

2.4 Facilities and Equipment Plan

2.4.1 Design Policies

(1) Design Conditions

Given the specific characteristics of each model site, including the social conditions and natural environment, the design conditions for Maumere (Kalimati), Wuring, Paga, and Ende (Paupanda) sites are as follows.

Environmental Conditions and Planned Improvements	
Model Sites	Environmental Conditions and Planned Improvements
Maumere (Kalimati): Urban marketing center (also serves as a retail market)	<ul style="list-style-type: none"> • Move the landing area and retail activities currently conducted in unsanitary conditions on the beach at the river mouth to a nearby area. • Plan facilities in consideration of the site prepared by the Sikka District Fisheries Office in 2001 and the problems with the improvements planned for 2002. • Plan solid facilities with due consideration to seismic resistance and the extensive damage sustained around this model site due to the 1992 earthquake and tidal wave.
Wuring: Village fishermen's center (independent fishing village)	<ul style="list-style-type: none"> • Given that the majority of houses in this sub-village are elevated above water, securing a site within the sub-village is very difficult. Thus, a site will be secured through land reclamation. • The location where the site was secured will be at the very edge of sub-village because of the sub-village structure, its surrounding topography and natural conditions and its fisheries activities. • Plan facilities that will improve the convenience of fisheries activities as well as daily living activities by integrating the fishing village. • Because there is only one road that runs through the middle of the sub-village, supplemental lines of movement that support fisheries activities and daily living activities are needed.
Paga: Village fishermen's center (independent fishing village)	<ul style="list-style-type: none"> • Plan facilities to withstand harsh sea conditions, such as long-period waves along the southern coast. • Prepare facilities that work with existing facilities, with due consideration to the area's natural conditions (wave conditions) and the ease of site procurement.
Ende (Paupanda): Urban marketing center (wholesale market)	<ul style="list-style-type: none"> • Plan facilities to withstand harsh sea conditions, such as long-period waves along the southern coast. • Use PPI facilities already built by the Ende District Fisheries Office. • In light of the wave conditions and fisheries activities, it is essential that the coral reefs around the existing jetty area be removed to ensure a safe vessel maneuver area.
Shared items	<ul style="list-style-type: none"> • Create a sanitary environment for fish handling. • Incorporate facilities and materials that can be independently and continuously managed.

(2) Guidelines

1) Kalimati Site

As explained in section 1.4.3 Existing Fishery Infrastructure, the Sikka District Fisheries Office created a site for fisheries activities in fall 2001 at the planned facilities development site, and plans to install a jetty, market, and offices in 2002. Because it is facing various problems, it will build the facilities that are lacking to make effective use of existing and planned facilities. It will also resolve the problems of the existing and planned facilities and will build more usable facilities.

Because the Maumere (Kalimati) site is located in the innermost part of the bay and is not affected by waves from the open sea, large breakwaters for keeping the waters calm are not necessary. The District Fisheries Office already developed a site for fisheries activities ($A=100\text{m} \times 23\text{m}=2,300\text{m}^2$), but because it does not meet the area requirements calculated for the functions it is supposed to serve (see Appendix

4), the site will be expanded on the west side of the existing facilities.

The wharf where morning landings are regularly conducted throughout the year needs to be adjustable to the tide level, and thus should have a depth that permits moorage even during low tides. Because the jetty planned by the District Fisheries Office is to have a depth of ± 0.00 and thus can not be used by smaller boats (1-7 GT) except during high tides, a new wharf will be constructed with a depth that can accommodate changes in the tide level in this project.

The crown height of the wharf is set so that it can be used during high tides, but it will also be able to accommodate fluctuating tide levels, which can vary by as much as 3m, in order to facilitate landing activities during low tides. However, securing the necessary wharf length that will enable the wharf to be used at low tide, high tide, and all tide levels will mean increasing the facility scale and construction costs. Thus, a fishing boat mooring function will be added to the site revetment to supplement the wharf's ability to accommodate the tide level variance. Because fishing boat preparations, such as replenishing fuel and water supplies, are performed after the catch is landed, the landing wharf also needs to be equipped to serve fishing trip preparations. Since this site will primarily serve fish landing and preparation functions, and the boats will return to their villages after they have completed their landings and preparations, a resting wharf is not needed here.

The remnants of buildings destroyed by the 1992 earthquake have been left in the water beyond the current coastline. Because the waves form currents at these remnants that hinder the maneuverability of fishing boats, a safe vessel maneuver area needs to be created.

The mooring facility construction guidelines are shown below.

Mooring Facility Construction Guidelines		
Type of mooring facility	Use	Construction guidelines
Landing	Fishing boat mooring	Jetty or quay wall-type facility that can accommodate the tide level variance. After landing, boats will conduct preparation activities and will move to a resting anchorage.
	Small-scale transport by sampan Beach landings of small-scale fishing boats	Provide a revetment or sandy beach with moorage functions that can accommodate tide level variance.
Preparation	Refueling, water supply, fishing gear loading and unloading, etc.	A refueling and equipment loading facility. Will double as a landing site.
Resting		Unnecessary. Serving primarily as a landing and preparation site.

To improve the effectiveness of each project, the following facilities and equipment will be provided along with the facilities and equipment above.

Other Facilities		
Type of facility	Facility, equipment	Reason for construction
Basic fishing port facilities	On-site roads, connecting roads	To facilitate the passage of vehicles used for fisheries activities.
	Parking lot	To facilitate the passage of vehicles used for fisheries activities.
	Site revetment	Site creation through land reclamation is necessary for the construction of the facilities planned in this project. This will be a revetment for that site creation.

Functional fishing port facilities	Administrative offices	To effectively manage the facilities and activities planned in this project.
	Electric supply facility	To support the operations of the facilities planned in this project.
	Simple wastewater treatment facilities	To ensure the minimum necessary level of sanitation for facilities where fresh fish are handled.
	Garbage dump	To ensure the minimum necessary level of sanitation for facilities where fresh fish are handled.

2) Wuring Site

The large majority of fishing boats from Wuring, except for angling boats, land their fish catch at Maumere (Kalimati). Since this site is primarily used for preparation and resting after the catch is landed, mooring facilities will not be constructed. However, land will be reclaimed at the far end of the sub-village to be used a site for supporting various fisheries activities. To support fish landings by small angling boats and preparation activities such as the loading and unloading of fishing gear onto and off of purse seiners and gill net boats, boat mooring functions will be added to the site revetment. Also, a small-scale multipurpose facility will be constructed to provide office space to support fisheries activities at the site (with wireless communications), storage space for insulated boxes, space for making simple repairs, and training and workshop space.

To improve the effectiveness of each project, the following facilities and equipment will be provided along with the facilities and equipment above.

Other Facilities		
Type of facility	Facility, equipment	Reason for construction
Basic fishing port facilities	On-site roads, connecting roads	To facilitate the passage of vehicles used for fisheries activities.
	Parking lot	To facilitate the passage of vehicles used for fisheries activities.
	Site revetment	Site creation through land reclamation is necessary for the construction of the facilities planned in this project. This will be a revetment for that site creation.
Functional fishing port facilities	Administrative offices	To effectively manage the facilities and activities planned in this project.
	Electric supply facility	To support the operations of the facilities planned in this project.
	Simple wastewater treatment facilities	To ensure the minimum necessary level of sanitation for facilities where fresh fish are handled.
	Garbage dump	To ensure the minimum necessary level of sanitation for facilities where fresh fish are handled.

3) Paga Site

Because this site faces the southern coastal zone, it is subjected to harsh waves including long-cycle waves. A large-scale breakwater for keeping the waters calm in spite of the long-cycle waves is essential for the construction of a landing wharf for fishing boats. To land their catch, fishing boats will drop anchor offshore and then transport their catch to the shore via small transport boats (sampan). Thus, mooring facilities will not be constructed, but on-land facilities for supporting landing operations will be built. However, to support landing operations when long-cycle swells are coming in, facilities will be constructed to support the manual work of carrying the catch from the beach to the handling facilities.

To improve the effectiveness of each project, the following facilities and equipment will be provided along with the facilities and equipment above.

Other Facilities

Type of facility	Facility, equipment	Reason for construction
Basic fishing port facilities	On-site roads, connecting roads	To facilitate the passage of vehicles used for fisheries activities.
	Parking lot	To facilitate the passage of vehicles used for fisheries activities.
Functional fishing port facilities	Administrative offices	To effectively manage the facilities and activities planned in this project.
	Electric supply facility	To support the operations of the facilities planned in this project.
	Simple wastewater treatment facilities	To ensure the minimum necessary level of sanitation for facilities where fresh fish are handled.
	Garbage dump	To ensure the minimum necessary level of sanitation for facilities where fresh fish are handled.

4) Paupanda Site

The Paupanda site is subjected to harsh waves because it faces the southern coastal zone, but a T-shaped jetty has already been built there. This project aims to improve the usability of the existing jetty. It also aims to make effective use of the existing facilities that are usable and to build the facilities that are lacking.

A breakwater should be installed to improve the maneuverability of fishing boats when long-cycle waves or swells are approaching the shore, but this is not possible because of the enormous construction costs that would be required to build a breakwater of sufficient scale to provide protection against long-cycle waves. Thus, instead of constructing a breakwater, small transport boats (sampan) will be used to transport the catch to the sandy beaches on both sides of the jetty (as is currently done) when the waves are hitting the shore, but still allow some degree of maneuverability. However, this will require that the coral reefs that dot the area around the jetty are removed and that a safe vessel maneuver area is created. Because the tide level can vary by as much as 3.45m, the existing jetty must be renovated so that it can accommodate fluctuating tide levels.

The mooring facility construction guidelines are shown below.

Mooring Facility Construction Guidelines

Type of mooring facility	Use	Construction guidelines
Landing	Fishing boat mooring	Renovate existing jetty to accommodate the tide level variance. After landing, boats will conduct preparation activities and will move to a resting anchorage.
	Small-scale transport by sampan Beach landings of small-scale fishing boats	As an added function, support the transport of product from the beach to the fish handling shed.
Preparation	Refueling, water supply, fishing gear loading and unloading, etc.	A refueling and equipment loading facility. Will double as a landing site.
Resting	Only for model fishing boats	Fishing boats will drop anchor offshore, as in the past.

To improve the effectiveness of each project, the following facilities and equipment will be provided along with the facilities and equipment above.

Other Facilities

<i>Type of facility</i>	<i>Facility, equipment</i>	<i>Reason for construction</i>
Basic fishing port facilities	On-site roads, connecting roads	To facilitate the passage of vehicles used for fisheries activities.
	Parking lot	To facilitate the passage of vehicles used for fisheries activities.
	Site revetment	Site creation through land reclamation is necessary for the construction of the facilities planned in this project. This will be a revetment for that site creation.
Functional fishing port facilities	Administrative offices	To effectively manage the facilities and activities planned in this project.
	Electric supply facility	To support the operations of the facilities planned in this project.
	Simple wastewater treatment facilities	To ensure the minimum necessary level of sanitation for facilities where fresh fish are handled.
	Garbage dump	To ensure the minimum necessary level of sanitation for facilities where fresh fish are handled.

2.4.2 Layout Plan

(1) Functional Integration and Division of Roles

The facilities will be laid out based on their function as shown below.

(a) Landing, Handling, and Shipping Functions

To support the fish landing and fish handling improvement project and the project to improve fresh fish transport, it is important that the landing support functions and the catch handling and shipping functions are integrated. Thus, these functions will be concentrated around the fish handling shed so that operations can flow seamlessly from landing to handling to packing to shipment. Ice supply facilities and insulated box storage space will be located nearby to facilitate these functions. To enable fishing boats that have landed their fish catch to prepare for the next day's fishing trip, preparation functions for refueling and loading fishing gear will also be concentrated in this area. To support the shipment and transport of fish from the fish handling shed, an access road linking the fish handling shed to the arterial road will be constructed. That road will be used by transport vehicles and by the fishermen and traders who use these facilities.

Functions and Facilities Located Behind the Landing Facility

<i>Facility</i>	<i>Function</i>
Landing wharf	To double as a preparation wharf
Fish handling shed	Will include a fish handling shed, insulated box temporary storage area, packing area, insulated box storage area, preliminary processing area, loading/unloading workspace for fish shipment, and secondary facilities.
Ice-making and storage facility	Will include an ice-making room, temporary storage room, ice storage room, machine/electrical room, and transport area.
Fuel supply facility	Will supply fuel to fishing boats.
Water supply facility	Will supply water to fishing boats and handling shed.
Roads	For transporting the catch.

(b) Fisheries Support Functions

Because the simple workshop, fishing gear repair shop, and fishing gear storage area will not be used for landing, handling, and shipping operations, they will be located in a separate area. However, to support the loading and unloading of fishing gear and equipment to and from fishing boats, they will be located near the revetment with mooring functions.

(c) Secondary Facilities

Sea water will be collected and used to wash the floor of the fish handling shed, but the sea water intake location will be separated from the wastewater discharge point.

(2) Kalimati Zoning and Line of Movement Plan

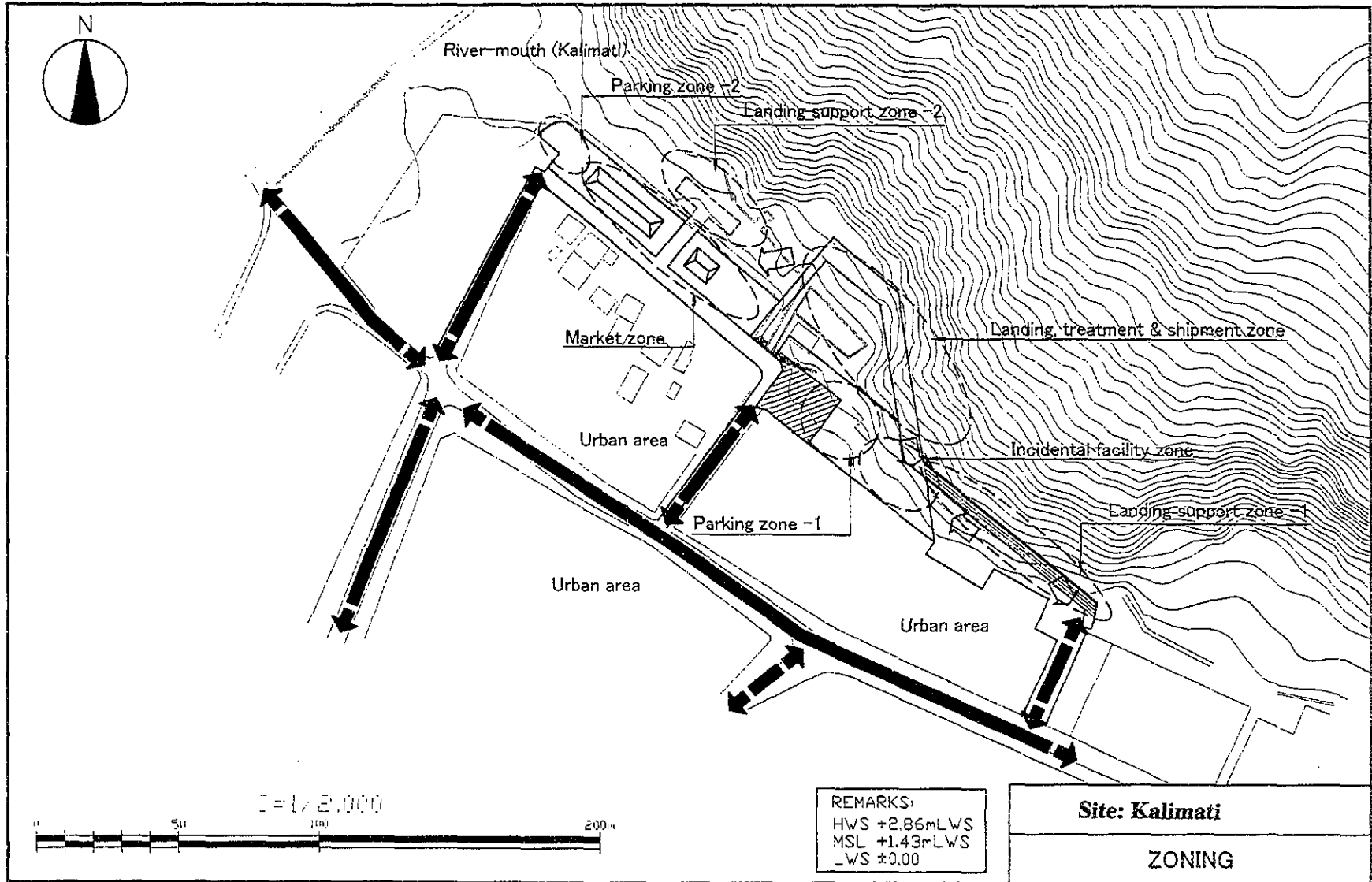
Facilities will be laid out in consideration of zoning suitable for the area's topographical and other conditions, between major lines of movement and each zone, and various types of lines of movement (for fishing boats, fish, people, fresh water and wastewater, vehicles, etc.).

Because the site prepared by the Sikka District Fisheries Office in 2001 lacked the necessary area, this project will expand the site eastward to secure the area required.

Three existing roads to the coast will be used as access roads between the facility and the city center. The fish handling shed zone will be located near the front central access road. The market zone will be located west of the fish handling shed where there are the most users, and the transport and shipping zone will be located east of the fishing shed. Mooring facilities will be located directly in front of the fish handling shed. The following table and the figure show the co-relation of the zoning and planned facilities.

Zoning and Added Functions and Facilities		
Zone	Added function	Added facility
Landing, handling, and shipping zone	Catch landing, preparation for shipment	Landing and preparation wharf
	Handling, packing, shipment	Fish handling shed
	Preliminary fish processing	Linked to fish handling shed
	Fresh fish storage	Linked to fish handling shed, ice-making and storage facility
	Fishing voyage preparations	Fuel supply facility, water supply facility
	Management of facilities and operations	Administrative offices (2nd floor of the fish handling shed)
Supplemental landing zone 1	Landings of small fishing boats	Doubles as a step-type site revetment
Supplemental landing zone 2	Landings of small fishing boats temporary moorage for other vessels	Doubles as a step-type site revetment
Fisheries support zone	Maintenance of fishing gear and materials	Simple workshop
	Fishing gear repair and temporary storage	Fishing gear repair shop and open yard
	Improvement, development, and extension of fish processing	Model processing plant
Market zone	Retail market, wholesale market for residents	Retail market, wholesale market
	Market management	Administrative offices (2nd floor of the retail market)
Secondary facilities zone	Secondary facilities	Water supply, electricity supply, simple wastewater, garbage dump
Parking zone 1	Parking space for fishing personnel	Personnel parking lot
Parking zone 2	Parking space for market users	Visitor's parking lot

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(3) Wuring Site Zoning and Line of Movement Plan

Since the majority of houses in this sub-village are small homes elevated above water, securing a site within the sub-village is very difficult. Thus, a site will be secured through land reclamation in the shallow waters at the edge of the sub-village. The reclaimed site will be used for small fishing boat landing and storage, preparations such as loading and unloading fishing gear, processing, and village improvements. The existing road will be extended so that it connects to the reclaimed area.

