Fishermen cooperatives (no. of members)
Kalimati/ Wuring	Maumere	3	7	N/D	N/D (575)	7	3	-
	Alok	2	2	54 (18)	1,769 (351)	7	3	-
	Nita	1	1	27 (3)	532 (120)	2	1	-
Paga	Paga	2	2	43 (25)	1,465 (397)	48	1	1 (80)
Ende	Ende Selatan	6	15	92 (60)	5,199 (1,390)	66	2	-
	Pulau Ende	6	18	72 (45)	2,071 (1,573)	1	-	-

1.2.2 Fishing Activities

(1) Major Fishing Methods and Fishing Boats

The fishing grounds can be divided into two large areas, the northern coastal waters (along the Flores Sea) and the southern coastal waters (along the Savu Sea). The predominant fishing methods used in both regions are purse seine, gill net, and angling. Along the northern coast, the Butong fishermen (based on Pomana Island in Maumere Bay) also employ skipjack pole and line fishing, and then sell most of their catch to the two fisheries companies in Maumere (one frozen processing company and one smoke-dried tuna processing company). The frozen processing company has its own fishing boats (ten 75-ton skipjack pole and line fishing boats and 20 3-ton tuna trawlers) which it operates on a contract basis with local fishermen. There are also live fish shipping companies in Maumere that ship live demersal fish under contract with angling fishermen. Along the southern coast, however, there are no fisheries or shipping companies.

Many fish aggregating devices (FAD) have been installed along the coasts of Maumere and Paga. In Maumere they are primarily used for purse seine fishing, while in Paga they are primarily used for gill net (fixed) fishing and trawling. FADs are nonexistent along the Ende coast. While purse seiners, the mainstay vessels of the coastal fisheries industry, rely on fish-gathering devices like FADs and fishing lamps for operating at night along the northern coast, fishing along the southern coast is done by visual observation during the daytime. Because of this, fishing resources in the southern coastal waters are believed to be richer (denser schools of fish) than in the northern coastal waters. Ende has a lot of lampara net operations (fishing at night using a fishing lamp) in addition to its purse seiners.

Ralue Island in the sea off the north coast of Ende (Sikka district) and Ende Island in Ende Bay are known for their large numbers of blast fishermen. Under the guidance of the district and sub-district governments, an agreement was reached in July 2001 requiring all fishermen to discontinue blast fishing, and thus, their numbers have been drastically reduced. Still, those who are poor and do not have purse seines or gill nets lack technologies other than blast fishing for catching fish. If no appropriate emergency measures are taken, these fishermen will be left with no other choice but to start blast fishing again. The fish targeted by the blast fishing conducted on Flores Island are pelagic fish (including large migratory fish) for local consumption. Blast fishing is not caused by shipping companies like those in Sulawesi loaning money to fishermen and thereby institutionally forcing them to catch

demersal fish. Rather, it has become a customary fishing method for poor fishermen.

The following table shows the number of active fishing boats by fishing method in the three model sites in this zone.

Model site	Purse seine	Gill net	Angling / Trawling	Other
Kalimati/Wuring	54	24	47	Shipping vessels 19
Paga	21	9	2	-
Ende (including Ende Island)	33	9		Lampara net 12

Source: Estimates based on the results of a landing site survey conducted in February-March 2002.

(2) Fishing Boat Operation Patterns

The fishing season in this zone is from March to December along both the northern and southern coasts. The peak season of the north-western monsoon (December to February) brings high waves that limit the number of fishing days along the southern coast, but the northern coast is virtually unaffected. Thus, the catch landed is affected by fishing season fluctuations for different types of fish. Catch volumes decline from December to February and June to August, but are relatively stable over the course of a whole year. Along the southern coast, however, the catch landed decreases dramatically from December to February. During this time, Eastern little tuna and other large pelagic fish are transported south from the fish catch harvested along the northern coast, and very few fish are sold on the market.