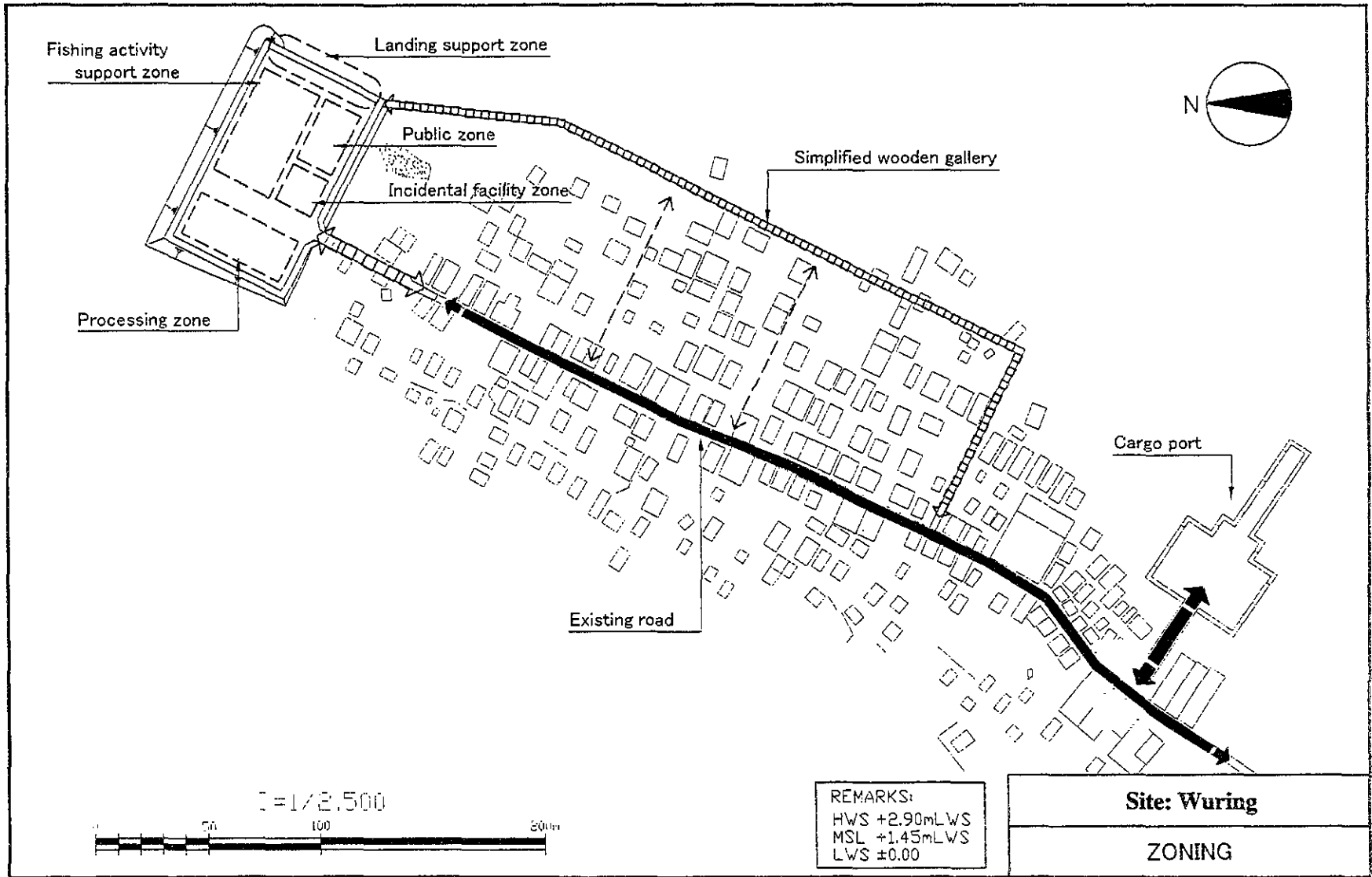
The main line of movement in Wuring sub-village is the road through the center of the sub-village (B=3-5, built jointly by the government and residents after the 1992 earthquake). Houses are built around the central road, and simple bamboo roads leading off to both sides connect the road to other areas. The overall level of transportation convenience in the sub-village is poor. To improve the transportation system, a corridor will be installed on the northeastern side of the sub-village to provide multiple lines of movement. The existing central road will be used by vehicles while the corridor will be used by pedestrian traffic and for supporting fisheries and everyday living activities. Since the eastern side of the sub-village has deeper waters than the western side, and is not affected by the western winds, many fishing boats anchor on the eastern side. The installation of a corridor to the east is possible because this area has deeper waters and therefore little possibility for housing expansion in the future.

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. Thus, the level of wooden corridor substructure must be kept at sufficient height to permit the passage of the sampan. Also, to support the preparation of fishing boats (loading and unloading of fishing gear, etc.), it will be structured to allow the temporary moorage of fishing boats.

When the project is complete, fresh fish will be landed at Maumere (Kalimati) and fish for processing will be taken back to Wuring (landing -> preliminary processing -> processing). In other areas, the preliminary processing (washing, cutting) will be done in the available space in the fish handling shed, but in Wuring, where there is no fish handling shed, a preliminary processing area will be provided in the model processing plant.

Zoning and Added Functions and Facilities		
Zone	Added functions	Added facilities
Supplemental landing zone	Support for landings of small fishing boats	Doubles as a step-type site revetment
Fisheries support zone	Fishing gear repair and temporary storage	Fishing gear repair shop and open yard
Processing zone	Improvement, development, and extension of fish processing	Model processing plant, preliminary processing area
Public zone	Management of facilities and operations	Administrative offices
	Parking space for fishermen	Parking lot
Secondary facility zone	Secondary facilities	Water supply, simple wastewater, garbage dump

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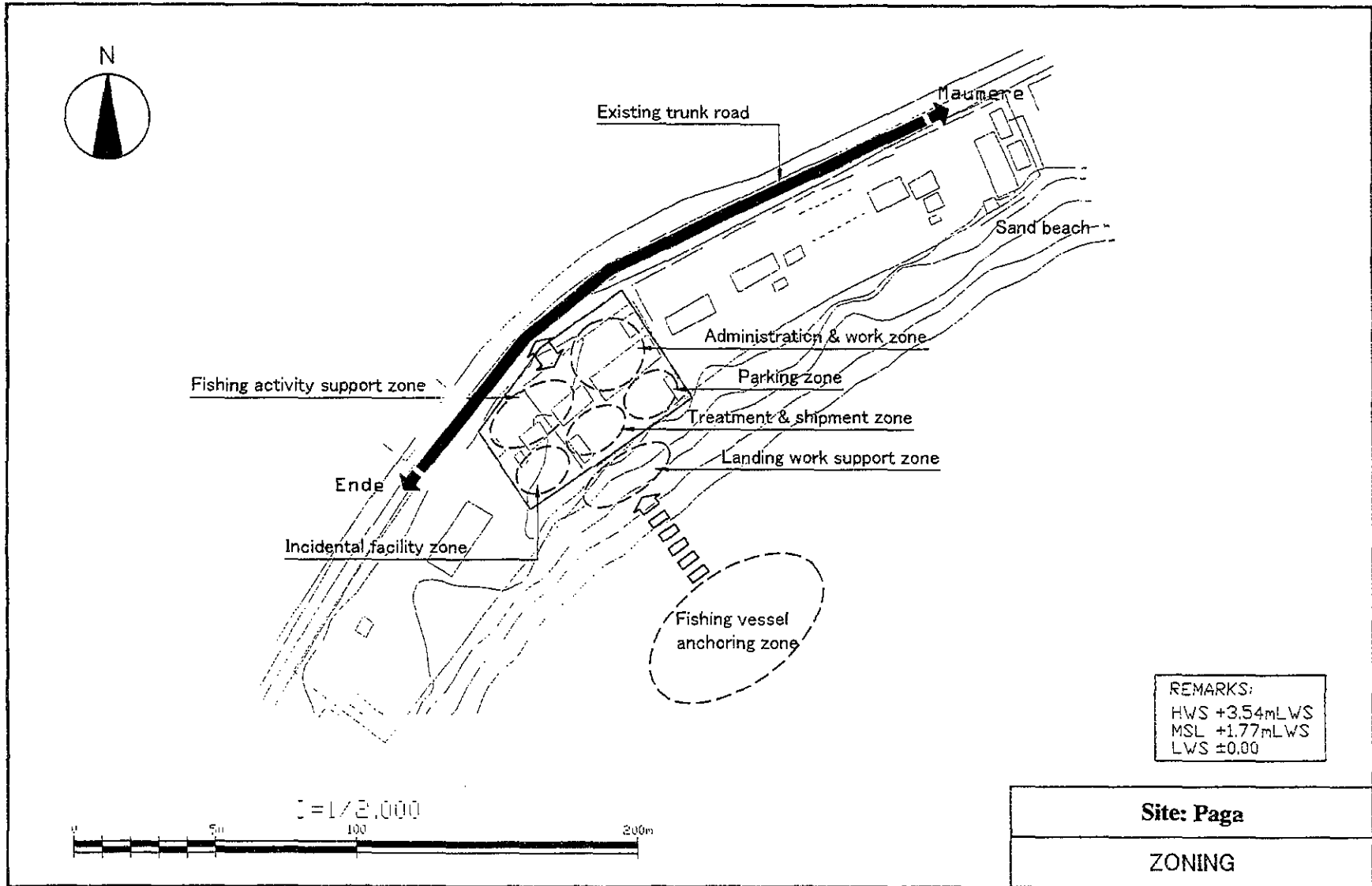


(4) Paga Site Zoning and Line of Movement Plan

Because of the ease of securing the site, a step-type passageway will be built to improve access from the fish landing operations to the facilities on the beach where landing facilities have been installed at the site of the existing cooperative.

Zoning and Added Functions and Facilities		
Zone	Added function	Added facility
Landing operations support zone	Support for the transport of catch from the small transport boats to the fish handling shed	Step-type landing support passageway
Management and operations zone	Management of facilities and operations	Administrative offices
	Maintenance of fishing gear and materials	Simple workshop
Fisheries support zone	Fishing gear repair and temporary storage	Fishing gear repair shop and open yard
Handling and shipping zone	Cutting, packing, shipping	Fish handling shed
	Fish preliminary processing	Linked to fish handling shed
	Fresh fish storage	Linked to fish handling shed, ice-making and storage facility
	Fishing voyage preparations	Fuel supply facility, water supply facility
Parking zone	Parking space for fishing personnel	Parking lot
Secondary facility zone	Secondary functions	Simple wastewater treatment facilities, garbage dump

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Site: Paga

ZONING

(5) Paupanda Zoning and Line of Movement Plan

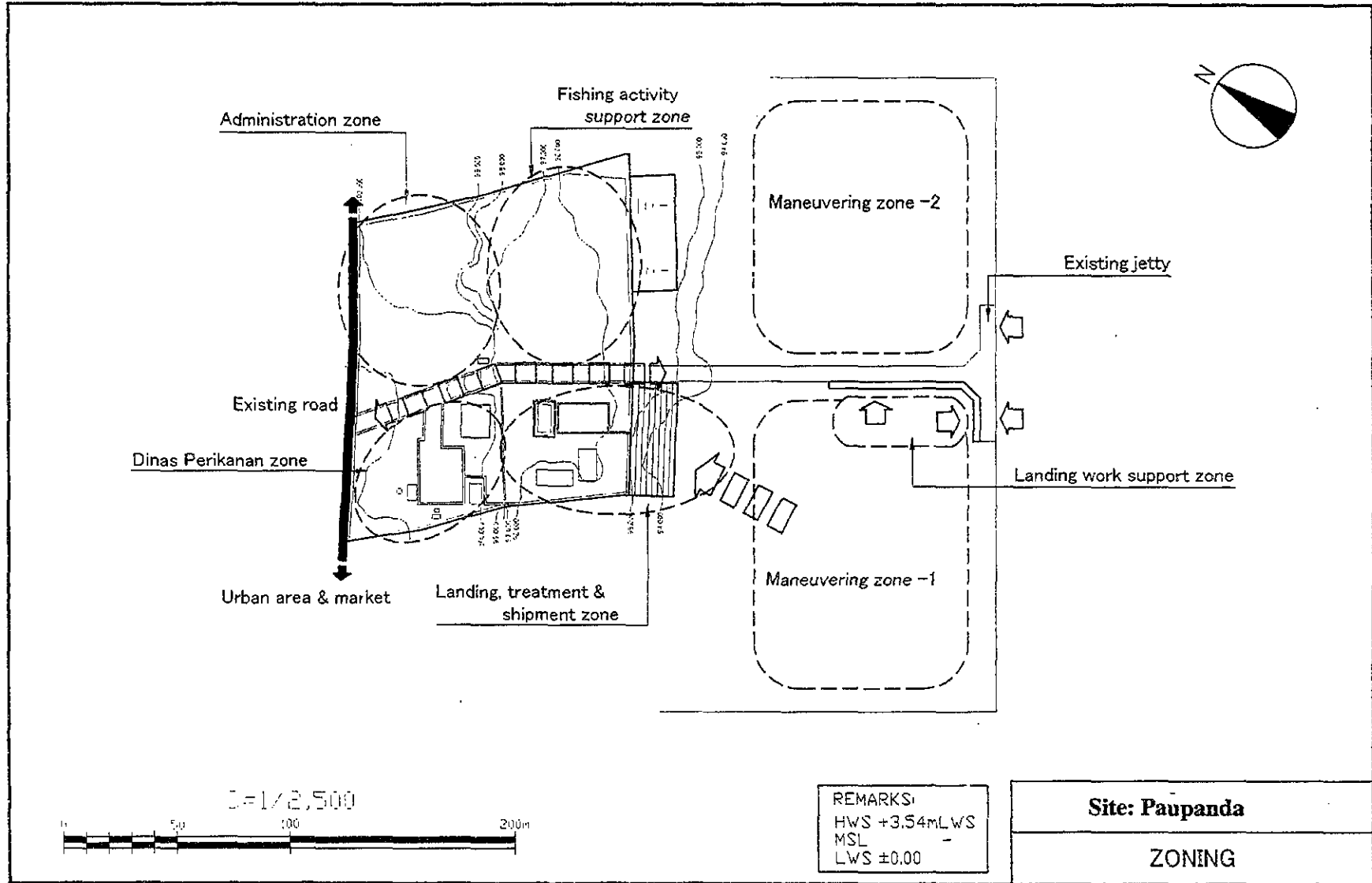
Facilities will be laid out in consideration of zoning suitable for the area's topographical and other conditions, connections between major lines of movement and each zone, and various types of lines of movement (for fishing boats, fish, people, fresh water and wastewater, vehicles, etc.).

The western zone is the District Fisheries Office administrative functions zone, and the existing facilities will be for the exclusive use of the District Fisheries Office. The landing, handling, and shipping functions will be concentrated in the existing facilities in the southern zone. The eastern zone will contain the such fisheries support functions as the simple workshop, fishing gear drying area and open yard, and fuel and water supply facilities. Simple wastewater treatment facilities and a garbage dump will be installed to maintain a sanitary environment. The administrative offices, model processing plant, and parking lots will be located in the northern zone.

A safe vessel maneuver area that can withstand harsh ocean conditions (waves, tide levels) will be secured in the area from both sides of the existing jetty to the beach.

Zoning and Added Functions and Facilities		
Zone	Added function	Added facility
Western zone (District Fisheries Office zone)	Exclusive District Fisheries Office area	Existing facilities, no facility construction
Southern zone (Landing, handling, and shipping zone)	Support for the transport of catch from the small transport boats to the fish handling shed	Step-type landing support passage-way
	Handling, packing, shipping	Fish handling shed
	Fish preliminary processing	Linked to fish handling shed
	Fresh fish storage	Linked to fish handling shed, ice-making and storage facility
Eastern zone (Fisheries support zone)	Maintenance of fishing gear and materials	Simple workshop
	Fishing gear repair and temporary storage	Fishing gear drying area and open yard
	Fishing voyage preparations	Fuel supply facility, water supply facility
	Secondary functions	Simple wastewater treatment facilities, garbage dump
Northern zone (Management zone)	Management of facilities and operations	Administrative offices
	Improvement, development, and extension of fish processing	model processing plant
	Parking space for fishing personnel	Parking lot
Landing operations support zone	Support for landing activities that can accommodate changing tide levels	Wharf that can be adjusted to changing tide levels (renovation)
Vessel maneuver area zone-1	Creation of vessel maneuver area for fishing boats and small transport boats	Removal of coral reefs
Vessel maneuver area zone-2	Creation of vessel maneuver area for fishing boats and small transport boats	Removal of coral reefs

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Site: Paupanda
ZONING

2.4.3 Facilities Plan

(1) Kalimati Site Development

1) Basic Fishing Port Facilities

(a) Protective Facilities

To use the fisheries activity site created by the District Fisheries Office in 2001 and to expand the site on the east side to obtain the space needed, a revetment (L=120m) for land reclamation will be built behind the mooring facilities (jetty). The eastern revetment (L=80m) will be a step-type revetment that can accommodate fluctuating tide levels, facilitating its use by small fishing boats. Because of concerns that the area between the existing and new site revetments will be turbulent due to the concentration of waves there, wave absorption works will be performed to improve the calmness of the water.

(b) Mooring Facilities

Mooring facilities will be built in a location where the necessary depth is available based on the sea bottom topography. The crown height of the mooring facilities will be +3.40m, given the HWL (+2.86m). The necessary depth of the wharf is only needed at low tide. When the tide level is high (MWL-HLL) mooring is possible even when the depth is shallow. Thus, mooring facilities will be added to the revetment on the eastern side where the depth is shallow, and these will be used to supplement preparation activities, such as the loading and unloading of fishing gear.

Mooring facilities can either have a gravity-type or jetty-type structure. A gravity-type structure offers lower construction costs, but when waves caused by the western winds hit, the waters in front of the mooring facilities will be agitated by waves reflected from the mooring facilities, reducing usability and safety. A jetty-type structure, however, can effectively control the effects of the reflected waves and ensure usability and safety. Therefore, a jetty-type structure will be used for the mooring facilities. The depth of the mooring facilities will be 2m at the front (L=30m), -2m (L=40m) and -3m (L=20m) at the inclined section on the east side.

Under the District Fisheries Office plan, the jetty (L=25m) will be constructed in 2002. The necessary length of a 2m-deep landing site is L=100m (Appendix 4, Necessary Scale of Facilities), meaning that the jetty will be 75m short after it is constructed, but given the topographical conditions and the potential range of options at the planned site, the extension of the -2m-deep wharf will be L=70m, as described above. Because the planned jetty is to have a depth of $\pm 0.00\text{m}$, it will be difficult for the fishing boats (1-15 GT) to use it except at high tide. Thus, mooring functions will be added to the revetment on the eastern side to provide supplemental landing facilities during mid- and low tides.

Unscheduled transport boats from the islands (4GT, about 30 boats use Kalimati for pick up and drop off island passengers and to refuel.

Notes: Tide level variance measures

- To maintain operability, the distance between the surface of the sea and the mooring facility crown height should be no more than 2.0m.
- If the HWL is +2.86m and the tide level is divided into two stages, the usable crown heights will be as follows:
 - MWL-HWL (tide level of +1.43 or higher): Crown height should be +3.4m
 - LWL-MWL (tide level lower than +1.43): Necessary depth is needed; crown height should be about +2.0m.

(c) **Water Facilities**

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 maneuverability of fishing boats. The destroyed structures will be removed to provide a safe vessel maneuver area.

(d) **Transport Facilities**

The access road from the existing arterial road will be divided into three sections. A fisheries activity parking lot ($A=610\text{m}^2$) and a market parking lot ($A=600\text{m}^2$) will be constructed.

2) **Functional Fishing Port Facilities**

(a) **Catch Handling and Storage Facilities**

Facilities will be concentrated so that all the marketing support processes, from landing to handling to shipping, can be seamlessly integrated. Thus, the facilities will be located in front of the fish handling shed and mooring facilities. Storage space will be provided at the fish handling shed, and a transport vehicle waiting area will be constructed on the road next to the fish handling shed.

(b) **Management Facilities**

Administrative offices, which will include a management office, a waiting room for traders, a training/meeting room, public restroom, and an electricity and machine room, will be created for managing the facilities and fisheries activities. To effectively use the limited space available, the second floor of the two-storied fish handling shed will be used for this facility.

(c) **Supply Facilities**

The fuel supply facility includes both fuel tank and fuel depot facilities. It will be located near the preparation/landing wharf so that it can be used to supply fishing boats, but extra space will be secured around the fuel storage tank because of its hazardous content.

The water pipes (PDAM) from the existing arterial road will be extended, and a water supply facility for fisheries activities will be constructed to supply water for fish processing and replenishing water on boats, and for ice-making and sanitation facilities. To reduce the costs involved in constructing the water supply facility, sea water will be used for washing the fish catch and for cleaning the facilities and equipment. The standards for building a water supply facility to be used for fisheries activities including drinking water for the facility can be found in the Public Work Ministry construction guidelines (Direction of Director General of Cipta Karya, Public Work Ministry, No.43/KPTD/CK/1999, About Technical Guidelines on Constructing Fishermen Housing).

The electric supply facility will lay wire from the existing PLN network to the planned site. Since electricity will be supplied to machinery like the ice-making machine, a joint electricity/machine room will be built in the administrative offices building.

(d) **Waste Disposal Facilities**

To ensure a minimum level of sanitation in the locations where fresh fish is handled, facilities will be provided for supplying fresh water, collecting garbage, and collecting and disposing wastewater. Each facility will be used for the disposal of waste from both fisheries activities and the market. The construction standards for

each facility can be found in the Public Work Ministry construction guidelines.

(e) Market Facilities

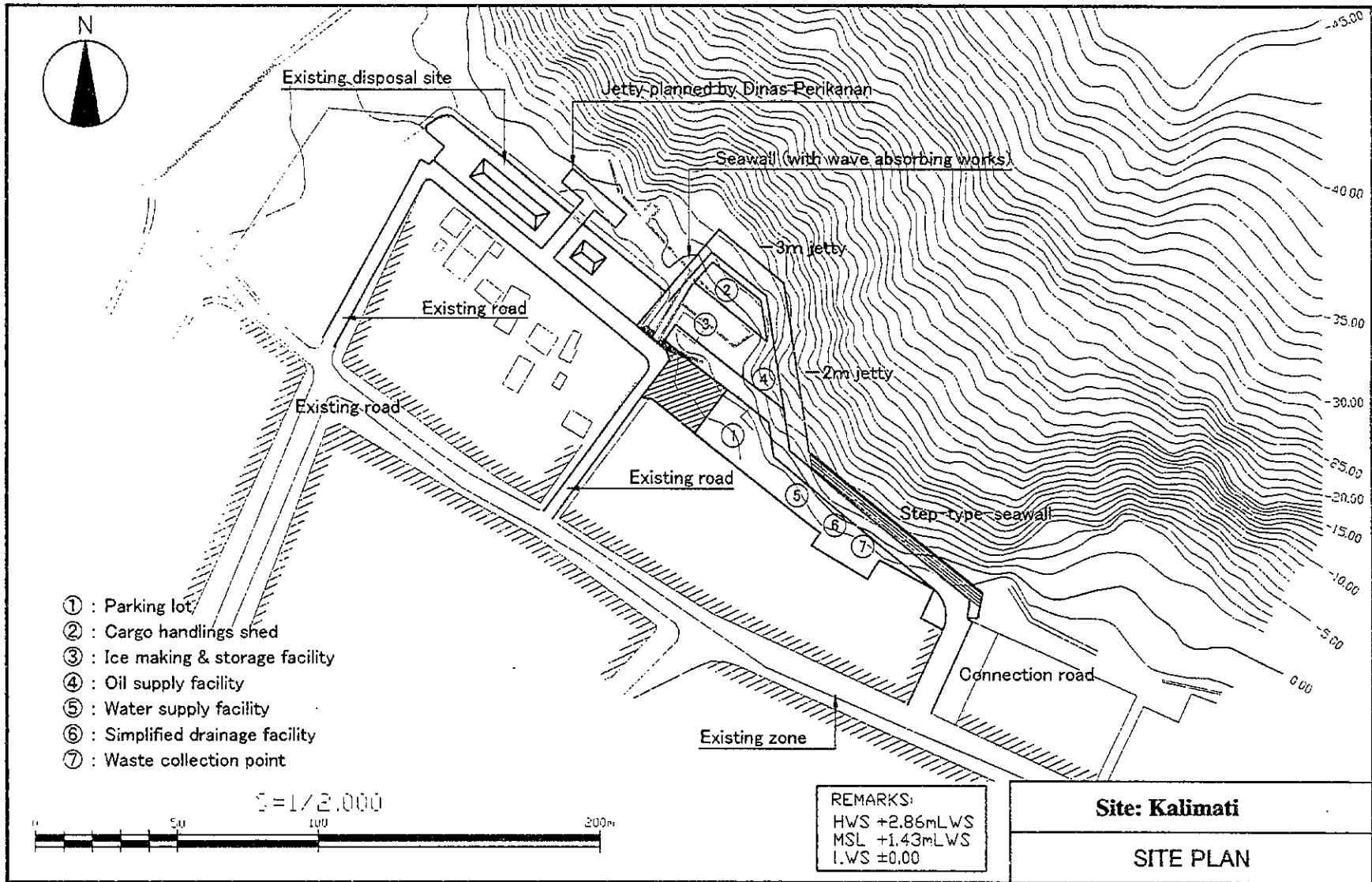
Considering the existing line of movement used by local residents, the market facilities will be concentrated on the west side of the site. The facilities ($A=30m*10m=300m^2$) that the District Fisheries Office plan to construct in 2002 will serve as the fresh fish retail market facilities, and a new fresh fish wholesale market not included in the district plan will be built. Administrative offices will be build adjacent to the fresh fish retail market.

The following is a list of developments planned for the Maumere (Kalimati) site.

List of Developments				
Facility category / classification	Facility	Facility scale	Comments	
Basic fishing port facilities	Protective facilities	Revetment	L=120m	For site creation behind jetty, right side of site
	Mooring facilities	Step-type revetment	L=80	Right side of site, also used for fishing boat moorage (and landing/preparation) to accommodate fluctuating tide levels
		Wave absorption works	L=40m	Between the right side of the new site and the existing site
		-2m landing site	L=70m	For fishing boats (landing, fuel/materials supply), jetty-type, with step for accommodating fluctuating tide levels
	Transport facilities	-3m quaywall	L=20m	For model fishing boats, jetty-type, with step for accommodating fluctuating tide level
		Connecting road	L=40m	Connects with existing road, B=6m+draignage ditches on both sides.
		On-site roads	L=160m	B=6m+ditches on both sides
		Parking lot	A=610m ²	For fisheries activity use
	Other	Offshore destroyed structure removal	1	Removal of structures destroyed in the 1992 earthquake
		Site development	A=2,300m ²	Excludes land reclamation, site development, and on-site roads
Functional fishing port facilities	Catch handling and storage facilities	Fish handling shed	Construction area 550m ²	Includes fish handling shed, storage box temporary storage area, packing area, insulated box storage area, preliminary processing area, loading/unloading workspace for fish shipment, and secondary facilities
	Management facilities	Ice-making and storage facility	Construction area 180m ² Ice made: 3 tons/day Ice stored: 6 tons	Includes an ice-making room, temporary storage room, ice storage room, machine/electrical room, and transport area.
		Administrative offices	Construction area 290m ²	The 2nd floor of the fishing handling shed will be used to provide a traders' waiting room, retail shops/warehouse, training/meeting room, public restroom, electrical/machine room, etc.
	Supply facilities	Fuel supply facility	Fuel tank 2kl Fuel depot 7m ²	Fuel supplied by dispenser Fuel supplied by hand pump

		Water supply facility	Water tank 8m ³	Extended from the water pipes (PDAM) along the arterial road
		Electric supply facility	1 system	Extended from PLN network, uses the electrical/machine room in the administrative offices
	Waste disposal facilities	simple wastewater treatment facilities	Wastewater volume 12m ³ /day	Simple treatment of wastewater generated at the facility site (screen and settling reservoir)
		Garbage dump	Facility area 90m ²	Dump for garbage generated at the facility site
Market facilities	Basic facilities	Parking lot	A=680m ²	For market visitors
	Functional facilities	Fresh fish retail market	-	Use the facilities planned by the district government
		Fresh fish wholesale market	A=560m ²	
		Administrative offices	A=260	Customer waiting room, warehouse, fresh fish storage area, electrical/machine room, public restroom, etc.

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(2) Wuring Site Development

1) Basic Fishing Port Facilities

(a) Protective Facilities

A new facility site suitable for the topographical, natural and fisheries activity conditions around the sub-village will be constructed on reclaimed land 60m from the end of the existing road. The ground height of the site will be at +3.40m in consideration of the HWL (+2.90m). The ground height of the existing road is about +2.50 to 2.80m, but since the lowest areas are overtopped during high tide when the western winds blow, the ground height will be set as described above.

The revetment (L=60m) on the eastern side of the site will be equipped with small fishing boat mooring functions, and will either be a step-type or gentle-slope type revetment that can accommodate fluctuating tide levels. The revetments on the other three sides will be rock revetments (gentle slope-type). The revetments (L=100m+60m) on the northern and western sides of the site will be equipped with a low parapet to handle oncoming waves. Based on its use, the site of the revetment on the eastern side will be B=6m, while the other three sides will be B=3m.

(b) Mooring Facilities

Mooring functions are needed at Wuring for small fishing boats, and the loading and unloading of fishing gear from purse seiners and gill net fishing boats. However, because of the small landing volume, the mooring functions will be added to the site revetment. According to the wind observation findings at Maumere Airport (see Appendix 5), most winds come from the north and southwest, with the most frequent direction for average wind speeds being WSW-ESE. Thus, given the coastal topography, the wind and waves can be expected to come in from the northwest. However, because the water is shallow in this direction, small wave heights can be expected. Consequently, to control the effects of the wind and waves, the revetment on the eastern side will be equipped with the fishing boat mooring functions. Also, since the water is shallow at the site of the revetment and the depth needed for moorage is unavailable; its use will depend on the tide level.

Notes: Tide level variance countermeasures

- To maintain operability, the distance between the surface of the sea and the crown height of the revetment with mooring facilities should be no more than 2.0m.
- If the HWL is +2.90m and the tide level is divided into two stages, the usable crown heights will be as follows:
 - MWL-HWL (tide level of +1.45 or higher): Crown height should be +3.4m
 - LWL-MWL (tide level lower than +1.45): Necessary depth is needed; crown height should be about +2.0m.

(c) Transport Facilities

The connecting road to the new site will be an extension of the existing road and will have a width of B=6m to allow vehicles to pass one another. The connecting road, like the existing road, will have revetments on both sides.

A corridor will be built around the eastern perimeter of the sub-village to serve as a supplemental line of movement for fisheries activities as well as daily living activities. To facilitate maintenance, the corridor will be a solid structure whose main component will be either wooden or concrete posts. The upper portion will be

made of wood planks so that maintenance and repairs can be performed locally, and the width will be $B=3\text{m}$ for usability. It can also be used for the temporary longitudinal mooring of fishing boats, to facilitate the loading and unloading of fishing gear. The small transport boats (sampan) used to get to the houses in the sub-village can pass beneath this corridor.

A connecting road between the existing site road and the facility area will be built. A parking lot will be located in the northern zone.

2) Functional Fishing Port Facilities

(a) Fisheries support Facilities

Also, a small-scale multipurpose facility will be constructed to provide office space for supporting fisheries activities at the site (with wireless communications), storage space for insulated boxes, space for making simple repairs, and a training and workshop space. This small-scale multipurpose facility will be used for handling the fish catch landed by small angling boats.

(b) Processing Facilities

A model processing plant will be built to support the activities planned under the project to improve fish processing. The model processing plant will have an iron pot, an improved drying area, and an indoor processing facility. The improved drying area will consist of only a roof and floor.

(c) Fishing Gear Drying Yards

A fishing gear drying area will be created for washing, drying, and repairing fishing gear and nets. A multipurpose open yard will also be provided to facilitate fisheries activities. The fishing gear drying area and open yard (site only) will be secured for multipurpose use.

(d) Supply Facilities

The water pipes (PDAM) from the existing arterial road will be extended, and a water supply facility for fisheries activities will be constructed to supply water for fish processing and replenishing water on boats, and for sanitation facilities. To reduce the costs involved in constructing the water supply facility, sea water will be used for washing the catch and for cleaning the facilities and equipment. The standards for building a water supply facility to be used for fisheries activities including drinking water in the facility can be found in the Public Work Ministry construction guidelines.

The electric supply facility will lay wire from the existing PLN network to the planned site.

(e) Waste Disposal Facilities

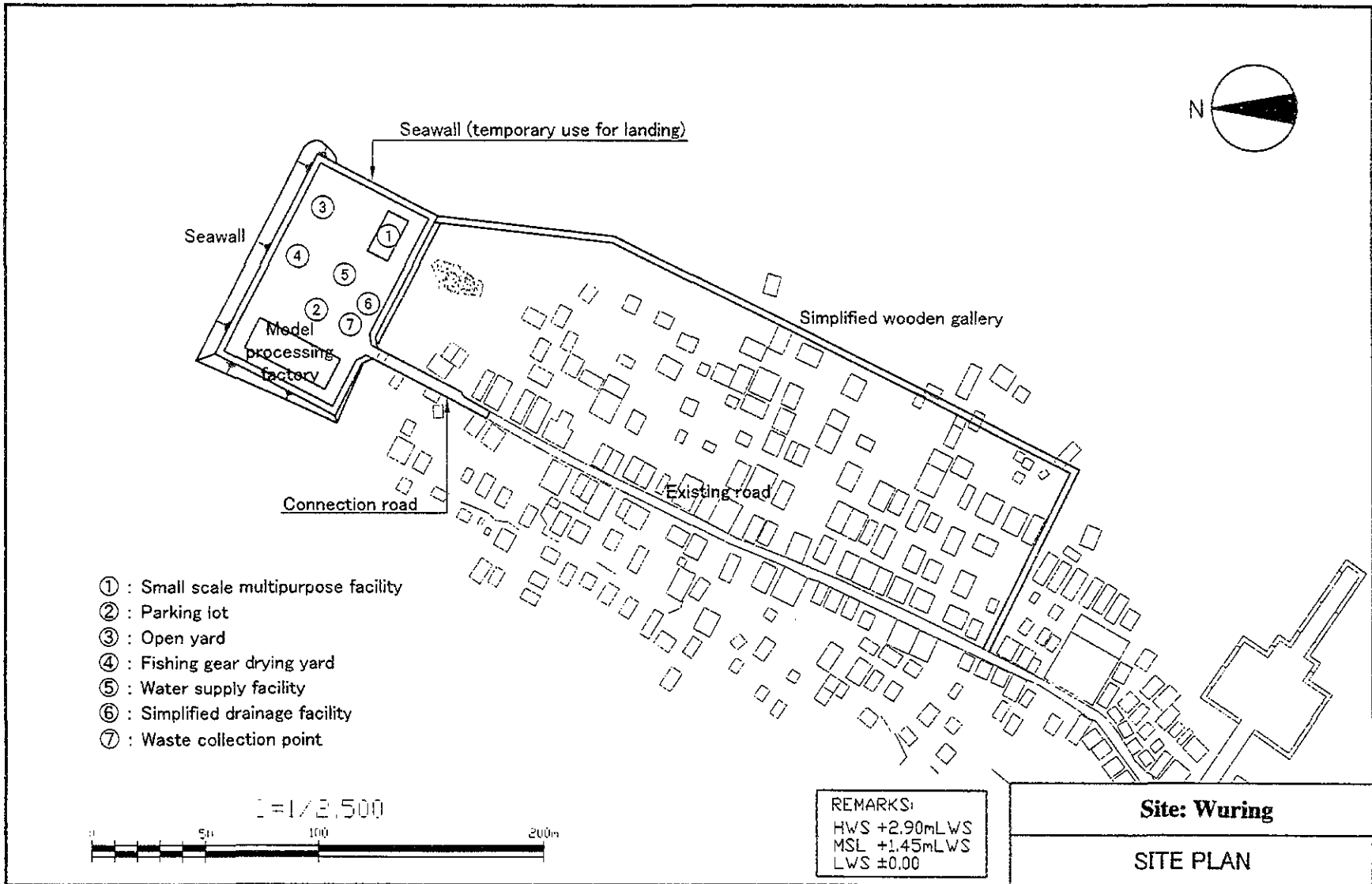
To ensure a minimum level of sanitation in the locations where fresh fish is handled, facilities will be provided for supplying fresh water, collecting garbage, and simple wastewater treatment. The construction standards for each facility can be found in the Public Work Ministry construction guidelines.

The following is a list of developments planned for the Wuring site.

List of Planned Developments

Facility category / classification	Facility	Facility scale	Comments	
Basic fishing port facilities	Protective facilities			
	Revetment	L=314m	For site creation, eastern revetment (L=60m) is also used for fishing boat moorage (and preparation/resting) during MWL to HWL.	
	Transport facilities			
	Connecting road	L=60m	Connects the existing road with the site, reclaimed land, B=6m	
	On-site roads	L=130m	B=5m+ditches on both sides	
	Corridor	L=400m	Wooden, jetty-type	
Functional fishing port facilities	Other	Site development	A=4,800m ²	Excludes land reclamation, site development, and on-site roads
	Fisheries support facilities	Small-scale multipurpose facility	Construction area 200m ²	Offices, multipurpose work space, insulated box holding area, retail shops/warehouse, public restroom, etc.
	Processing facilities	Model processing plant	Construction area 620m ²	A iron pot steaming area, improved drying area, and indoor processing facility
	Fishing gear drying yards	Open yard	Site area 250m ²	Multipurpose fisheries activity site
		Fishing gear drying area	Site area 1,880m ²	Fishing gear drying area and repair shop for purse seines, gill nets
	Supply facilities	Water supply facility	Water tank 4m ³	Extended from the water pipes (PDAM) along the arterial road
		Electric supply facility	1 system	Extended from PLN network
	Waste disposal facilities	Simple wastewater treatment facilities	Wastewater volume 3m ³ /day	Simple treatment of wastewater generated at the facility site (screen and settling reservoir)
		Garbage dump	Facility area 20m ²	Dump for garbage generated at the facility site
	Fishing village improvements	Garbage receptacles	40	1m x 0.5 with lid

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(3) Paga Site Development

1) Basic Facilities

The existing cooperative site will be used because of its ready availability. To support the transport of the landed catch, a (wide) step-type passageway will be built between the site and the beach. 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. Thus, the ground height of the site will be set at +6.50 in juxtaposition to the ground height of the arterial road and its surroundings. However, the foundation portion of the buildings will be set at about +6.8 to 7.0 to avoid the spray of high waves.

2) Functional Facilities

(a) Catch Handling and Storage Facilities

Facilities will be concentrated so that all the marketing support processes, from landing to handling to shipping, can be seamlessly integrated. Thus, the site will be created near the coast, and the on-land functional facilities will be located within the site. A space for loading the catch onto transport vehicles will be located in the fish handling shed, and a transport vehicle waiting area will be created on the road next to the fish handling shed.