The fish catch for Maumere is largely harvested by purse seiners in neighbouring Wuring village, and many of the fish caught by gill nets and angling are landed at nearby villages. The women of the fishing villages either transport the fish over land to the Maumere markets for sale or process the fish in the village. In Maumere, there are also fish collection boats (19) that collect fish from purse seiners at the fishing grounds during the night for direct landing. There are many fishermen on Pomana Island in Maumere Bay (mainly skipjack pole and line fishing) and Besar Island (mainly demersal fish angling), but the fish catch at the former is largely sold to fisheries companies while the fish catch at the latter is shipped as salted and dried demersal fish to the Geliting market located about 10km east of Maumere. Thus, virtually no fish is landed directly at Maumere (Kalimati).

(3) Fish Species

The percentage of large pelagic fish such as bonito and tuna is higher in this zone than in other areas. They comprise about 70 percent of the entire catch landed in Maumere. Also, along the southern coast, there is a large percentage of small pelagic fish, such as round scad, fusiliers, and big-eye scad. Few sardines are caught in either the northern or southern coastal waters. The breakdown of fish species at each model site is shown below (for details see Table 1-9, Appendix 1).

Coastal region	Model site	Large pelagic fish	Small pelagic fish	Demersal fish	Comments
North	Maumere	69%	24%	7%	Kec. Alok landing data
South	Paga	22%	67%	11%	Kec. Paga landing data
	Ende	37%	50%	13%	Paupanda landing data

Source: Sikka District and Ende District Fisheries Offices.

(4) Procurement, Repair, and Replacement of Fishing Equipment

Much of the fishing equipment and spare parts that are needed can be purchased at fishing gear stores in the towns of Maumere and Ende. There are thus no problems regarding materials procurement. Because there is no store in Paga, however, the fishermen all have to purchase their own materials from Maumere. Fishing boat fuel is available at all the sites.

The fuel storage facilities of a petroleum company are located in Maumere and Ende, so fuel can be purchased at standard prices. However, because the gasoline stations are located far away and often have long lines, even fishermen living in the city buy their fuel from fuel stations near their homes. The refuelling volume per day is about 20 to 30L for a purse seiner (5 to 10 L for a gill net or angling fishing boat). Because they have to refuel before going fishing each day, the fishermen prefer to buy their fuel from the nearest, most convenient fuel stations, even if the prices are somewhat higher.

1.2.3 Fish Marketing, Processing, and Shipping

(1) General Conditions

The main seafood consumption areas in the central Flores region are Maumere, a fish landing site and the capital of Sikka district, and Ende, the capital of Ende district.

Some fish landed in the early morning at Maumere (Kalimati region) is sold in the retail markets along the landing beach, while traders ship some to villages in the interior and to Ende. The fish sold along the beach includes the catch directly landed there as well as the catch landed in nearby villages and transported over land to the beach by village women. All of the activities along the landing beach are finished by about 10:00 a.m., and any remaining fish is sold in public markets or in the interior regions.

The fish catch destined for Ende is largely landed at Mbongawani beach. This landing beach is used for the catch destined for the Ende outskirts (Mbongawani, Ruknlima, and Mbonagawani areas), as well as for the direct landings of the purse seiners and lampara net fishing boats from Ende Island. Behind the beach lies the Mbongawani public market, and much of the catch landed is available for direct retail at the beach. There are three public markets in Ende (at Mbongawani, Potulando, and Wolowona), and fish is sold primarily in the mornings at Mbongawani and in the evenings at Potulando. There are also landing beaches and fishing villages (Ippi, Mautapaga, Arubara) along the eastern Ende peninsula, but the scope of the fishing operations is small, and the fish catch is directly landed at each village and transported over land for sale in interior markets in the island. Presently, virtually none of the fish catch landed in Ende is transported outside the region.

Paga is located about one hour from Maumere and about three hours from Ende, so much of its fish catch is sold to interior villages. When the catch is especially large, some fish are shipped to Ende, but rarely are the fish landed here shipped to Maumere.

(2) Fish Transactions

The majority of the catch in this zone is distributed through male traders and retailers. Only the fishing village women sell fish landed in the fishing villages outside of Maumere in the city markets, and in Paga and Ende along the southern coast. Most of the traders, including the retailers, are men. Fish transactions differ by model site. In Ende, about 10 fish collectors (including large-scale boat owners) buy the entire catch from the fishing boats and then sell it to the retailers on the beach. In Maumere, by contrast, a mixture of traders and retailers make purchases of various sizes, and transactions are done directly with the fishing boats. In some cases, purse seine fishermen directly sell their fish catch in plastic bags of 12 kg each along the beach. In Paga, the landed fish catch is small, but each boat lines up its catch along the beach, and the fishermen compete to sell their hauls directly to the retailers gathered there (many of whom will motorbike into the interior regions to sell the fish).

The units of transaction along the beach differ by location, type of fish, and type of fishing boat. Generally, the units of transaction are divided by the size of the fish. Small fish weighing 100g or less are sold in plastic bags (12kg each, Maumere) or in plastic containers

(15kg each, Ende), while larger fish are sold according to catch in number. However, halfbeaks and flying fish, though small, are usually sold according to catch in number. In Paga, due to the large size of the fish and the small size of the catch, the transactions are conducted according to catch in number.

Perhaps because Ende has long prospered as a merchant town, the fishermen and distributors have a sense about the kilogram unit, even though it is not yet used in daily transactions. There are many old refrigerators and wooden insulated boxes along the beach, and many market retailers use the small insulated boxes. In Maumere, on the other hand, wooden insulated boxes (with interiors made of ferrocement) are used for shipping fish outside the local area, to Ende for example, but are not yet widely used in the city for retail purposes.

(3) Fish Distributors

The results of the counting survey conducted in February to March 2002 can be used to estimate the average daily number of traders and retailers and the daily transaction volumes (fresh fish only) during the peak fishing season at each planned site using methods described in Appendix 1. The results are shown in the table below (for details see Table 1-5, Appendix 1).

	Maumere (Kalimati)	Paga (Paga/Mauloo)	Ende (Mbongawani)
Number of people	79	37	107
Transaction volume (kg/day)	7,525	2,373	7,386
Average (kg/person/day)	95	64	69

An analysis by gender shows that there is a high percentage of men at each site, 75 percent in Paga, 91 percent in Maumere, and 100 percent in Ende. Transactions by small-scale traders and retailers with daily transaction volumes of 100kg or less account for 39 percent of all transactions in Maumere, 67 percent in Ende, and 98 percent in Paga. These results show that while Maumere has a mixture of large-scale operators who ship to Ende and small and medium-sized retailers who sell their fish in the city or in the interior regions, the large majority of traders in Ende are retailers who sell their fish in the city, though some fish collectors handle large catches. In Paga, because motorbike merchants who sell fish in the interior regions conduct most transactions, most are small-scale traders.

(4) Fish Processing

As mentioned earlier, the percentage of large pelagic fish in this zone is higher than in other regions. Since the majority is distributed as fresh fish, the region is known for having a preference for fresh bonito and tuna. A large percentage of small pelagic fish is sold fresh and consumed in the cities of Maumere and Ende, but during the peak fishing season, there are large quantities of unsold fish that are used for salting and drying or for pickling. In Paga, many of the small pelagic fish during the peak fishing season are preserved and shipped after being salted and dried or pickled. In Maumere, frigate tuna are seasonally caught in large quantities, but because they are too large to be suitable for salting and drying, and no other processing methods are currently in wide use, the fish price plunges, sometimes causing unsold quantities to simply be abandoned on the beach and used as food for pigs.

(5) Fish Price

The beach fish price fluctuates according to the fishing season and the size of the catch landed on a given day. The fish price in Maumere is especially prone to reflect the size of the day's catch. There is little fluctuation in the monthly catch landed there, but since extraordinary hauls of a given species of fish may occur on any given day, the fluctuation in

fish prices is extremely large. Along the southern coast, however, fish prices are only linked to seasonal fluctuations of the fish catch, and extremely high or low prices are rarely found. The beach fish prices for the major fish species at each site are shown below.