(b) Management Facilities

Administrative offices, which will include a management office, a waiting room for traders, a training/meeting room, public restroom, and an electricity and machine room, will be created at the site for managing the facilities and fisheries activities.

(c) Fishing Gear Drying Yards

A fishing gear drying area will be created for washing, drying, and repairing fishing gear and nets. A multipurpose open yard will also be provided to facilitate fisheries activities. The fishing gear drying area and open yard (site only) will be secured for multipurpose use.

(d) Supply Facilities

The fuel supply facility includes both fuel tank and fuel depot facilities.

The water pipes from the existing arterial road will be extended, and a water supply facility for fisheries activities will be constructed to supply water for fish processing and replenishing water on boats, and for ice-making and sanitation facilities. To reduce the costs involved in constructing the water supply facility, sea water will be used for washing the catch and for cleaning the facilities and equipment. The standards for building a water supply facility to be used for fisheries activities including drinking water in the facility can be found in the Public Work Ministry construction guidelines.

The electric supply facility will lay wire from the existing PLN network to the planned site. Since electricity will be supplied to machinery like the ice-making machine, a joint electricity/machine room will be built in the administrative offices building.

(e) Waste disposal facilities

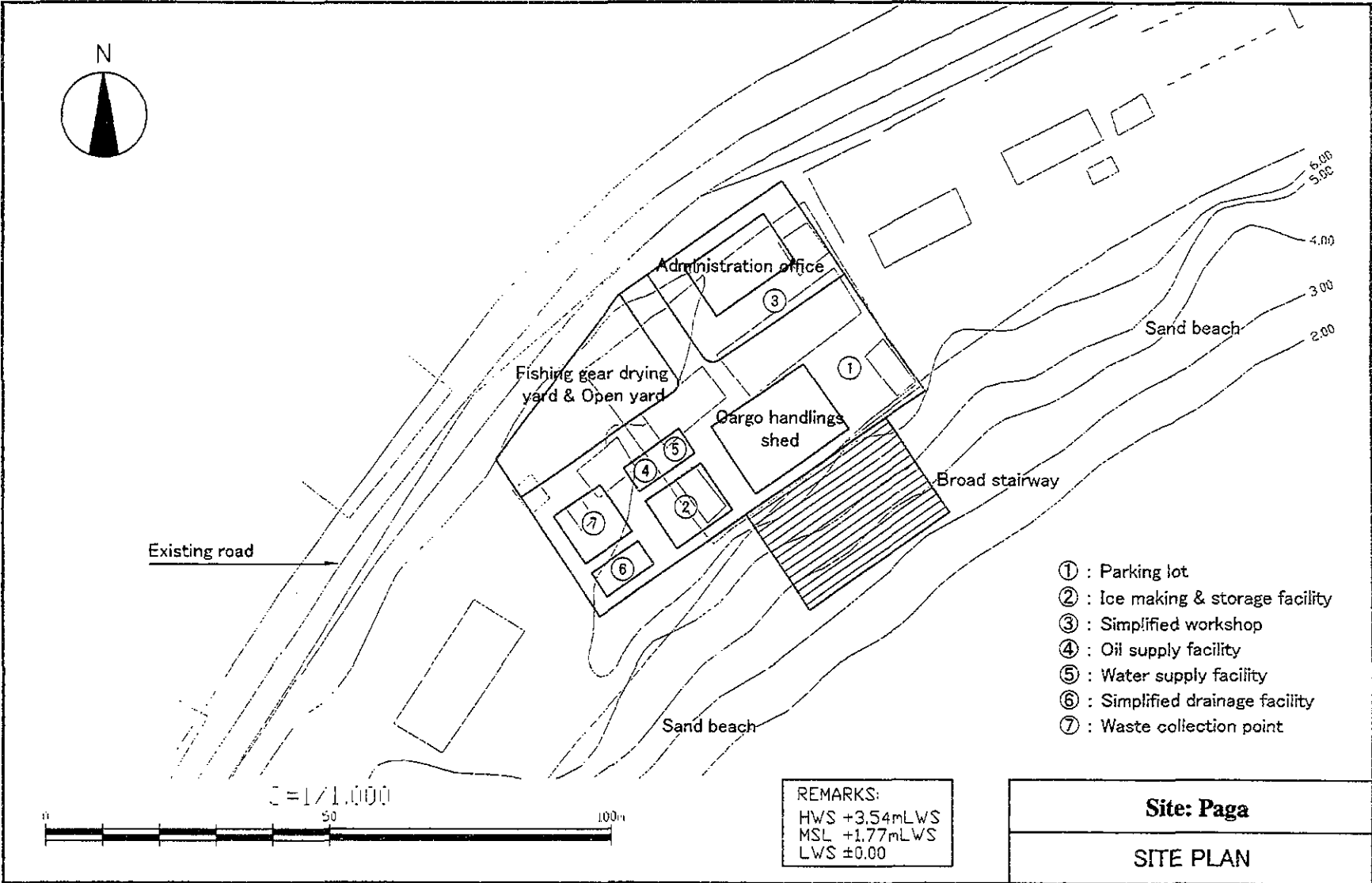
To ensure a minimum level of sanitation in the locations where fresh fish is handled, facilities will be provided for supplying fresh water, collecting garbage, and collecting and disposing of wastewater. The construction standards for each facility can be found in the Public Work Ministry construction guidelines.

The following is a list of developments planned for the Paga site.

List of Planned Developments				
Facility category / classification	Facility	Facility scale	Comments	
Basic facilities	Transport facilities, etc.	Wide step-type passageway	W=30m	For transport activity support after landing
		Installed road	L=5m	Connects to the arterial road, B=6m+run-off area
		On-site roads	L=100m	Roads on the facility site, B=5m+ditches on both sides
		Parking lot	A=370m ²	
		Site development	A=2,400m ²	Reclamation, developed site
Functional facilities	Catch handling storage facilities			Includes fish handling shed, storage box temporary storage area, packing area, insulated box storage area, preliminary processing area, loading/unloading workspace for fish shipment, and secondary facilities
		Fish handling shed	Construction area 280m ²	
		Ice-making and storage facility	Construction area 120m ² Ice made: 2 tons/day Ice storage: 4 tons	Includes an ice-making room, temporary storage room, ice storage room, machine/electrical room, and transport area.
Management facilities	Administrative offices	Construction area 170m ²	Traders' waiting room, retail shops/warehouse, training/meeting room, public restroom, electrical/machine room, etc.	
Fishing gear drying yards	Simple workshop	Construction area 50m ²	Engine maintenance, insulated box manufacture, repair, and reinforcement, technology training and extension, etc.	
	Open yard	Site area 60m ²	Multipurpose fisheries activity site	
	Fishing gear drying area	Site area 740m ²	Fishing gear drying area and repair shop for purse seines, gill nets	
Supply facilities	Fuel supply facility	Fuel depot 14m ²	Fuel supplied by hand pump	
	Water supply facility	Water tank 6m ³	Water supplied by water pipes along the arterial road	
	Electric supply facility	1 system	Extended from PLN network, uses the electrical/machine room in the administrative offices	

Waste disposal facilities	Simple wastewater treatment facilities	Wastewater volume 5m ³ /day	Simple treatment of wastewater generated at the facility site (screen and settling reservoir)
	Garbage dump	Facility area 50m ²	Dump for garbage generated at the facility site
Fishing village improvements	Model toilet facility	2	Indonesian-style toilets, located in the center mentioned above.

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- ① : Parking lot
- ② : Ice making & storage facility
- ③ : Simplified workshop
- ④ : Oil supply facility
- ⑤ : Water supply facility
- ⑥ : Simplified drainage facility
- ⑦ : Waste collection point

REMARKS:
HWS +3.54mLWS
MSL +1.77mLWS
LWS ±0.00

Site: Paga
SITE PLAN

(4) Paupanda Site Development

1) Basic Fishing Port Facilities

(a) Protective Facilities

As described above in the Guidelines, this site is subjected to harsh waves because it faces the southern coastal zone, but since a T-shaped jetty has already been built there, the existing jetty needs to be made more usable. The construction of a breakwater is a possible measure that can be taken to improve the calmness of the sea in this area, but it will not be built because of the enormous construction costs that will be required to construct a breakwater of sufficient scale to provide protection against long-cycle waves.

(b) Mooring Facilities

It is difficult for fishing boats to use the existing jetty during low tide because of its high crown height (+4.45m) in spite of the large tide level variance of 3.45m. Because of this, the passageway of the existing jetty will be renovated to enable mooring and landing operations to be conducted even during mid- and low tides, and the lacking wharf length will be secured (L=100m-60m=50m). Because the waves and swells from the open sea come from the east, the jetty renovations will target the right side (west side) of the existing jetty. Also, the right inside of the existing jetty will be renovated (L=20m, B=1.5m) to provide a regular mooring facility (3m) for the model fishing boats. However, since major pressures or shocks might be induced by the waves (long-cycle waves, swells) if the tide-level-adjustable step (floor) crown is less than the HWL, the design needs to incorporate measures for counteracting such pressures and shocks.

The sea around the existing jetty is struck by long-period waves from the ESE when the western winds and southeastern winds blow. Since it is difficult for fishing boats to moor in harsh waves, their maneuverability in front of the existing jetty has been reduced. The existing jetty is the main jetty used for landing fish, but to keep maneuverability from decreasing during harsh waves, a supplementary system is used in which small transport boats (sampan) transport the fish from the fishing vessel to the sandy beach. A gently sloping passageway (B=20m, L=50m) will be installed in front of the fish handling shed. Also, a gently sloping path (B=20m, L=50m) on the sandy beach in front of the eastern zone will be installed to support the landing operations of small fishing boats and to facilitate fishing boat repairs and preparations.

Notes: Tide level variance countermeasures

- To maintain operability, the distance between the surface of the sea and the mooring facility crown height should be no more than 2.0m.
- If the HWL is +3.45m and the tide level is divided into three stages, the usable crown heights will be as follows:
 - Tide level $\pm 0.0\text{m}$ to +1.1m: Crown height: about $\pm 2.0\text{m}$
 - Tide level $\pm 1.1\text{m}$ to +2.2m: Crown height: about $\pm 3.0\text{m}$
 - Tide level $\pm 2.2\text{m}$ to +3.4m: Crown height: about $\pm 4.0\text{m}$

(c) Water Facilities

Accumulated coral reef from the shoreline to the end of the jetty has formed a sandbar in the area around the jetty, making it impossible for fishing boats to approach. Since long-cycle waves on the coral reef sandbar form currents that prevent fishing boats from approaching during low tide, the coral will be removed to provide boats with a safe maneuvering area so that they can anchor in the area around the

existing jetty and then use the small transport boats (sampan) to transport their fish to the jetty. Based on the distribution of coral corroborated by the field survey findings, the size of the vessel maneuver area that will be cleared (where coral reefs will be removed) will extend 120m to the right of the jetty and 100m to the left.

2) Functional Fishing Port Facilities

(a) Catch Handling and Storage Facilities

Facilities will be concentrated in the southern part of the zone so that all the marketing support processes, from landing to handling to shipping, can be seamlessly integrated. Existing facilities will be used for fish handling, and a loading/unloading workspace for fish shipment, which is now lacking, will be created. A transport vehicle waiting area will be created on the road next to the fish handling shed.

(b) Management Facilities

Administrative offices, which will include a management office, a waiting room for traders, a training/meeting room, public restroom, and an electricity and machine room, will be created between the entryway to the connecting road from the arterial road and the landing jetty passageway.

(c) Processing Facilities

A model processing plant will be built to support the activities planned under the project to improve fish processing. The model processing plant will have an iron pot, an improved drying area, and an indoor processing facility. The improved drying area consists of only a roof and floor.

(d) Fishing Gear Drying Yards

A fishing gear drying area will be created for washing, drying, and repairing fishing gear and nets. A multipurpose open yard will also be provided to facilitate fisheries activities. The fishing gear drying area and open yard (site only) will be secured for multipurpose use. A simple workshop (building only) will be created and made available for use by all the fishermen. Due to usability considerations, these facilities will be located behind the eastern sloping path.

(e) Supply Facilities

The fuel supply facility includes both fuel tank and fuel depot facilities. It will be located near the preparation/landing wharf so that it can be used for supply fishing boats, but extra space will be secured around the fuel storage tank because of its hazardous content.

The water pipes (PDAM) from the existing arterial road will be extended, and a water supply facility for fisheries activities will be constructed to supply water for fish processing and replenishing water on boats, and for ice-making and sanitation facilities. To reduce the costs involved in constructing the water supply facility, sea water will be used for washing the catch and for cleaning the facilities and equipment. The standards for building a water supply facility to be used for fisheries activities including drinking water in the facility can be found in the Public Work Ministry construction guidelines.

The electric supply facility will lay wire from the existing PLN network to the planned site. Since electricity will be supplied to machinery like the ice-making machine, a joint electricity/machine room will be built in the administrative offices building.

(f) Waste Disposal Facilities

To ensure a minimum level of sanitation in the locations where fresh fish is handled, facilities will be provided for supplying fresh water, collecting garbage, and collecting and disposing of wastewater. The construction standards for each facility can be found in the Public Work Ministry construction guidelines.

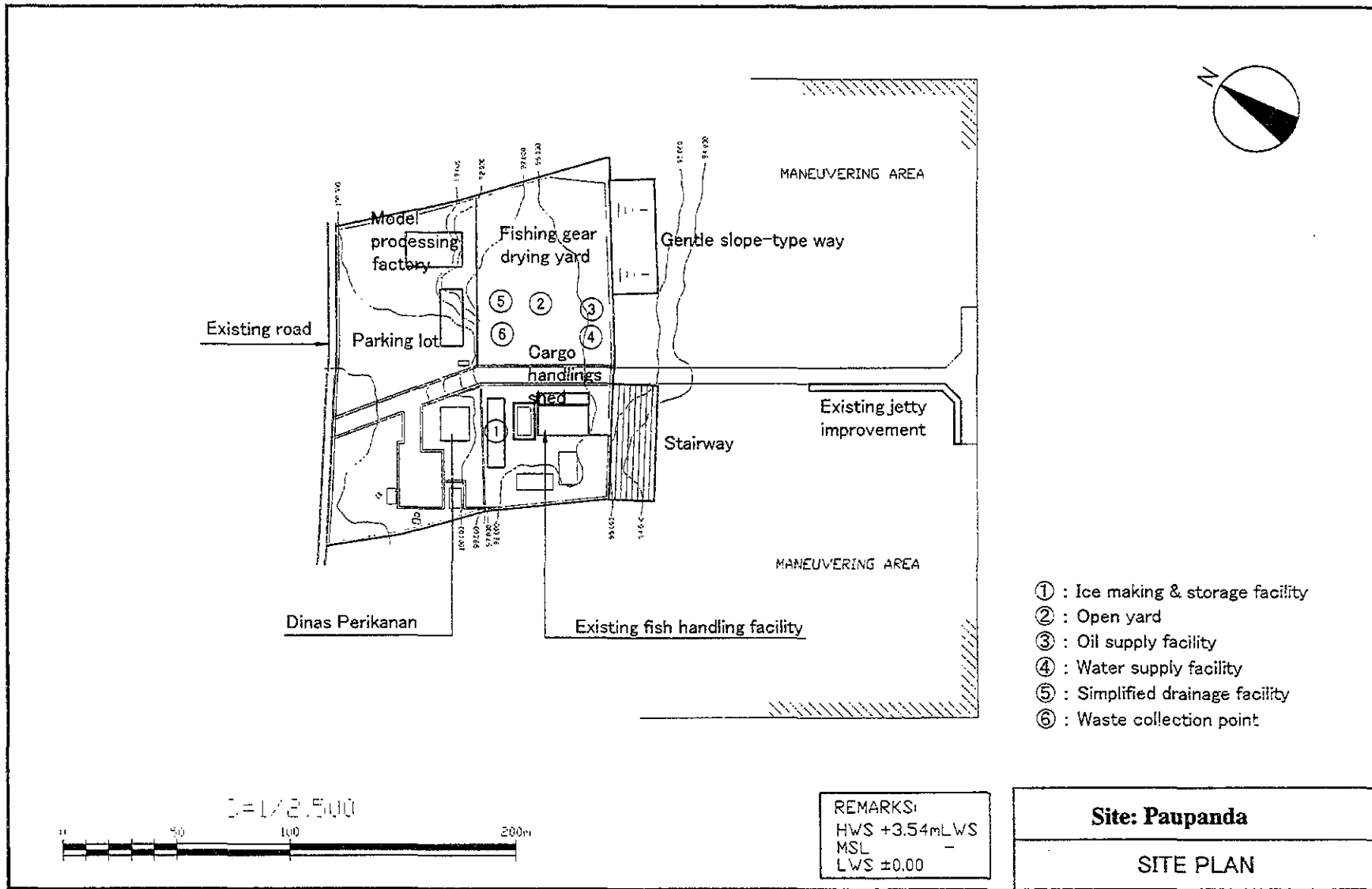
The following is a list of developments planned for the Paupanda site.

List of Planned Developments

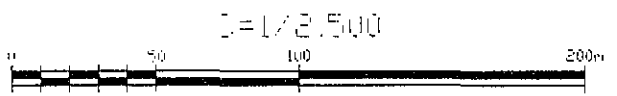
Facility category / classification	Facility	Facility scale	Comments	
Basic fishing port facilities	Mooring facilities	Facility jetty renovation	L=50m	For fishing boats (landing, fuel/materials supply), with step to accommodate fluctuating tide levels
	Facility jetty renovation	L=20m	For model fishing boats, step-type to accommodate fluctuating tide levels	
	Step-type passageway	W=50m	For transport activity support after landing, B=20m	
	Gently sloping passageway	W=50m	Also for transport activity support after landing, and as a slipway	
	Transport facilities	On-site roads	L=250m	Roads on the facility site, B=6m+ditches on both sides
		Parking lot	A=640m ²	
	Water facilities	Reef removal	V=7,300m ³	Coral reef removal
Other	Site development	A=8,100m ²	Excludes site development, and on-site roads	
Functional fishing port facilities	Catch handling and storage facilities	Fish handling shed	Construction area 120m ²	Build only a loading/unloading workspace for fish shipment, use existing facilities for other functions
		Ice-making and storage facility	Construction area 290m ² Ice made: 5 tons/day Ice storage: 10 tons	Includes an ice-making room, temporary storage room, ice storage room, machine/electrical room, and transport area.
	Management facilities	Administrative offices	Construction area 290m ²	Traders' waiting room, retail shops/warehouse, training/meeting room, public restroom, electrical/machine room, etc.
	Processing facilities	Model processing plant	Construction area 390m ²	A iron pot steaming area, improved drying area, and indoor processing facility
	Fishing gear drying yards	Simple workshop	Construction area 150m ²	Engine maintenance, insulated box manufacture, repair, and reinforcement, technology training and extension, etc.
		Open yard	Site area 280m ²	Multipurpose fisheries activity site
		Fishing gear drying area	Site area 2,730m ²	Fishing gear drying area and repair shop for purse seines, gill nets
	Supply facilities	Fuel supply facility	Fuel tank 3kl	Fuel supplied by dispenser
			Fuel depot 12m ²	Fuel supplied by hand pump
		Water supply facility	Water tank 12m ³	Extended from the water pipes (PDAM) along the arterial road

	Electric supply facility	1 system	Extended from PLN network, uses the electrical/machine room in the administrative offices
Waste disposal facilities	Simple wastewater treatment facilities	Wastewater volume 10m ³ /day	Simple treatment of wastewater generated at the facility site (screen and settling reservoir)
	Garbage dump	Facility area 80m ²	Dump for garbage generated at the facility site

V-419



- ① : Ice making & storage facility
- ② : Open yard
- ③ : Oil supply facility
- ④ : Water supply facility
- ⑤ : Simplified drainage facility
- ⑥ : Waste collection point



REMARKS:
HWS +3.54mLWS
MSL -
LWS ±0.00

Site: Paupanda

SITE PLAN

2.4.4 Equipment Plan

(1) Basic Guidelines

Machinery will be selected that is used in Indonesia and that is made by manufacturers who can offer after services in order to facilitate the sustained maintenance of the machinery at the site.