(Unit: Rp./kg)

Species/Site	Maumere	Paga	Ende
Fusiliers	2,100 - 12,500	2,500 - 5,000	3,500 - 4,000
Round scad	2,100 - 14,500	2,800 - 5,250	3,000 - 5,000
Bigeye scad	2,100 - 12,500	3,500 - 5,250	
Halfbeaks	500 - 1,500	1,250 - 3,750	1,000 - 2,500
Flying fish	350 - 1,750		1,000 - 2,500
Frigate tuna	80 - 2,500	1,700 - 3,300	1,500 - 3,000
Bonito	1,000 - 5,000		2,000 - 8,000
Tuna			2,000 - 8,000
Cheapest season	Dec. – July	Mar. – Aug.	June – Aug.
Most expensive season	May – Nov.	Nov.-Dec.	Dec. – Mar.

Source: On-site interview survey findings, March 2002 (see Table 1-8, Appendix 1).

1.2.4 Mariculture

Fishermen in Sikka district have engaged in seaweed culture since 1989 through a private company, but the crop was entirely destroyed by a tidal wave in 1992. Culture activities stopped until 2000 when seaweed culture was restarted at Koja Doi Island located in the seas north of Maumere as part of a district government project. A central government project in 2002 at Koja Doi Island also started the floating cage culture of sea bass and rabbitfish. The District Fisheries Office has policies to promote the culturing of seaweed and cage culturing at Koja Doi Island and nearby Paramahan Island.

(1) Culture Conditions

(a) Sea Bass and Rabbit fish Cage Culture

Floating cage culture of humpback grouper, tiger grouper, and rabbit fish on Koja Doi began on January 15, 2002. The project is being funded by the central government, but the District Fisheries Office is in charge of setting up the project and monitoring activities. Twenty fishermen were selected from Koja Doi to participate in the cage culture project and to set up two kelompok. When the project began, there were 2,750 sea bass and 4,000 rabbit fish, but a survey conducted in May 2002 showed poor results: the sea bass population had been severely depleted to only about 1,000, indicating a survival rate of only 36 percent. The decrease in rabbit fish could not be determined. The cage culture of sea bass and rabbit fish in Sikka district involved the following components.

(i) Introduction of Artificial Seedlings

This project purchased humpback sea bass and carpet cod seeds from the Gondol Research Institute for Mariculture. This would make it possible to breed a fixed quantity of fry of the same size. However, the project purchased natural rabbit fish fry caught by local fishermen.

(ii) Educating Fishermen at the Gondol Research Institute for Mariculture

Participants in this project underwent a one-week training course at the Gondol Research Institute for Mariculture. Adequate training can not be provided in such a short time, but further training is included as part of the project. Sikka District Fisheries Office personnel also participated in this training course.

(iii) Use of Mixed Feed

Under this project, rabbit fish are fed market-purchased mixed feed (Rp.10,000/kg). Because the price of a rabbit fish is about Rp.15,000/kg, this clearly poses a financial problem, but new approaches incorporating new technologies are being attempted. However,

because this mixed feed floats, it cannot be used for sea bass. They are fed small fry.

(b) Seaweed Culture

As part of this District Fisheries Office project, only ten kelompok members were given materials for culturing seaweed in 2000. Initially, only these 10 people on Koja Doi Island engaged in seaweed culturing. Later, other fishermen on the island began their own seaweed culturing activities, and as of May 2002, more than 20 households outside the kelompok were engaged in seaweed culturing. After the product is dried for three days, the fishermen sell it to a fish collector located on the island. The fish collector dries the purchased seaweed for another two days, and once all foreign matter has been removed, it is sold to a Maumere shipper. The wholesale price for seaweed sold by the fishermen to the fish collector at the time of this survey was 3,250 Rp./kg, and the sales price from the fish collector to the shipper was Rp.3,750/kg. The sales price from the shipper to the processing plant in Surabaya was Rp.4,250/kg. The sales price for seaweed sold around the same time by fishermen on Lombok Island to the fish collectors was Rp.3,500/kg, Rp.250/kg higher than in Maumere. Seaweed culture in Sikka district involved the following components.

(i) Long lining Culture

Long line techniques using mineral water bottles as buoys have been adopted in areas covered by this survey such as Waworada, but because it is difficult to obtain empty bottles on Flores Island, a highly priced bamboo raft technique has become more popular than long lines. But, fishermen still engage in long lining culture at Koja Doi Island using fragments of rubber sandals and styrene foam as buoys. Effort is being made to reduce costs using limited materials.

(ii) Individual Operations

Like other fisheries projects undertaken by other District Fisheries Offices, the kelompok of this project was established as an organization for undertaking support projects. Nonetheless, the kelompok members are engaged in long line culture individually, and they are not engaged in joint activities as a kelompok.

(iii) Women's Participation

All the members of the kelompok are men, but women also work in seaweed culture. In many cases, the whole family is involved. Seaweed culture does not require advanced technology and it is not very labour intensive, so it provides an opportunity for women to become involved in their communities.

(2) Issues

The following issues have arisen in the mariculture efforts in Sikka district.

(a) Sea Bass Culturing

(i) Low Motivation to Participate

Like the culture project in the eastern Flores zone, this project does not support personnel costs. Also, the fishermen have to catch the fry they need to use as bait. Thus, the participants do not receive any income until the harvest, forcing them to engage in both farming and fishing. Because the project is not currently helping their income, the participants' motivation to engage in culture activities is low.

(ii) Inadequate Bait Supplies

A lack of adequate funding has meant a shortage of bait. Because there are some days when an adequate supply of fry for bait cannot be caught, the pace of growth is slower here than in the trial sea bass culture activity being conducted as part of this study in Lembata.

(iii) Undeveloped Rearing Techniques

Participants underwent culture training in sea bass culture before the project began, but because the course was very short, they were unable to learn everything they needed to know. Perhaps due to their low motivation, cage management activities such as net cleaning are inadequate, and proper rearing records are not being kept. In addition, Fisheries Office employees do not know how to treat fish diseases.

(iv) Inadequate Materials

In this project, floating cages, nets, and fry are given to participants. However, the task of replacing the nets has been neglected, and there were not enough nets for the number of floating cages. In addition to nets, the supply of other basic equipment that is used on a daily basis, such as lift nets and baskets is inadequate.

(b) Seaweed Culture

(i) High Culture Costs

Because the equipment and materials for seaweed and other types of culturing are supplied from Surabaya and Ujung pandang, their cost is higher than in Sumbawa Island. There are also materials that cannot be obtained on Flores Island, such as empty mineral water bottles. The product is ultimately shipped to processing plants in Surabaya or Java, and shipping costs are also higher than on Sumbawa.

(ii) Crop Rotation

In conversations with fishermen, researchers learned that kirinsai (Eucheuma muricatum) is not native to the area around Koja Doi. Thus, some of the cultured seaweed is reused to produce seeds for the next crop. It is well known that if this crop rotation of kirinsai continues for a length of time, its productivity declines. Seaweed culture on Koja Doi Island has been ongoing for about three years, and a loss of productivity has not yet become a problem. Nonetheless, seaweed seed from other sources should be introduced periodically.

Areas suitable for mariculture in Sikka district are limited to island areas such as Koja Doi. These regions lie outside the priority sites covered by this survey. In addition, because the model sites of Paga and Ende have flat coastlines and face the Savu Sea (Indian Ocean), they do not have any areas suitable for mariculture. Thus, mariculture plans have not been included for this region.

1.3 Fishermen Organization, Fisheries Credit, Fisheries Extension, Education/Training and Community Living Environment

1.3.1 Fishermen Organization and Fisheries Credit

(1) Fishermen Organization

This zone includes the three model sites of Maumere (Kalimati) and Maumere (Wuring) in Sikka district and Paga, and Ende (Paupanda) in Ende district. There are no cooperatives at the Maumere site, but there are 16 fishermen groups and seven women's groups. There used to be a cooperative in Wuring (established in 1976), but all of the related buildings were destroyed in the 1992 tidal wave, bringing the cooperative's activities to a halt. There are about 40 traders at the Maumere (Kalimati) landing site, and they have been active for more than ten years in fish marketing, fish price setting, mutual financing, and providing assistance to fishermen.