(2) Machinery for the Coastal Resources Management Plan

Type	Machine name	Major specifications	Quantity		
			Wuring	Paga	Paupanda
To improve the data collection system and to expand the fishing licensing system	Logbook	Loose-leaf notebook, for fishermen's log, with fishing license	130	35	60
	Calculator	Solar-powered, 8-column	130	35	60
	Computer	To be installed in each facility, with printer	1	1	1
	Fishing boat marking tool	Flag, paint, etc. (for 130 boats, 35 boats, 60 boats each)	1	1	1
To expand fishing grounds and to improve the surveillance system of coastal fishing grounds	FAD	500-1,000m depth model	3	1	4
	VHF wireless	For land office (25W, table-top)	2	1	1
		For coastal surveillance (25W, simple antenna, with batteries)	3	1	4
		For coastal surveillance (5W, portable, rechargeable)	-	2	-
	Small engine	Diesel engine (8-16 horsepower)	-	33	136
	Model fishing boat	Made by FRP, about 13m long x 3.7m wide 1.4m deep. On-board diesel engine: about 90 horsepower. Crew: about 10 people. Insulated fish hold: about 7m ³ . Fishing equipment: hydraulic roller, ring wire block, fishing lamp Navigation equipment: VHF wireless, GPS, sonar, magnetic compass Fishing gear: purse seine (about 350m x 60m), gill net, long lines	1	-	1
High-speed boat	Total length: 7-8m. Made by FRP, capable of beach landing. Engine: about 40 horsepower. Cruising speed: 20 knots plus. Crew: 5 people. Voyage area limited to within 4 miles of the coast. Equipped with VHF wireless, GPS, sonar, compass.	1	1	1	

(3) Plan for Improving Landing, Handling, Shipping, and Processing

Type	Machine name	Major specifications	Quantity			
			Wuring	Paga	Paupanda	
To improve landing and handling	Plastic containers	Internal capacity 60L, mesh, stackable	37	29	34	
	Platform scale	Scale capacity 0-100kg, mechanical, kg display	2	1	2	
To improve fresh fish shipping	Ice-making machine	Daily production: 3 tons/2 tons/5 tons (block ice 25kg/block x 60/40/100blocks/operation x 2 operations/day), compression function capability about 27kw/18kw/45kw, air cooling, brine tank: made of insulating concrete, with a chain block and ice crushing device	1 (3 tons)	1 (2 tons)	1 (5 tons)	
	Ice storage	Insulating concrete structure with a capacity of 18m ³ (about 6 tons of ice storage)/about 12m ³ (about 4 tons of ice storage)/about 30m ³ (about 10 tons of ice storage). Insulation material thickness of 60mm or more, with an insulated door	1 (18m ³)	1 (12m ³)	1 (30m ³)	
	Insulated fish box	Styrene foam box (capacity: 45L)		78	61	133
		Styrene foam box (capacity: 80L)		34	-	21
		Made by FRP (capacity: 150L)		13	-	6
		Made by FRP (capacity: 300L)		-	6	40
	Multipurpose transport boat	Total length: 10-12m, made by FRP. Engine: about 40 horsepower. Capacity: about 5 tons (insulated fish hold capacity 1.5m ³ , fresh water tank 3KL, drum cans: 2). Crew: 8		-	-	2
Catch transport vehicle	3-ton refrigerated truck	2	-	2		
SSB wireless	150W, for communication between the 3 model sites	1	1	1		
To extend fresh fish handling technology	Fish box reinforcement materials	Wood, tacks, tape (112 pieces/61/154 rolls, respectively, for the styrene foam boxes mentioned above)	1	1	1	
To improve fish processing	Materials for making improved drying racks	Wooden rack (size: about 60cm x 400cm, 3-layers) + wooden frame net panel (120cm x 80cm x 24 panels)	4	2	3	
	Machines for processing development	1 processing table, 2 manual meat grinders, 1 manual press, 1 vacuum packager, 1 freezer (capacity of 500L, -20C), 1 hanging scale, 10 pieces of cooking equipment.	1	-	1	
Materials to support fisheries activities	Repair tools	General hand tools for woodworking, general and specialized tools for diesel engine repair	1	1	1	

2.5 Operation and Maintenance Plan

2.5.1 Organization for Operation and Management

Of the three model sites included in central Flores, Paga and Ende have existing cooperatives. Fishermen account for only 30 percent of the members of the cooperative in Paga (Koperasi Usaha Baru), so it is not appropriate for the cooperative to serve as a management organization for the fisheries facilities. The fishing cooperative in Ende (KUD Nelayan Mina Bahari) went bankrupt several years ago, and had been inactive for a time. But after March 2002 when the former Fisheries Office director was appointed to serve as the chairperson of the cooperative, it once again began engaging in small-scale credit and purchasing activities, and it has been working to regain the trust of its members (150, all of whom are fishermen). Maumere (Kalimati), however, is an urban landing area and market. While some fishermen from nearby villages land their fish catch here, the development of organizations for fishermen and traders/retailers who use the facility has lagged. Wuring fishing village located outside of Maumere accounts for the majority of the fish catch landed at Kalimati. It presently has six types of fishing groups, but they do not get along very well, making it difficult to organize them into a single organization.

Under these conditions, the initial operating organization at each model site included in this area is as follows.

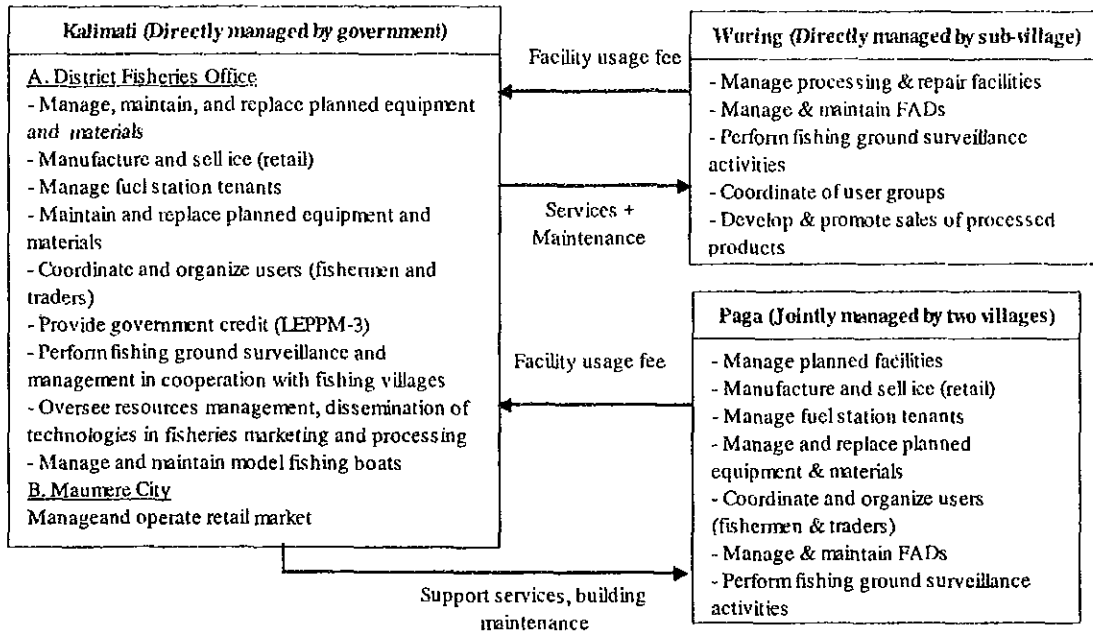
Model site	Facility function	Operating Organization	Comments
Maumere/ Wuring	Landing, handling, shipping, and sales (Kalimati)	District Fisheries Office + Maumere city (under direct governmental management)	There are no existing cooperatives for fishermen or traders/retailers in the areas around Maumere. The planned facilities will function as an urban center for landing, distribution, and sales, and facility users will come from the surrounding villages. Consequently, it will initially be directly managed by related government bodies, and plans will be made to gradually shift control to a private party as user organizations are formed.
	Processing, repairs (Wuring)	Wuring sub-village (coordinated by the District Fisheries Office)	Because the Kalimati landing facility is not a village, only a facility directly used by fishermen and fishing village women will be placed in Wuring, a prominent fishing village on the outskirts of Maumere. Since this facility will only benefit the fishermen of Wuring, it will be directly managed by the fishing village.
Paga	Landing, handling, shipping, processing, repairs	Village association (Coordinated by the Paga sub-district government)	The planned facility will be used by villagers from two villages, Paga and Mauloo. However, the development of organizations for fishermen and traders/retailers has lagged in this area. Consequently, the facility will initially be jointly managed by the two villages under the management and coordination of the Paga sub-district government and plans will be made to gradually shift control to a private party as user organizations are formed.
Paupanda	Landing, handling, shipping, processing, repairs	Fishing cooperative (Koop. Nelayan Mina Bahari)	The planned site is an existing landing managed by the District Fisheries Office (PPI), but at present it is hardly used. The revitalized existing fishing cooperative will manage the facility on behalf of and with support from the District Fisheries Office.

(1) Linkages between Sites and Organizations

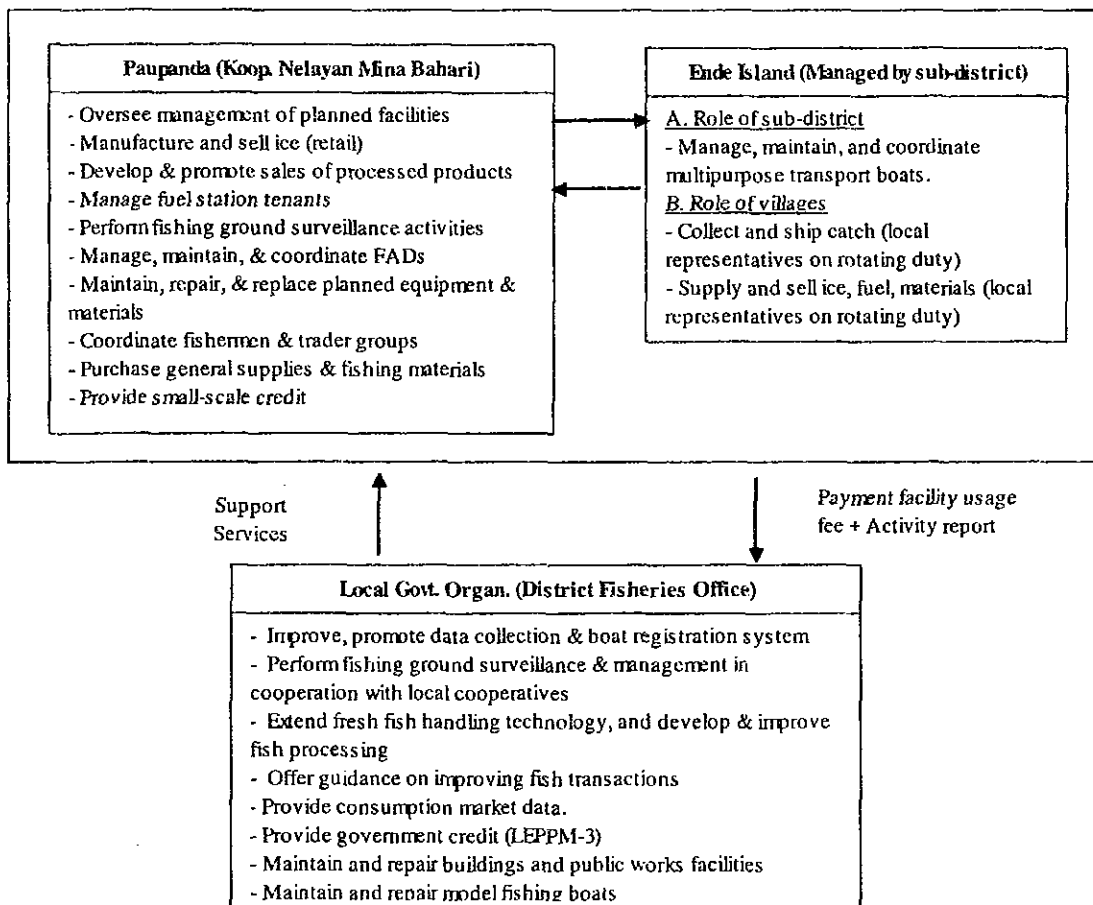
The facilities that have been planned will fulfill three functions pertaining to (1) fish landing, handling, processing, and shipping, (2) coastal resources management, and (3) fishing community living environment. Coordination between model sites and among related organizations is essential to ensure that the facilities are effectively operated and their functions are fulfilled as planned. The functions and role divisions of each organization and the overall system of coordination are shown

in the figure below.

(a) Sikka district



(b) Ende District



(2) Facility Management Organization

Regardless of the management organizations (government, village, or cooperative), the planned facilities are to be used for those involved in the fisheries activities and the local residents. Thus, the facilities need to be managed to reflect the opinions of local residents and they must become self-supporting. Under this project, regardless of the type of organization, the facility management organization will be open to membership by anyone, and the rules as shown below will be set up to ensure that the facilities are continuously managed with the cooperation of each member. Where there is an existing organization, the existing rules will be kept, but when possible the rules will be revised as shown below.

1) Membership System

There will be three types of members of the management organization: individual members, institutional members, and supporting members.

Individual membership is for individual fishermen, traders, retailers, and local residents. Institutional membership is established to allow the planned facilities to be used at the area (organizational) level for fish shipments and materials procurement. Supporting membership is established for related companies or fish collectors that are active in the region. There are many fisheries companies and fish collectors in the planned region and they are highly involved in local coastal fishing. The development of a cooperative structure with these existing business is essential to the effective implementation of the many activities that will center around these facilities (such as local resources management, shipment of fresh fish outside the region, fisheries processing development, the procurement and maintenance of fisheries equipment and materials).

All individual members, institutional members, and supporting members have one vote at the general meeting of the organization.

2) Funding Through Member Investments

For each management organization to secure the start-up capital for the planned facilities, a minimum investment of at least Rp.10,000 will be collected from each member. If a profit is earned from the use of this capital for the management of the facility, dividends will be paid. If the organization disbands, the equity funds will be returned to investors.

3) Membership Benefits

The planned facilities may be used by anyone, members and non-members alike, but members will enjoy priority use of the facilities and discounted user fees. Priority will also be given to members for existing government credit (LEPPM-3 and others) and for the various technology extension services planned under this project. Measures will also be taken to give priority to regions where progress is being made in the formation of groups, and the formation of user groups within the organization will be promoted.

(3) Decision-making Mechanism Regarding Facility Operations

The following management and coordination mechanism will be created within each management organization to ensure that the various aspects of the facility operations will reflect the general consensus of its members. The decisions will be adopted at the annual general meetings held by the members. Boards of directors are already established within existing fishing cooperatives, but since the content and

scope of their activities will be greatly expanded with the implementation of this project and the composition of their membership will change, adjustments need to be made to ensure that each user group in each area has an impartial board of directors.

1) Board of Directors

The board of directors will be comprised of the representatives from each area and user group who will serve as directors. They will be responsible for making decisions about facility operations or related activities. Discussions, confirmations, deliberations on countermeasures, drafting bylaws on facility operations, coordinating with other related organizations, discussion of personnel matters, and others will be handled by the board of directors. In principle, a board meeting will be held once a month with the participation of an advisory committee.

The members of the initial board of directors at each site will be as shown below, in accordance with the scale of activities and number of fishermen households at each site.

Position	Kalimati/Wuring	Paga	Paupanda
Chairperson (Ketua)	1	1	1
Secretariat	1	1	1
Auditor	1	1	1
Director	7	3	6
Advisor	1	1	-
Total	11	8	9

Members of the initial board of directors will be selected at each model site as follows.

(a) Kalimati/Wuring

The planned facilities will be directly managed by the government, but the board of directors will include government officials as well as representatives of the related sub-villages and the facility users. The initial representatives (directors) will be as follows.

Type of representative	No. of reps.	Breakdown
District government	2	1 representative each from the District Governor's Office and District Fisheries Office
City and area government	2	1 representative each from Maumere city and Kel. Wolomarang
Sub-village representatives	3	1 representative each of Wuring, Nangafure, Waturia (if additional related sub-villages participate, the number of representatives will increase)
User representatives	4	1 purse seine/lampara net fisherman, 1 gill net/angling fisherman, 2 traders' and retailers' representatives
Total	11	

Sub-village representatives will be from a fishermen household and should be elected according to peer popularity. They will not be the village head or other public officeholder. These representatives will play a central role in promoting fishermen, trader, and retailer groups in their area.

(b) Paga

In Paga, the facilities will be managed by two villages, but the board of directors will include user representatives to ensure that the users' opinions are reflected in management decision. One district fisheries officer will serve on the board as an advisor, and will reinforce the government's structure of support services.

Type of representative	No. of reps.	Breakdown
District Fisheries Office	1	Fisheries Office Paga Branch Director (in the new post of technical advisor)
Sub-district government	1	Paga sub-district head
Village representatives	2	1 person each from Paga and Mauloo
User representatives	4	1 purse seine fisherman, 1 gill net/angling fisherman, 2 traders' and retailers' representatives
Total	8	

(c) Paupanda

In addition to the chairman of the existing fishing cooperative (Koop. Nelayan Mina Bahari), three representatives according to fishing boat type (one purse seine/Lampara net, one gill net/angling, and one payang net) will be selected from among the existing cooperative members. Three representatives from the distributors and processors (one trader, one retailer, and one processor) will also be selected. A total of four representatives will be chosen to represent the areas that will use the facility, one each from Paupanda, Reknlima, Mbongawani, and Ende Island. The allocation of representatives by area or by user group may be revised as circumstances change.

Type of representative	No. of reps.	Breakdown
Fishing cooperative	4	Chairman of existing cooperative (Koop. Nelayan Mina Bahari), 3 representatives by type of fishing boat (1 purse seine/Lampara net, 1 gill net/angling, and 1 payang net)
Distributors/processors	3	1 trader, 1 retailer, 1 processor (female)
Area representatives	2	1 person each from Paupanda, Reknlima, Mbongawani, and Ende Island
Total	9	

Sub-village representatives will be from a fishermen household and should be elected according to peer popularity. They will not be the village head or other public officeholder. These representatives will play a central role in promoting fishermen, trader, and retailer groups in their area.

The directors will be responsible for coordinating the different views in the area and among the user groups about resource management and facility operations, holding board meetings once a month, and discussing organizational decisions. The content of the final discussions will be constantly fed back to relevant user groups through their representatives, and re-discussed within those groups. They will be formally adopted as bylaws or standards based on the clarifications that are given and the majority consensus achieved at the regular annual general meeting. An emergency general meeting will be called to decide urgent matters.