Paga has a fishery cooperative with 80 members (Koperasi Nelayan Mina Bahari), but it is not active. It has 48 fishermen groups and one women's group.

A fishermen's village cooperative (KUD Mina Putra Bahari) was established in Paupanda village in Ende district in 1994 with 179 members, but until recently it was not very active. A former district fisheries officer became the chairperson of the cooperative in March 2002, and it has begun such activities as small-scale financing. According to the chairperson of the cooperative, the group's problems include low awareness among members about repayment rates and savings, a lack of management and business skills, and a lack of desire for self-improvement through a spirit of cooperation.

About 25 people, including fishermen from Ende Island, attended a workshop in Ende on fisheries development programs being planned and conducted as part of this study. The attendees seemed to recognize the importance of autonomous management, were interested in participating in the project, and expressed ideas about ways to support the project's planning and implementation. They understood that the planning and implementation of this project are tied to the stabilization of fish prices, the formation of a stable market, and quality improvements, and they were not opposed to paying service fees and facility use fees. They also agreed to form a group and take responsibility for the operation and management of planned facilities and equipment. They agreed to entrust the existing cooperative with the responsibility of handling the operation and management functions.

(2) Fisheries credit

Because the Kalimati landing site in Sikka district and the fishing villages of Wuring and Paga do not have cooperative financial services for fishermen, the fishermen have to rely on informal financing. To ensure their own stable supply of fish, the group of 40 traders operating at the Kalimati landing site plays the role of an informal financial institution for the fishermen. The existing cooperative in Paupanda village in Ende district was given Rp.8 million from the District Cooperative Office when it was established. Today, that cooperative provides small-scale loans to cooperative members at high interest rates of 10 percent per month.

Sikka and Ende districts were allotted Rp.628 million and Rp.800 million, respectively, from the 2001 PEMP fund. Still, the sub-districts where the model sites are located were not chosen as targets for financing in FY2001.

1.3.2 Fishery Extension, Fishermen Education and Training

The Sikka District Fisheries Office proposes to the district government for funds to incorporate training and extension activities into the annual development program. In FY2001, the District Fisheries Office budgeted Rp.5.7 million to cover costs for activities targeting three fishing villages (Paga, Wuring, and Nangahela). These included extension costs related to information dissemination on fisheries resources conservation and the costs for periodic radio broadcasts related to natural resources conservation and fisheries business activities. The training activities were led by eight staff members with fisheries experience. The Ende District Fisheries Office had also budgeted Rp.2 million for fisheries conservation and education and training activities in freshwater fish culture.

1.3.3 Community Living Environment

(1) Kalimati/Wuring Site

Because the Kalimati (Maumere) site is only a fish landing site, with no nearby sub-villages, this section will describe the conditions at the Wuring site, where fishermen land

their catches at Kalimati.

Wuring fishing village lies just north of central Maumere city. The village faces the Flores Sea, and is centered around a single village road (600m long, 3 to 4m wide) that was created using the sandbar that extended from the coast into the sea. It is a typical seaside sub-village with elevated houses densely clustered along both sides of the road. The residents are ethnically Bugis, and all of the households make their living from the fisheries industry. This village is part of a "Traditional Village Tour" for tourists who visit Flores Island.

The following are issues regarding living environment improvements that were raised during a workshop on fishing village environmental improvements held in the village.