Representatives at each model site will select a chairperson, secretariat, auditor, and advisor (in Paga this will be a fisheries officer) from among themselves.

2) **Advisory Committee**

In Ende, an advisory committee composed of a representative from the District Governor's Office (the governor or vice governor), two representatives from the Fisheries Office, and two representatives from the relevant administrative districts (Kec. Ende Selatan, Kec. Pulau Ende), for a total of five members, will be established. The advisory committee will have absolutely no decision-making powers with regard to the operations of the facilities. It will serve strictly in an advisory capacity on technical issues and will offer support and advice on management issues. In addition, the function of the advisory committee will be gradually decreased as the capabilities of the board of directors improve and are strengthened. A councilor will be assigned to each management organization as needed and the region's self-reliance will be targeted.

There is no need to establish an advisory committee in either Maumere or Paga as the government will be directly involved in the management of their facilities.

3) **General Meeting**

The board of directors will present and explain the fiscal year report on activities and accounts, the activities and accounting plan for the following year, field questions from members, and obtain the final approval on decisions at the annual general meeting. If revisions and reforms of the (provisional) bylaws and standards on operations are required, the directors will explain and discuss these revisions at the meeting, and the attending members will approve the changes. The changes will become effective following this approval. The general meeting will be held regularly once a year and attended by all members. Emergency meetings will be held to discuss urgent matters.

(4) **Management Structure of Activities**

The activities of the cooperative will be implemented according to the operations policy, bylaws, and standards that were passed at the annual general meeting, and the management group will be responsible for the operations and maintenance of the facilities. The management group will be headed by a manager and assistant manager, who will be responsible for overseeing five groups--a facility operations group, ice-making and retail group, technical group, administrative and accounting group, and resources group. Each group member will be under the direct management and coordination of the manager and assistant manager. The manager and assistant manager will submit a monthly facility operations report to the board of directors. Existing problems will be discussed and solutions will be proposed by the operations side.

To effectively operate the facilities, the management group will be comprised of the following staff members. Priority will be given to the residents of each area during recruitment. But for the positions of manager, mechanic, and general affairs/accountant, the most qualified person will be hired irrespective of place of residence.

Position	No.			Duties	Hiring Policy
	Kalimati	Paga	Paupanda		
Manager	1 (concurrently)		1	Perform overall management and coordination of the fish landing, marketing, and processing facilities, prepare the monthly report for the board, negotiate/coordinate with related government institutions, check the daily operations records, supervise staff members	Honest and diligent candidate will be recruited irrespective of region or place of residence (initially a two-year contract, the position will be filled by a local staff member as skills improve)
Assistant Manager	1	1	1	Assist the manager	Will be recruited from among residents of each area (future manager candidate)
Mechanic	1 (concurrently)		1	Operate, repair, and maintain the ice-maker, freezer, pump, and other machinery, transfer technologies to local mechanic	Will be hired from Sulawesi, Java (initially a two-year contract, the position will be filled by a local staff member as skills improve)
Assistant Mechanic	1	1	1	Assist the mechanic, manage the workshop	Will be recruited from among residents of each area (future mechanic candidate)
Facility Overseer	5	1	3	Oversee activities at the jetty, fish handling shed, retail market, and processing facility, collect user fees, clean the facilities	Will be hired from among residents of each area
General Affairs, Accountant	2	1	2	Collect fees for ice and facility usage, sell tickets, perform bookkeeping of expenses and revenues and other general office work	Will be recruited from among residents of each area
Workers	4	3	6	Make and sell ice (supply water, remove the ice, discard old ice, handle ice crushing, sorting, storage, sales), clean the facility	Will be recruited from among residents of each area (will hire according to area)
Security Guards	2	1	2	Patrol the grounds, conduct surveillance	Will be recruited from among residents of each area (shift change every 12 hours)
Boat operator	-	-	2	Operate and maintain the multipurpose transport boat (Ende Island)	Will be recruited from among Ende Island residents
Driver	2	-	2	Driver of the fish transport vehicle and its maintenance	Will be recruited from among residents of each area

Note: The fueling facility will be operated by a private tenant based on a direct contract with Pertamina and the management organization.

(5) Government Assistance Organizations and System

To provide the variety of assistance services explained in section (1) Linkages with Related Organizations, the following staff members from the District Fisheries Office will be assigned to the administrative offices at the facilities to pursue their work as fisheries officers and to participate as members of the resources group in each management organization.

Position	No.		Duties	Hiring Policy
	Sikka	Ende		
Branch Director	2	1	Oversee resources management related activities, coordinate extension activities in fish marketing and processing, coordinate the navigation of the model fishing boat and small high-speed boat	Will be selected from the existing district fisheries officers
Data Collector	3 (Maumere 2, Paga 1)	2	Collect the fishermen's logbooks, analyze and report data, perform boat registration tasks, provide guidance on fish handling at the fish handling shed, implement improvements in fish transaction related activities	Will be recruited from the existing data collectors
Boat Captain	1	1	Navigate and maintain model boat, maintain logbook, file reports	Will be hired from Sulawesi, Java (initially a two-year contract)
Chief Engineer	1	1	Same as above.	Same as above.
Navigator	2 (1/site)	1	Navigate and main ten high-speed boat	Will be selected from the local fishermen

2.5.2 Operation and Management Plan

(1) Coastal Resources Management Plan

1) Project to Improve the Data Collection System and Expand the Fishing Licensing System

The project will be implemented with the cooperation of with the District Fisheries Office and other relevant government agencies, (district, sub-district, village administrative offices). One fisheries officer will be assigned to implement the project. He will be responsible for integrating and coordinating the various activities and hiring and supervising temporary data collectors to conduct the field work (explain, supervise, tally, and input data, distribute boat markings). The following inputs will be required to implement the project.

(a) Improve the Data Collection System

Cost	Breakdown	Cost (million Rp.)	
		Sikka	Ende
Equipment and materials	Logbook Rp.100,000/fbook x 165/60 books, calculator Rp.50,000/unit 165/60 units, computer Rp.20 million x 2/1 units	64.8	29.0
Consumables	Rp.100,000/month x 15 months x 2 districts	2.0	1.0
Village meeting costs	Rp.10,000/man day x 225 man days x 6 meetings (1 seminar for fishermen, 1 social gathering, 4 training sessions)	9.9	3.6
Personnel costs	Data collectors Rp.300,000/man month x 3/2 people x 15 months	13.5	9.0
Travel cost	Fisheries officer Rp.50,000/man days x 1 person/district x 60/30 days	3.0	1.5
Total		93.2	44.1

(b) Expanding the Fishing Licensing System

Cost	Breakdown	Cost (million Rp.)	
		Sikka	Ende
Equipment and materials	Registration card Rp.20,000/card x 165/60 cards Boat markings Rp.50,000/boat x 165/60 boats	11.6	4.2
Village meeting costs	Rp.10,000/man day x 165/60 man days (1 public hearing)	1.7	0.6
Personnel costs	Data collectors Rp.300,000/month x 3/2 people/district 6 months	5.4	3.6
Travel cost	Fisheries officer Rp.50,000/man days x 1 person/district 60/30 days	3.0	1.5
Total		21.7	9.9

The activities listed above are anticipated to be implemented in two

years time at an estimated cost of Rp.168.9 million (Rp.114.9 million for Sikka district, Rp.54 million for Ende district). The subsequent estimated yearly cost that this project will incur is Rp.18.0 million annually for Sikka district (personnel cost Rp.10.8 million, traveling cost Rp.3.4 million, and equipment maintenance cost of Rp.3.8 million) and Rp.10.6 million for Ende district (personnel cost Rp.7.2 million, traveling cost Rp.1.7 million, and equipment maintenance cost of Rp.1.7 million). The annual budget of the District Fisheries Office for project activities in FY 2001 is Rp.1,275 million for Sikka district and Rp. 650 million for Ende district. A separate budget has been created for fisheries management activities, but the costs for these are well within the present yearly district budget.

2) Project to Expand Fishing Grounds and Develop a Surveillance System for the Coastal Fishing Grounds

The coastal fisheries resources management activities will be carried out by the District Fisheries Offices with the cooperation of the local management organizations (fishing cooperative or village) at each model site. The operations plan for the major facilities and equipment is as follows.

(a) Model Fishing Boat

One model fishing boat each will be provided to Sikka district and Ende district. The model fishing boat will explore new coastal areas and develop new fishing grounds. Through these activities, fishermen will be given the opportunity to participate in new fishing operations, and to experience and acquire new fishing technology. The crew of the model fishing boat will be comprised of groups of local fishermen who, by exploring new coastal areas, becoming involved in the actual operations of the boat, and engaging in fisheries activities, will gain new levels of experience, knowledge, and technology.

(a-1) Operations plan

The model fishing boats will belong to the District Fisheries Offices, and one will be provided to each district. The District Fisheries Offices will be responsible for their operations and maintenance and for hiring a full-time captain and chief engineer. During the initial stages, a crew of fishermen experienced in fishing operations in the waters of South Sulawesi and Java will be recruited. The full-time captain and chief engineer will provide guidance on boat operations and maintenance, and technical supervision for the fishing crew trainees. Through these on-board training activities, local fishermen who show potential aptitude to serve as a full-time captain and chief engineer will be selected and trained, and the model fishing boats will be completely manned by local crews in a few years.

There are two model sites in Sikka district, Kalimati/Wuring and Paga. The model fishing boat will be operated out of Maumere to promote the exploration of new coastal waters and the development of new fishing grounds outside of Maumere Bay, the site where fisheries activities are most concentrated. Depending on the technical training of the fishermen groups and their performance in operating the fishing boat, consideration may be given to operating the boat along the southern coast of the district, using Paga as a base.

Fishermen groups that want to participate in the on-board training activities will be able to participate on a rotational basis, and the captain will supervise the

training activities. The management organization at each model site will collect the fishermen groups' requests to use the boat, and will coordinate and arrange the selection of groups and their scheduling under the guidance and supervision of the District Fisheries Office.

One fishing group will be comprised of seven to eight members, and one training session will be for a one-month period. An estimated 11 groups will be able to participate in the practical training operations of the model boat in one year. Each fishing trip will last for three days and about eight trips will be carried out in one month.

The operations and maintenance costs of the model fishing boat will be paid out of the revenue generated from the sales of the fish catch. The salaries of the captain, chief engineer and the direct operating costs will be directly deducted from the sales revenue and the remainder (gross profit) will be divided equally between the District Fisheries Office and the crew (fishermen group). The District Fisheries Office will save the profit revenue that it receives to pay for the maintenance costs of the model fishing boat.

(a-2) Revenues and expenditures

The period for one fishing trip is three days, and eight fishing trips will be carried out in one month. Therefore, 88 fishing trips will be conducted in one year (11 months). The annual operating cost for the model boat is estimated at Rp.144 million (see Table 5-1-4, Appendix 5). This amount includes the salaries for the captain and chief engineer (Rp.21.6 million), who will be recruited from outside the district to operate the model fishing boat during the initial stages. This cost is anticipated to be greatly curtailed in the future when the local fishermen learn the technology and they are able to take over the operations and maintenance of the model boat.

One fishing trip of the model fishing boat is estimated to harvest 1,200kg of fish, and the annual revenue generated from fish sales is estimated at Rp.198 million based on the lowest fish price in the central Flores region surveyed in this study. The gross annual profits that have been estimated after the operating costs have been deducted from the sales revenue are Rp.54 million.

The gross profits will be shared equally (50/50) between the boat owner (District Fisheries Office) and the fishing crew, which is a commonly accepted practice in this region. The profits will be distributed to the fishermen group (for the fishing crew) and the captain and chief engineer as commissions. Although the individual distribution ratio will be discussed and decided in separate negotiations, the annual average commission that will be distributed for each person is estimated at Rp.2.7 million.

The annual distribution to the District Fisheries Office is estimated at Rp.27 million. This will be retained by the District Fisheries Office as a model fishing boat management fund to be used for covering the maintenance and repair costs of the model fishing boat. The annual maintenance and repair costs of the model boat are estimated at Rp.26 million.

(a-3) Maintenance plan

The captain and chief engineer will be responsible for the local maintenance and repair work of the model fishing boat at the site. The fishermen groups will carry out the daily maintenance work and repairs under the supervision of the captain and chief engineer. Large major repairs will be carried out in Denpasar since a repair dock

for fishing boats is nonexistent in both NTB and NTT provinces.

(b) Fish Aggregating Devices (FADs)

The local management organization of each model site (Maumere/Wuring, Paga, Ende) will be responsible for the operations and maintenance of the FADs under the guidance of the District Fisheries Office. A 24-hour daily fishing ground surveillance system using the FADs will be created and local management organization members (fishermen) will participate in the system on a 12-hour rotational shift. The fishermen will moor their boats at a FAD, and equipped with a wireless communications unit and binoculars, they will watch the fishing grounds. In addition, they will be responsible for collecting fishing fees (prepaid tickets) from the fishermen operating near the FAD and for reporting to the administrative office after their return to port. The surveillance activities will be conducted by the fishermen on a voluntary basis.

The durability of a FAD is one year and in order to sustain its continuous use, it must be reset once a year. The cost of this activity will be covered by the fishing fees that are collected. The type and number of fishing boats that are expected to be active, based on the fisheries industry conditions at each site, are shown below.

(b-1) Annual number of fishing boats

FAD site	Managing village	Targeted fishing boats	No. of boats
Northwestern coast of Maumere	Wuring	Purse seiners	2 boats/unit/day x 20 days/month x 12 months = 480
Southern coast of Paga	Paga/Mauloo	Gill net, trolling	22 boats/unit/day x 20 days/month x 9 months = 3,960
Ende Island area	Ende Sel./ P. Ende	Gill net, trolling	23 boats/unit/day x 20 days/month x 9 months = 4,140

Note: The number of fishing boats that will utilize the facilities is estimated at 50 percent of the total existing gill net fishing boats and trolling and number of motorized fishing boats targeted (discussed earlier).

It is assumed that two purse seiners will operate simultaneously around a single FAD.

(b-2) Fishing fees per fishing operation

(b-2-1) Maumere (1,000m depth models): FAD materials, construction, and installation costs are Rp.25million/unit

Purse seine fishing fee: $\text{Rp.25million} \div 480 \text{ boats/year} = \text{Rp.52,000/operation}$

(b-2-2) Paga (1,000m depth models): FAD materials, construction, and installation costs are Rp.25million/unit

Troll fishing fee: $\text{Rp.25million} \div 3,960 \text{ boats/year} = \text{Rp.6,300/operation}$

(b-2-3) Ende (1,000m depth models): FAD materials, construction, and installation costs are Rp.25million/unit

Troll fishing fee: $\text{Rp.25million} \div 4,140 \text{ boats/year} = \text{Rp.6,000/operation}$

Troll catches using existing shallow-water FADs in Paga average 50kg or more per day in February to March (the catch would be 30kg or more per day without

the FAD). Thus, if an average annual catch of 50kg/day can be assumed, sales per day would be a minimum of Rp.100,000 (Rp.2,000/kg x 50kg/day), making the fishing fee above a reasonable 10 percent of sales. Likewise, since purse seiners land an average daily catch of 200kg in the coastal waters of Maumere, their daily average sales are estimated to be a minimum of Rp.400,000 (Rp.2,000/kg x 200kg/day). Based on this estimation, it has been concluded that fishermen will be able to pay the above fishing fee Rp.52,000 per operation. However, the actual system that will be adopted will not be based on the collection of fishing fees, but on a payment system where 30 to 50 percent of the profits generated from the fish catch volume minus costs is paid to the owner. Since this amount is larger than the amounts calculated above, it has been concluded that this business will generate a sufficient profit.

(c) High-speed Boat

The high-speed boat will be used only in response to emergencies or illegal fisheries activities reported by fishermen. The estimated operating and maintenance costs of this boat are shown in the table below.

Item	Calculated Expenditures	Annual Operating Cost Rp million.		
		First 2 years	3-5 years	After 6 years
Fuel	100 trips/year x 2 hours/trip x 24L/hour (80hp) x Rp.2,000/L	9.6	9.6	9.6
Maintenance, repair	1%, 2%, 4% of boat cost	1.6	3.2	6.4
Pay for the pilot	Rp.20,000/hour x 100 trips/year	2.0	2.0	2.0
		13.2	14.8	18.0

Based on the above, the annual operating and maintenance cost of the high speed boat has been estimated at Rp.13 to Rp.18 million. However, since there is no fishing licensing system established in either Sikka district or Ende district, the annual license revenue (except for non-motorized boats) that would come from the model sites must be calculated by applying the current fisheries licensing fees in Bima district. The results are shown in the table below.

Fishing gear	Annual licensing fee	Sikka district (Maumere/Paga)		Ende district (Ende)	
		Boats	Estimated revenue (Rp. million)	Boats	Estimated revenue (Rp. million)
Purse seine	Rp.200,000	75	15.0	33	6.6
Lampara net	Rp.150,000 (tentative)	-	-	12	1.8
Manual angling	Rp.20,000	47	0.9	-	-
Gill net (monofilament)	Rp.15,000-25,000	-	-	54	1.6
Gill net (multi)	Rp.35,000-75,000	33	1.6	-	-
Trolling	Rp.15,000	2	0.0	-	-
Skipjack pole and line	Rp.500,000 (tentative)	26	(13.0)	-	-
Total		213	17.5 (30.5)	96	10.0

Source: Bima District Fisheries Office

If a self-supporting accounting system is established, i.e., if the revenue generated from licensing fees is saved as a reserve fund for the fishing grounds and used to pay the annual operating costs of the high-speed boat, it will be possible to operate as planned even if one high-speed boat is provided for each of the two model sites (Maumere and Paga, for a total of two boats) if the skipjack pole and line boats are included in the Sikka district. Also, since fishing boats in Maumere are scattered throughout the islands, if licensing fees can be collected from these fishing boats, it

will be possible to expand the range of the high-speed boat operations. In Ende, it is expected to be somewhat difficult to finance 100 operations of the boat per year using licensing revenues alone, but since licensing revenues will increase as fishing boats (135) become motorized, it will be possible to introduce one high-speed boat. The durability of the high-speed boat is about ten years and the government must take budgetary measures to meet the cost of replacing the boat (about Rp.160 million) in the future.

(2) Approach to Improving Fish Landing, Handling, Shipping, and Processing and Cost

The fish landing, handling, shipping, and processing facilities and the fishermen activity support facility will be supervised by the Sikka and Ende district governments and operated by the local management organizations at each model site. However, the facilities at Maumere (Kalimati) will be operated directly by the District Fisheries Office.

1) Fish Landing Improvement Project and Project to Improve Fresh Fish Shipments

(a) Setting and Collecting Facility Use Fees

Currently there are no ordinances or regulations established in the central Flores region (Sikka district, Ende district) regarding facility management. Under this plan, the collection methods and amounts will be established according to the same guidelines prescribed for Priority Zone Bima (for details see V-1 Priority Zone Bima, Section 2.5.2 Operation and Management Plan, (2) Approach to Improving Fish Landing, Handling, Shipping, and Processing and Cost).

Specific facility use fees will be set in the order shown below. However, because the Maumere (Kalimati) site is located in an urban area and there are no fishermen residing nearby, that site will be designated as a fish landing and market site only, with processing and repair functions to be provided outside the city at the Wuring site.