Issues	Existing Conditions
1) Water supply shortage	A waterworks system has been installed, and most households have tap water for drinking and household water use. However, the water supply is low, and the water is frequently shut off.
2) Lack of roads and drainage facilities in the sub-villages	The roads in the village today were rebuilt using donations from local residents after the village was completely destroyed by a tidal wave in 1992. The road is narrow at only 3-4m wide, and because it is not fixed, there is often traffic congestion. Because wastewater from homes flows directly into the sea, there is a terrible stench at low tide when the beach is exposed.
3) Toilets	Many households do not have a toilet. There is one public toilet, but it is not used by local residents because of the stench. Many residents use the beach to meet their needs.
4) Disorderly garbage disposal	The residents dispose their garbage around their homes or in the nearby ocean since there are no rules on garbage disposal. Because dumped garbage is brought back in by the tides, garbage is littered around their homes at low tide. Recent years have yielded a significant accumulation of discarded plastic, which is not easily broken down under natural conditions, so garbage is not being dispersed into the sea and the seabed around the village has become terribly polluted.
5) Electricity	Electricity is supplied 24 hours a day, but there are frequent blackouts. Firewood is used as cooking fuel.
6) High primary school dropout rate	Parent awareness of the importance of formal education is limited and the ratio of children who dropout of primary school is high (the dropout rate is uncertain). The greatest reason children drop out is because parents have their children help with nighttime fishing activities when they are around primary-school age. Because the children can earn some spending money this way, they eagerly help out with the fishing and lose any desire to attend school.
7) Lack of leadership qualities	Every Friday, the villagers clean the mosque and roads, but they lack adequate cleaning equipment. Although it is possible to purchase the cleaning material through joint funds, there is no one to organize such an effort. The villagers enjoy volleyball as a form of recreation, but there are not enough balls or nets. They know that by pooling their funds they could buy the equipment jointly, but with no one willing to take a leadership role in organizing this activity, it never happens.

(2) Paga Site

Paga fishing village is a sub-village formed by rows of houses along the flatlands stretching from the arterial road that links Maumere and Ende to the coastline of the Savu Sea (Indian Ocean) to the south. Houses stand along blocks built in a latticework pattern. The coastline has a sandy beach and a beautiful natural landscape. A cottage restaurant has thus been built in one corner of the beach for domestic and international tourists.

Houses along the arterial road have sufficient space surrounded by a hedge for a garden, and offer a better living environment than residential areas in some of the other model sites, but the living environment in the villages distantly removed from the road are densely populated and have poor sanitary conditions.

The village is comprised of about 1,460 households, of which 27 percent (about 400 households) earn their living from fisheries (or from the sales of fishery products). The following are issues regarding living environment improvements that were obtained from interviews about fishing village environmental improvements conducted in this village.

Issues	Existing Conditions
1) Water supply shortage	About 30 percent of households are connected to a waterworks system, while 60 percent use well water and the remaining 10 percent obtain household water from rivers or other sources. The well water is somewhat salty, but it is used as drinking water, and the water supply is plentiful. Residents take baths around the well. One well serves an average of three to four households, and it may be used by as many as 10 households without any particular problems.
2) Village roads and wastewater	Roads in the village are not paved, but wastewater ditches have been built.
3) Toilets	About 30 percent of households have toilets, while 15 percent use public toilets and the remaining 55 percent use the ocean near the fish landing site to meet their needs. Villagers, especially the young people, recognize the need for toilets that provide privacy.
4) Disorderly garbage disposal	The village does not have rules regarding garbage disposal, so residents keep the areas around their own homes clean, but dump their garbage in the nearby ocean. Because the tides prevent dumped garbage from accumulating along the coastline, at present, the sandy beaches retain their natural beauty. Residents recognize that garbage dumping should stop for the sake of attracting tourists to Paga beach, but since there have been no specific problems, such as the degradation of the coastal scenery due to accumulated garbage, garbage disposal measures have not been implemented.
5) Electricity	About 87 percent of households have electricity. About three percent use in-home generators and the remaining 10 percent do not have electricity.
6) Primary school	There are no significant problems.
7) Lack of leadership qualities	Every week all residents participate in cleaning the mosque and church. For recreation, the young men and women of the village play volleyball or soccer. The village has an active community life, and residents gather to celebrate Christmas and other holidays. The village head collected donations from everyone in the village to buy balls and other sports equipment. He often gathers input from the villagers when making various decisions for the village. This has not posed any major problems.

(3) Ende (Paupanda) Site

Paupanda village is located near Ende town, the district capital. Residences extend across the coastal flatlands, forming a sub-village. Residences are built in an orderly manner along the side roads that extend out from the paved arterial road in the village.

Issues	Existing Conditions
1) Water supply shortage	About 30 percent of households are connected to a waterworks system, while 60 percent use well water and the remaining 10 percent obtain household water from rivers or other sources. The well water is somewhat salty, but it is used as drinking water, and the water supply is About 70 percent of households are connected to the waterworks system, while 25 percent use well water and the remaining 5 percent obtain household water from rivers or other sources. Residents do not need to pay a fee for the installation of water taps, but the usage fees per household average about Rp.16,000 per month. This would not put an enormous strain on the average household budget, but since the wells are free, many households prefer to use well water. Well water can be reached by excavating to a depth of about 4m, and the water supply is plentiful. It contains some salt, but this does not prevent its use as drinking water. There are no

	major water-related issues.
2) Village roads and wastewater disposal	Because the arterial road in the village is paved and equipped with drainage ditches on both sides, there are basically no drainage-related problems in the village. Nonetheless, the road that runs along the beach is higher than the natural ground as a high-tide countermeasure. Because the drainage ditches that cross this road and flow into the sea are inadequate, the nearer a house is to the ocean, the poorer its drainage conditions.
3) Toilets	Almost all households have an Indonesian-style toilet (called a kamar mandi, a toilet with a bathing area). However, because the drainage system is merely a hole excavated to a depth of two meters without any purification system, there is a strong stench.
4) Disorderly garbage disposal	Garbage is collected by the district government, but the system is difficult to implement because of the irregular pick-up schedule. Garbage is either burned by each household or dumped along the beach. The district government has asked people not to dump garbage at the beach, but many households ignore this request, and dumped garbage is scattered along the beach.
5) Electricity	About 90 percent of households have electricity.
6) High primary school dropout rate	There is a primary school nearby, and because parents recognize the importance of formal education, most children complete primary school. Unlike other model sites, there are no problems in this regard. To attend junior high school, however, children must go as far as Bemo. Because the fare to Bemo (round-trip Rp.2,000 per day) takes up a significant portion of the household budget on days when the fish catch is small, the number of dropouts has risen.
7) Lack of leadership qualities	Every week residents all participate in cleaning the mosque and church. Other activities include volleyball, which is enjoyed by the young men and women of the village on the village's one volleyball court. Religious activities include instrumental music performances every Saturday. Community life is relatively active, and poses no major problems.

7) Leadership

Every week residents all participate in cleaning the mosque and church. Other activities include volleyball, which is enjoyed by the young men and women of the village on the village's one volleyball court. Religious activities include instrumental music performances every Saturday. Community life is relatively active, and poses no major problems.

1.4 Development Issues

(1) Development Issues (Sikka District)

a. Increase fish production volume by effectively utilizing the abundant fishery resources in the district, in particular 1) improve the fish landing and marketing facilities at Maumere as a major regional production and marketing base, 2) develop large pelagic fisheries in the southern coastal waters, 3) develop a fishing ground management and surveillance system.

b. Reduce the economic losses after the fish catch has been landed and establish a stable and increased fish supply to the inland areas and west Flores (Bajawa, Ruteng markets). In particular, an important development issue is to improve fresh fish storage and shipping methods of Maumere as a supply point and to improve the quality of processed products during the peak fishing season.

(2) Development Issues (Ende District)

a. Increase fish production volume by effectively utilizing the abundant fishery resources in the district, in particular 1) appropriate management of coastal resources through countermeasures to prevent destructive fishing operations, and 2) improvements that provide an alternative source of income for fishermen engaged in blast fishing.

b. Achieve stable and increased fish supply to the inland areas and west Flores region (Bajawa, Ruteng markets) by improving fish landing, marketing, and processing technology. In particular, improving fresh fish storage and shipment methods to Ende and improving the quality of processed products during the peak fishing season are important issues.