(b) Sources of Facility Revenue

Same as the Bima Priority Zone. There are three major sources of revenue for the facilities that have been planned: ice sales, facility user fees (quaywall moorage, the fish handling shed), and rental fees for the model processing plant and for insulated boxes used for the overnight storage of fresh fish.

(b-1) Quaywall moorage fees

Same as the Bima Priority Zone Bima. At Paga, however, which does not have a landing wharf, the fee will be uniformly set at Rp.500.

(b-2) Fish handling shed fees

Same as the Bima Priority Zone.

(b-3) Rental fees for special facilities and equipment

Same as the Bima Priority Zone.

The Maumere retail market use fee will be set at Rp.1,000, calculated by adding a water use fee of Rp.500 to the business tax currently collected from the district government (Rp.500/day/person).

(c) Price of Ice

The volume of ice that will be sold has been estimated at 90 percent of the production volume due to losses and fluctuations in demand. After calculating the anticipated ice sales revenue and the maintenance and operations cost of the facility, the unit price of ice was set to prevent a deficit in the overall revenues and expenditures of the facilities. Ice will be sold in 25kg blocks and in 5kg units in plastic bags for retailers and small fish traders. The prices are shown below.

	Kalimati/Wuring	Paga	Paupanda
Blocks (25kg)	Rp.320/kg	Rp.420/kg	Rp.300/kg
Bags (5kg)	Rp.340/kg	Rp.440/kg	Rp.320/kg
Remarks (current prices)	Ice in plastic bags (Maumere: Rp.500/kg, Paga: Rp.1,000/kg, Ende: Rp.750/kg) Blocks (Maumere private ice makers: Rp.380/kg)		

The price of ice sold in plastic bags reflects the cost of the plastic bags and the labor cost of crushing and packing the ice, and is thus relatively expensive compared to the price of ice blocks. Since the demand for ice in Paga is lower than in Maumere and Ende, the sales price is relatively high, but it should be possible to set the price at one-half of the current price at each site. In view of the absolute shortage of ice at each site, the use of ice is expected to be as planned due to the training provided to traders, retailers, and consumers on how to maintain fish freshness.

(d) Nonmember User Fees
Same as the Priority Zone Bima.

(e) Revenues and Expenditures Generated from Facility Operations

If the fees explained above for each facility are collected, the revenues for the facilities at each model site are calculated as shown below. These amounts are sufficient for the facilities to sustain their operations and maintenance, including the replacement of equipment (see Tables 5-2-6 and 5-2-8, Appendix 5 Calculations of the Operations Revenues and Expenditures. Figures will be finalized when the facility maintenance fees are added).

	Kalimati/Wuring	Paga	Paupanda
Avg. annual revenues	Rp.349.0 million	Rp.209.7 million	Rp.444.6 million
Avg. annual expenditures	Rp.344.9 million	Rp.204.4 million	Rp.433.5 million
Annual earnings	Rp.4.1 million	Rp.5.3 million	Rp.11.1 million

However, these figures are strictly estimations, and it is anticipated that the balance in the revenues and expenditures will fluctuate if the facilities are not utilized as expected. Therefore, the board of directors of the association in charge of the facilities will draft a revision of the user fees for each facility, based on the annual revenues and expenditures generated and the conditions of the activities, and will submit it to the annual general meeting for all members where it will be debated and adjusted according to the general consensus.

In addition, although revenue to cover equipment depreciation costs will be generated as part of the annual profits, it must be saved to enable the association to replace the equipment in future.

The district government will be responsible for the public works related to the facilities, for maintaining the structures and facilities, in addition to providing the needed technical development and extension services. Although the district government is able to fulfil these responsibilities under its present budget, it will not be able to provide added services. Thus, in view of the stringent budget of the district government, there is concern that financing for the activities will not be available in future. For each project to become financially self-supporting in each district there is a need for a segment of the profits generated from the facilities to be paid to the district government.

(f) Fish Transport Vehicle

Each facility management organization will be responsible for employing a full-time driver for the fish transport vehicle planned for Maumere and Ende and for vehicle related maintenance and repairs. This vehicle will be leased to traders and retailer groups on a charter basis. The routes, annual number of trips, annual operating and maintenance costs, and use fees are shown in the table below (see Table 5-3-2, Appendix 5 Calculations of the Operations Revenues and Expenditures).

	Maumere and Ende
Type and number of vehicles	2 refrigerated 3-ton trucks
Routes	Maumere/Ende - Bajawa/Ruteng
Allowable transport volume/trip	3 people + 1.5 tons of fresh fish
Annual number of trips	100 trips/vehicle
Annual operations and maintenance costs	Rp.90.8 million/vehicle
Round-trip charter fee	Rp.910,000/trip (charter and gasoline charges are to be borne by the user)
Current freight rates	Maumere-Ende round-trip charter of a pick-up truck: Rp.250,000

Based on the table above, the charter fee for the use of the planned vehicles is calculated at about Rp.1.0 million including the costs of gasoline. Currently, refrigerated trucks are not being used, and since the route goes as far as Ende a simple comparison cannot be made, but if a shipment is taken twice the distance, and three times the amount of fresh fish that fits in a pick-up truck can be shipped in one trip, this is a reasonable rate. The transport cost per 1kg of fresh fish (including fuel charges) is calculated at about Rp.1,000, but since the fresh fish price in fish-scarce Bajawa and Ruteng is about 1.5 times the price in the central Flores region, a sufficient profit can be expected.

(g) Multipurpose Transport Vessel

The multipurpose transport boats will be operated and maintained by the Ende Island sub-district government (Kec. Pulau Ende), which will be responsible for hiring a full-time operator who will oversee the daily operations and maintenance of the transport boats. Two transport boats will service each of the island's six villages (three villages/boat) once every three days. The boats will make one round-trip voyage between Ende Island and Ende city each day. Each village will pay a fixed round-trip fee to the sub-district government, and representatives from each village will load and sell fish for the voyage to Ende city. Necessities such as fresh water, ice, and kerosene will be delivered to Ende Island on the return trip.

The annual number of trips per multipurpose transport boat will be 300 (100 trips per village). To cover the annual operations and maintenance costs, the per-trip use fee will be set at about Rp.220,000 (see Table 5-4-6, Appendix 5 Calculations of

the Operations Revenues and Expenditures).

However, the revenues and expenditures of each village for each trip of the transport boat are shown in the table below. As long as it does not keep the boat from turning a profit, fresh water and fresh demersal fish can be shipped to the villagers.

	Transport volume	Delivery/transport costs		Sales		Profit
		Unit price	Total	Unit price	Total	
Fresh fish	650kg	Rp.5,673/kg	Rp.3,687,524	Rp.6,000/kg	Rp.3,900,000	Rp.212,476
Ice	1,200kg					
Fresh water	3,000L	Rp.47/L	Rp.140,714	Rp.50/L	Rp.150,000	Rp.9,286
Kerosene	400L	Rp.1,100/L	Rp.416,762	Rp.1,100/L	Rp.440,000	Rp.23,238
Total			Rp.4,245,000		Rp.4,490,000	Rp.245,000

2) Project to Extend Fresh Fish Handling Technology and Project to Improve Fish Processing

The District Fisheries Office will implement this project with the cooperation of the facility management organizations. During the first year, one fisheries officer will be assigned to each site to prepare and implement the workshops for the trial processing activities, and to carry out technical guidance and evaluation activities. The following input will be needed to implement these activities.

(a) Improve and Disseminate Fresh Fish Handling Technology

Item	Details	Costs (Million Rp.)	
		Sikka	Ende
Cost of materials	Reinforcement materials: Rp.10,000/box x 173 boxes (Sikka)/ 154 boxes (Ende)	1.7	1.5
Cost of workshops	Meals: Rp.10,000/man day x 2 days/person x 115 people (Sikka) / 108 people (Ende)	3.5	3.3
Personnel costs	Transportation costs: Rp.10,000/person x 115 people (Sikka) / 108 people (Ende) Supervisor: Rp.50,000/man day x 1 person x 2 days/workshop x 8 workshops / 7 workshops Carpenter: Rp.30,000/man day x 2 people x 8 workshops / 7 workshops	1.3	1.1
Traveling cost	Supervisor: Rp.50,000/person/workshop x 1 person x 8 workshops / 7 workshops	0.4	0.4
Total		6.9	6.3

(b) Improve and Disseminate Fish Processing Technology

Item	Details	Costs (Million Rp.)	
		Sikka	Ende
Cost of materials	Raw fish for processing Rp.2,500/kg 300kg/operation 50 operations/year Other ingredients Rp.100,000/operation 50 operations/year	42.5	42.5
Cost of workshop	Meals Rp.10,000/man day x 10 people/workshop x 3 days/workshop x 50 workshops/year Transportation costs Rp.10,000/man day x 10 people/workshop x 50 workshops/year	20.0	20.0
Personnel costs	Supervisor Rp.50,000/ man day x 1 person x 3 days/workshop x 50 workshops/year	15.0	15.0
Cost of consumables	Office supplies, coffee, etc.Rp.30,000/workshop 50 workshops/year	1.5	1.5
Total		79.0	79.0

Note: Due to cooperation of the facility management organizations, the model processing facility and equipment will be provided under grant aid cooperation, and the cost of the electricity, water, and ice will be free.

It will be feasible to implement the activities described above in one year at

the estimated cost of Rp.109.6 million (Rp.55.1 million in Sikka district and Rp.54.5 million in Ende district) and there are no activity costs to be maintained after this period. Following the second year, processing groups will begin actual operations based on the knowledge and experience gained from their one-year study period and trial processing activities. Financially self-supporting processing operations are expected to develop under the leadership of the management organizations. Funds to cover the costs of fish handling and processing related activities have not been allocated in the District Fisheries Office annual budget for project activities. Therefore, new budgetary measures must be adopted to implement extension activities. However, if the district government is unable to enact new budgetary measures, the construction of the model processing plant will be shelved.

(3) Operations and Cost of the Project to Improve the Fishing Village Environment

The project to improve the villages is comprised of the Project to Improve the Fishing Village Infrastructure and Project to Improve the Social Environment of the Fishing Village. The operations and cost of this project are described below.

1) Project to Improve the Fishing Village Infrastructure

(a) Developing a water supply and model toilets

A total of two Kamar mandi style toilets (with washing area) will be installed at each of the fishing sub-villages in Paga. This toilet will be comprised of a water supply and septic tank. The village residents will be responsible for disposing the accumulated sludge in the septic tank on a voluntary basis, therefore, maintenance costs have not been added.

Item	Details	Cost (Rp million)
Model toilet facility	Paga: 2 sites x Rp.4,080,000/site=Rp.8,160,000	8.2
Total		8.2

(b) Garbage collection system

Each village women's group unit (1 unit comprised of 10 households) will be provided with a garbage container made of concrete and therefore, maintenance costs will not be incurred. The garbage collected by the assigned group for that day will be taken to the garbage dumpsite by cart. These village activities will be decided at the village meeting under the leadership of the village head and the district fisheries office will coordinate the activities until they become fully established. The fisheries officer will also be responsible for monitoring and recording the progress of these activities.

Item	Details	Cost (Rp million)
Garbage improvement cost	Maumere (Wuring): All 397 households, 40 units x Rp.350,000 = Rp.14,000,000 Carts: 4 units x Rp.4,000,000 = Rp.16,000,000	30.0
Personnel costs	Maumere (Wuring): District FO officer. Transportation costs will not be included due to the close proximity to the fisheries office.	-
Total		30.0

2) Project to improve awareness about the social environment of the village

(a) Supplementary educational materials for educational awareness activities to improve the social environment

The materials are identical the materials that will be used in Waworada. The costs of the district fisheries office are listed as follows.

Item	Details	Cost (Rp million)
Information collection	Maumere District fisheries officer: Rp.50,000/man day x 1 person x 8 days/month x 2 months = Rp.800,000, Transportation costs: Rp.10,000/man day x 16 man day = Rp.160,000 Ende: District FO officer: Rp.50,000/man day x 1 person x 8 days/month x 2 months = Rp.800,000. Transportation cost: Rp.10,000/man day x 16 man day = Rp.160,000	1.9
Total		1.9

(b) Materials to support educational activities to improve the community

The same equipment and materials that will be provided to Waworada will be provided for this model site. The district fisheries office will be responsible for the following costs listed below.

Item	Details	Cost (Rp million)
Travel costs for extension activities	Maumere: Fuel cost Rp.50,000/day x 20 days = Rp.1,000,000 Extension officer Rp.50,000/ man day x 2 persons 20 days = Rp.2,000,000 Ende: Fuel cost Rp.50,000/day x 20 days = Rp.1,000,000 Extension officer Rp.50,000/man day x 2 persons x 20 days = Rp.2,000,000	6.0
Total		6.0

(4) Operation Cost of Improvement of Fishermen Organization and Fisheries Extension

The proposed plan for improvement of fishermen organization and fisheries extension is similar to that explained in Part V-1 of Section 2.3.5 of Bima Priority Zone and the method of implementing and cost estimation is explained in Part V-1 of Section 2.5.2 of Bima Priority Zone. The estimated cost of education/training for the three models sites of Kalimati/Wuring, Paga and Ende Selatan in the Central Flores Priority Zone is as follows.

1) Preparation stage

(a) Mobilization of fishing community for awareness building

The estimated cost of mobilizing the community, and transport and allowance for staff members is about Rp 8.4 millionn as shown below.

Items	Details	Cost (Rp million)
Organizing cost	Rental of hall, materials (stationery), refreshments and transport of fishing community x 4 days (Rp300,000/day) at 3 model sites	3.6
Per diem	Rp30,000/person x 5 persons x 4 days x 3 sites	1.8
Allowance	Rp50,000/person x 5 person x 4 days x 3 sites	3.0
Total		8.4

(b) Selection of members and formation of management organization

The estimated cost of selection of members and formation of fishermen organization is about Rp 13.8 million as shown below.

Items	Details	Cost (Rp million)
Organizing cost	Rental of hall, materials (stationery), refreshments and transport of fishing community x 4 days (Rp300,000/day) at 3 model sites	3.6
Per diem	Rp30,000/person x 5 persons x 4 days x 3 sites	1.8
Allowance	Rp50,000/person x 5 person x 4 days x 3 sites	3.0
Total		8.4

(c) Preliminary extension/training

The estimated cost for conducting the preliminary extension/training is about Rp 12.3 million as shown below.

Items	Details	Cost (Rp million)
Organizing cost	Rental of hall, materials (stationery), refreshments and transport of fishing community x 5 days (Rp300,000/day) at 3 model sites	4.5
Per diem	Rp50,000/person x 2 persons x 5 days x 3 sites (Staff from outside district) Rp30,000/person x 4 persons x 5 days x 3 sites	1.5 1.8
Allowance	Rp50,000/person x 6 person x 5 days x 3 sites	4.5
Total		12.3

2) Management/Operation Stage

(a) Participatory monitoring and evaluation

The estimated cost for the introductory one-week training workshop for three persons is Rp 3.9 million and the subsequent annually recurring cost is Rp 8.64 million.

Items	Details	Cost (Rp million)
Organizing cost of M&E	Step-1: Organizing to explain the introduction of M&E and developing tools; materials (stationery) and others Rp 100,000 x 5 days (First time) x 3 sites Step-2: Conduct monthly evaluation; 3 days/month x 12 months x 3 sites	1.5
Per diem	Step-1: Rp30,000/person x 2 persons x 5 days x 3 sites Step-2: Rp30,000/person x 1 person x 3 days/month x 12 months x 3 sites	0.9 3.24
Allowance	Step-1: Rp50,000/person x 2 person x 5 days x 3 sites Step-2: Rp50,000/person x 1 person x 3days/month x 12 months x 3 sites	1.5 5.4
Total		12.54

(b) Periodic extension/training

The annual estimated cost for periodic extension/training is about Rp 17.28 million.

Items	Details	Cost (Rp million)
Organizing cost	- To implement extension/training depending on the needs proposed by the resident fisheries staff and members, and also the results of M & E. - Three days a month for one site by 2 persons (three model sites)	
Per diem	Rp30,000/person x 2 persons x 3 days/month x 12 times x 3 sites	6.48
Allowance	Rp50,000/person x 2 person x 3days/month x 12 months x 3 sites	10.8
Total		17.28

(5) **Cost of Fisheries Education and Training**

The proposed plan for education and training is similar to that explained in Section 2.3.7 of Bima Priority Zone and the method of implementing and cost estimation is explained in Section 2.5.2. The estimated cost of education/training for three model sites of Maumere/Wuring, Paga and Ende Selatan in the Central Flores Priority Zone is as follows.

1) **Fishing technology and coastal resources management**

The annual estimated cost is about Rp 12.6 million as shown below.

Items	Details	Cost (Rp Million)
Travel to Labuan Bajo	Rp100,000/trip/person x 6 persons x 3 sites	1.8
Per diem	Rp50,000/person/day x 6 persons x 6 days x 3 sites	5.4
Allowance	Rp 50,000/person/day x 6 persons x 6 days x 3 sites	5.4
Total		12.6

2) **Fish marketing and processing**

The annual estimated cost is about Rp 4.95 million as shown below.

Items	Details	Cost (Rp Million)
Organizing expense	Rp 150,000/time x 3 sites	0.45
Per diem	Rp 50,000/pers/day x 2 pers x 5 days x 3 sites	1.5
Allowance (Lombok)	Rp 50,000/person/day x 2 pers x 5 days x 3 sites	1.5
Other expenses (material, etc.)	Preparation charts, hand-outs, etc. (3 sites)	1.5
Total		4.95

3) **Strengthening of fishermen organization**

The annual estimated cost is about Rp 15.75 million as shown below.

Items	Details	Cost (Rp Million)
Organizing expense	Rp100,000/day x 5 days x 3 sites	1.5
Per diem	Rp50,000/pers/day x 3 pers x 5 days x 3 sites	2.25
Allowance	Rp 100,000/pers/day x 3 pers x 5 days x 3 sites	4.5
Training Fee to Diklat	Rp 2.5 million per course x 3 sites	7.5
Total		15.75

4) **Fisheries extension unit (within district fisheries office)**

The annual estimated cost is about Rp 35.1 million for two district fisheries office in Sikka and Ende as shown below.

Items	Details	Cost (Rp Million)
Travel to Semarang	Rp 400,000/trip/person x 3 persons x 2 sites	2.4
Travel to Labuan Bajo	Rp 150,000/trip/person x 3 persons x 2 sites	0.9
Per diem	Rp 50,000/person/day x 3 persons x 35 days x 2 sites	10.5
Allowance	Rp 50,000/person/day x 3 persons x 35 days x 2 sites	10.5
Training Fee to Semarang	Rp 60,000/trainee/day x 35 days x 3 persons x 2 sites	10.8
Total		35.1

2.5.3 Maintenance Plan

The maintenance activities of quay walls, revetments, roads, and other public works and structures (wastewater, water supply, and electricity) will be divided between the regular annual inspection and repairs and the periodically implemented large-scale repairs (includes renovation of the facilities). As explained earlier, the district government or sub-district/village governments will be responsible for the maintenance of the facilities. The construction costs of the structures and public works facilities are enormous and if they are not adequately maintained and inspected on a daily basis, the repair and renovation work may become very costly. Therefore, it is important that daily inspections and maintenance work are performed to improve the durability of the facilities and to keep maintenance costs down. Each organization will perform the daily inspections and repairs shown in the table below.

Maintenance Organizations and Daily Inspections		
Model site	Organization responsible for maintenance	Daily inspections, repairs, maintenance
Maumere (Kalimati)	Sikka District Fisheries Office + Maumere town	Sikka District Fisheries Office + Maumere town (direct government management)
Wuring	Sikka District Fisheries Office	Wuring sub-village
Paga	Sikka District Fisheries Office	Village association (Paga, Mauloo villages)
Ende	Ende District Fisheries Office	Fishing cooperative (Koop. Nelayan Mina Nahari)

The maintenance methods and costs for each facility are shown below. The cost of major renovation and repair work (including the replacement of facilities) within the overall maintenance cost has been calculated as follows. The renovation cost based on the number of durable years of the facility was calculated, and the daily maintenance cost was calculated on a yearly basis using a percentage of the direct construction costs (see Table 5-2, Appendix 5).

Maintenance Methods and Costs for Each Facility

Type	Facility	Maintenance and Cost
Basic Facilities	Outside facilities	Revetment, jetty Partial repairs will be carried out once every 10 years. 1% of the direct construction cost for 10 years will be added as renovation cost. 0.1% per year of this direct construction cost will be saved and used to pay for this cost.
	Mooring facility	Wharf, slipway Same as above
		Simple wooden jetty (substructure) 0.5% per year of this direct construction cost will be saved and used to pay for this cost.
		Simple wooden jetty (coping) Upper planks will be replaced once every 10 years. 10% of the plank replacement cost (direct public works cost) will be saved yearly for 10 years.
	Transport Facility	Road The road is widely used by the district residents as well as fisheries related personnel. The facility will be maintained by the management body, but small repairs will be carried out as a joint activity by the village community. 30% of the road will be paved every 10 years. 3% of the paving cost (direct public works cost) will be saved yearly and used to pay for this cost.
Parking area The cost of repaving the parking area is less than the repaving cost of the road due to less traffic. Therefore, 1% of the paving cost (direct public works cost) will be saved and used to pay for the repaving cost.		
Functional facilities	Building shed Handling shed, office, model fish processing facility, simple workshop, fuel depot The structure will be re-roofed once every 10 years. 0.5% of the construction cost (direct public works cost) will be saved annually and used for repairs and to replace parts, and pay for daily maintenance costs.	
	Water supply and wastewater sanitation facility	Main facility 0.5% of the main facility construction cost (direct public works cost) will be added as repair costs for the water supply facility, fuel depot.
		Mechanical facilities The mechanical facilities will be replaced once every 10 years. 10% of the mechanical facility cost (direct public works cost) will be saved yearly for 10 years.
	Electrical lighting facility The indoor and electrical lighting fixtures on the premises will be replaced once every 10 years. 10% of the electrical lighting fixture cost (direct public works cost) will be saved yearly for 10 years to pay for this cost. 0.5% of the annual construction cost (excluding the cost of the electrical lighting fixtures) will be used to pay for the daily repair costs.	

2.6 Environmental Impact Evaluation and Mitigation

2.6.1 Impact during Construction Stage for Kalimati Site

Activity	Potential Impact	Classification	Evaluation of Impact	Mitigation/ Comments	Responsible Institution
Site clearing / preparation/ reclamation/ filling	- There are no trees, mangrove or vegetation on site that need clearing. There might however be remnants of old foundation destroyed by the tsunami of 1992.	L, D, Lc, B, I	The significant impact of site preparation/ reclamation will be to remove/ bury the old foundation which is a hazard to navigation in the area.	None	-
Relocation	- No activities need relocation; however, beach access will be affected with the reclamation for the project site.	L, D, Lc, A	Impact will be slight as present beach access is restricted due to the presence of the sea wall along the beach.	None	-
Construction activities	- Construction activities on site will create noise, dust, and increase construction traffic on road	S, D, Lc, A, R	Impact will be significant but temporary only for the duration of the construction.	Construction activities to be restricted to working hours and constructional plant traffic should be cautioned to travel at low speed especially passing through populated areas.	<ul style="list-style-type: none"> • Implementing body • Contractor
Temporary services (water, electricity)	- Construction activities will make use of water & electricity supply on the site	S, D, Lc, A	Impact will not be significant and temporary only for the duration of the construction. There is pipe water supply in the area to meet the constructional needs.	Water requirement for the constructional needs should be sufficiently met by the pipe water supply at the site.	• Contractor
Construction labour force	- labour force from outside Maumere will create demand for housing, services (transport, restaurant, etc.)	S, D, Lc, B & A	Impact will not be significant as most of the unskilled labourers are available from Maumere. The impact will be temporary only for the duration of the construction. The beneficial benefits will be from the injection of cash into the local community and increase in economic activities of the outside workers. Adverse impact is not expected to be significant as the number of outside workers are expected to be small.	Encourage the contractor to hire local labourers from Maumere or nearby villages to reduce social tension from outside workers.	<ul style="list-style-type: none"> • Contractor • Implementing body

Legend: S = Short Term impact L = Long Term impact D = Direct impact I = Indirect impact
 Lc = Local impact St = Strategic impact A = Adverse impact B = Beneficial impact R = Reversible I = Irreversible

Notes: Impact that is Significant will be further classified into Reversible or Irreversible impacts.

Implementing body will consist of Dinas Perikanan. Management organization will consist of Fishermen groups (Kelompok)/ KUD Mina/ Village representatives (for details please refer to Section 2.5.1)

2.6.1 Impact during Construction Stage for Kalimati Site ...(continue)

Activity	Potential Impacts	Classification	Evaluation	Mitigation / Comments
Construction of shore facilities on reclaimed land.	- reclamation will be to the ~3m depth line and is expected to affect the local currents.	L, D, Lc, A	Impact will not be significant as the reclaimed area is small and its effect on the local currents will be minimal.	Monitoring of surrounding sea bed profile is recommended for early warning of and to avert unexpected adverse impact. <ul style="list-style-type: none"> • Contractor • Implementing body • Management organization

2.6.2 Impact during Construction Stage for Wuring, Paga, and Paupanda Site

Note: Impacts for Wuring, Paga, and Ende are the same unless stated otherwise

Activity	Potential Impact	Classification	Evaluation of Impact	Mitigation/ Comments	Responsible Institution
Site clearing / preparation (only for Wuring)	- There are no trees, and vegetation on site that need clearing/cutting.	-	No impact as there are no vegetation on the site.	None.	<ul style="list-style-type: none"> • Implementing body • Contractor
Excavation of to remove rocks from sea bed (only for Ende)	- Excavation of isolated patches of rocks on the sea bed to ease beach landing.	L, D, Lc, B, I	Removal of the rocks will significantly improve the safety of beach landing for the fishing vessels, and is not expected to affect significantly the existing local current or shore processes.	Monitoring of beach profile is recommended for early warning of and to avert unexpected adverse impact.	<ul style="list-style-type: none"> • Implementing body • Contractor • Management organization
Relocation (only for Wuring)	- Existing activities such as boat mooring will be affected by the reclamation of the beach front.	L, D, Lc, A	Impact will be not be significant as reclamation area is small.	Alternative sea front location in the village should be allocated for these beach front activities for the duration of the construction stage.	<ul style="list-style-type: none"> • Head of Village • Implementing body
Demolition (only for Paga)	- Demolition of existing structures on the site is required.	L, D, Lc, A	The impact will be negligible as the structures are in a bad state and not in use. Also, the impact will be temporary for the duration of the construction stage.	Consensus for the demolition should be confirmed with KUD Mina, the owner of the existing plot and facilities, to avoid any misunderstanding.	<ul style="list-style-type: none"> • Implementing body
Construction activities	- Construction activities on site will create noise, dust, and increase construction traffic on road	S, D, Lc, A	Impact will be not be significant as there are no inhabitants living near the site.	Constructional plant traffic should be cautioned to travel at low speed especially passing through populated areas.	<ul style="list-style-type: none"> • Implementing body • Contractor

Legend:

S = Short Term impact

L = Long Term impact

D = Direct impact

I = Indirect impact

Lc = Local impact

St = Strategic impact

A = Adverse impact

B = Beneficial impact

R = Reversible

I = Irreversible

Notes:

Impact that is Significant will be further classified into Reversible or Irreversible impacts.

Implementing body will consist of Dinas Perikanan. Management organization will consist of Fishermen groups (Kelompok)/ KUD Mina

2.6.2 Impact during Construction Stage for Wuring, Paga, and Paupanda Site ...(continue)

Note: Impacts for Wuring, Paga, and Ende are the same unless stated otherwise

Activity	Potential Impacts	Classification	Evaluation	Mitigation / Comments
Temporary services (water, electricity)	- Construction activities will make use of water & electricity supply on the site	S, D, Lc, A	Impact will not be significant and temporary only for the duration of the construction. There is no pipe water supply in the area to meet the constructional needs but there is underground well water on the site	Water requirement for the constructional needs should be sufficiently met by the well on site. • Contractor
Construction labour force	- labour force from outside the district will create demand for housing, services (transport, restaurant, etc.)	S, D, Lc, B & A	Impact will not be significant as most of the unskilled labourers are available from local communities. The impact will be temporary only for the duration of the construction. The beneficial benefits will be from the injection of cash into the local community and increase in economic activities of the outside workers (such as house rental, meals at local restaurants, use of transport). Adverse impact is not expected to be significant as the number of outside workers are expected to be small.	Encourage the contractor to hire local labourers from the community or nearby villages to reduce social tension from outside workers. • Contractor • Implementing body
Construction of shore facilities (only for Paga)	- Steps to be constructed on the beach to facilitate the carrying of fish from the boats to the shore.	L, D, Lc, A	Impact will not be significant as the steps are from the shore facilities to low water level with the same profile as the beach so will not affect the shore processes or local currents.	None • Contractor • Implementing body
Construction of beach front facilities (only for Wurling)	- The reclaimed island at the end of the village will create an additional restriction to the flow of current from east to west of the village.	L, D, Lc, A	The existing road in the village is already restricting the flow of current and the construction of the small reclaimed "island" at the end of this road will have slight impact on the flow. However, the indirect cumulative effect of the restriction of the reclaimed island may lead to excessive accumulation of rubbish that is presently thrown into the sea by the community.	The indiscriminate throwing of rubbish into the sea should be discouraged. An awareness campaign must be initiated to affect this habit change and to promote a rubbish collection system in the community. • Community leaders • Fishing Community

2.6.3 Impact during Operation/ Maintenance Stage for Maumere, Wuring, Paga, and Paupanda Site

Note: Impacts for Maumere, Wuring, Paga, and Ende are the same unless stated otherwise

• Coastal Resource Management Sector Plan					
Improve data collection system	- Collection of data will provide the necessary information to formulate resource management plans and policies.	L, D, Lc, B, R	Impact will be significant & beneficial in the long term to ensure future sustainable use of resources.	Accurate long-term data collection is essential for information exchange with fishers to raise their awareness for the need for resource management and policy making.	<ul style="list-style-type: none"> • Management organization • Implementing body
Introduce fishing licence system	- this licensing system will not only generate revenue for the fisheries public sector but also as a tool to manage the number & type of fishing vessels.	L, D, Lc, B, R	Impact will be significant & beneficial for management and control of the level and type of fisheries exploitation.	The need for to introduce this licensing system should be properly explained to the fishing community to get their understanding and consensus to avoid non-compliance and resentment.	<ul style="list-style-type: none"> • Management organization • Implementing body
	- fishing community may resent/resist this system.	S, D, Lc, A, R	Impact may be significant if the system is seen as unfair and if the introduction is not carefully explained and carried out with prior consultations/ meetings with the fishing communities that will be affected.	Fishers' understanding and consensus of the licensing system is essential to avoid conflict and resentment of this system.	<ul style="list-style-type: none"> • Implementing body
Fishing ground diversification					
- Offshore fishing ground (FAD introduction)	- will reduce the pressure on the near shore resources	L, D, Lc, B, R	Impact will be significant & beneficial by diversification of fishing ground and fish catch composition thus reducing the pressure on near shore fisheries resources.	Fair and equitable access to the FAD is essential to avoid conflict and resentment amongst the fishers.	<ul style="list-style-type: none"> • Management organization • Implementing body
- Modernization/ increase of fishing boat	- the training on the model boat will broaden the skills of the fishers.	L, D, Lc, B, R	The beneficial impact will only become significant as more fishers get trained and proceed to modernize their fishing technique/ equipment.	Opportunity for training and upgrading their fishing equipment should be availed to all fishers that wish to partake in this scheme.	<ul style="list-style-type: none"> • Management organization • Implementing body

<p>- Monitoring, control & surveillance system (enforcement by speed boat only for Maumere, Paga, and Ende)</p>	<p>- surveillance and communication will help to reduce illegal fishing practices. - will ensure the long term sustainability of the fisheries industry by control of illegal and/or unacceptable fishing practices.</p>	<p>L, D, Lc, B, R</p>	<p>Impact will be significant & beneficial. In the long term, future sustainability will be in doubt if these activities are not implemented.</p>	<p>Long term and sustained implementation of this system is essential for resource management and sustainable fisheries. For Maumere, this monitoring, control and surveillance system should be closely coordinated with the Coremap project to increase efficiency.</p>	<ul style="list-style-type: none"> • Management organization • Implementing body
<p>• Landing, Handling, Marketing & Processing Sector Plan</p>					
<p>Improve landing</p>	<p>- will improve the ease and efficiency of landing of fish.</p>	<p>L, D, Lc, B, I</p>	<p>Impact will be significant and effect immediate. The benefit will be substantial as the fishers are now able to land their fish easily especially during low tide.</p>	<p>Fair and equitable access to the landing facilities is essential to avoid conflict and resentment amongst the fishers and other users.</p>	<ul style="list-style-type: none"> • Management organization • Implementing body
<p>Fish cleaning, sorting, packing activities</p>	<p>- These activities will increase waste water and waste discharge from these activities.</p>	<p>L, D, Lc, A, R</p>	<p>Impact will be significant as the waste could lead to pollution of the ground water and surrounding environment if not properly handled and treated.</p>	<p>Project design will provide adequate water supply and incorporate waste handling/ disposal facilities, and septic tank. Proper maintenance and discharge of waste water must be done to keep the facilities running in good order and avoid polluting the environment.</p>	<ul style="list-style-type: none"> • Implementing body • Management organization
<p>On-land preparation for fishing activities</p>	<p>- Contamination of the environment from fuel supply activities</p>	<p>L, D, Lc, A, R</p>	<p>Impact will be significant if the fuel supply yard is not designed to handle fuel spillage.</p>	<p>Project design will incorporate fuel trap and separators to minimise spillage discharge. Proper fuel handling/ supply procedure to be followed to minimise risk of spillage.</p>	<ul style="list-style-type: none"> • Implementing body • Management organization
<p>Fish marketing activities - buying / selling - distribution / traffic</p>	<p>- These activities will mean an increased people and vehicle movement, impacting on noise and exhaust emission.</p>	<p>L, D, Lc, A, R</p>	<p>Impact will be significant within the complex due to the concentration of people and traffic to conduct these activities. Impact of exhaust emission is not expected to be significant due to the open nature of the complex design and no inhabitants living within the complex.</p>	<p>Project design will cater to the volume of people and traffic. Adequate truck access & parking will be provided to handle the vehicle traffic.</p>	<ul style="list-style-type: none"> • Implementing body • Management organization

Ice plant / cold storage - Water usage & waste water discharge - Ice Supply (only for Maumere, Paga and Ende)	- These operation impact on the water supply and generate waste water.	L, D, Lc, A, R	Impact will not be significant as the existing well water supply at the site is available and sufficient. Waste water discharge may pollute the environment.	The project will incorporate its own water supply system so will not affect community's water supply. Waste water generated will be adequately handled by the project's waste handling/ disposal facilities.	<ul style="list-style-type: none"> • Implementing body • Management organization
- Cool box and storage	- The ice and storage will impact on increased fish quality and maintaining freshness.	L, D, St, B, R	Impact will be significant as existing ice supply cannot meet local demand and storage facilities are not adequate.	Equity of access to be ensured by user group and autonomous body.	
Demonstration fish processing facilities & activities (only for Wurling and Ende)	- These facilities and activities will generate waste water and solid waste discharge.	L, D, Lc, A	Impact will not be significant as the scale of the operation is small and serve as model processing facilities used for teaching and extension function.	Waste water and solid waste discharge will be adequately handled by the project's waste handling/ disposal facilities.	<ul style="list-style-type: none"> • Implementing body • Management organization
Fishery Activities Support Sector Plan					
Workshop/ Repair / maintenance activities (only for Wurling, Paga, and Ende)	- Waste from net, boat, gear repairs. - Contamination of environment from waste oil / fuel discharge from repair activities.	L, D, Lc, A, R	Impact will be significant if the waste disposal is not managed and appropriate facilities to handle the waste discharge.	Waste disposal facilities and its management & control will be implemented in the project.	<ul style="list-style-type: none"> • Implementing body • Management organization
Water supply/ consumption	- Water supply developed for the project will provide water supply for the project activities.	L, D, Lc, B	Impact will be moderate as the new water supply to the complex will ease water supply for fishing activities.	The charges for the use of water by fishermen and the community of the project's water supply facilities must be fixed at a reasonable low cost and equity of access to be assured.	<ul style="list-style-type: none"> • Implementing body • Management organization
Fuel supply activities (only for Maumere, Paga, and Ende)	- Impact from accidental fuel spillage leading to contamination of soil and ground water. - Possible fire hazard.	S, D, Lc, A, R	Impact will be significant as existing site does not have fuel supply activities and is not contaminated. Impact will be significant as damage from fire will be drastic and may affect the whole operation of the complex.	Project will provide adequate fuel handling/ disposal facilities to cope with any accidental spillage. Fuel depot will be located away from complex to minimise fire hazard. Project to incorporate fire safety & fighting equipment.	<ul style="list-style-type: none"> • Implementing body • Management organization

Small scale multi purpose building (only for Wurling)	- Will impact on the ease and efficiency of landing of fish, fishing and subsequent marketing activities.	L, D, Lc, B, R	Impact will be significant as the facilities will concentrate necessary services in one convenient location for ease of operation.	Fair and equitable access to the multi purpose facilities is essential to avoid conflict and resentment amongst the fishers.	<ul style="list-style-type: none"> • Management organization • Implementing body
• Community Environment Improvement Sector Plan					
Community infrastructure improvement					
- Model water supply/ toilet (only for Paga)	- This model facility will serve to show the community the concept of communal bath/ toilet facilities and how the facilities should be managed and operated to maintain its sanitary condition for the benefit for all users.	L, D, Lc, B	The impact of this model facility will be slight in the short term but if the community decides to adopt the concept and develop/ built more of these facilities, the impact will become significant as sanitation will be much improved as these facilities become easily available in the <i>community</i> .	Socializing of this concept is required to build up awareness in the community on the proper usage, maintenance and benefits of this model facility.	<ul style="list-style-type: none"> • Management organization • Community leaders
- Garbage collection system (only for Wurling)	- The overall sanitation of the living environment of the community will improve with this rubbish collection system.	L, D, Lc, B	Impact will be moderate but will be significant when the reclaimed "island" at the end of the village is complete with subsequent restriction of the flushing action of the tides.	A rubbish collection system will become critical with the construction of the reclaimed "island" as the flushing of the rubbish/ debris to the sea will be restricted subsequently leading to accumulation of rubbish in certain isolated areas.	<ul style="list-style-type: none"> • Community leaders
- Upgrading motivation for social environment improvement	- These educational provisions will impact on the general level of <i>awareness of the community</i> regarding ways to improve their social environment and self reliance.	L, D, Lc, B, R	Impact will be significant as the existing education opportunities/ awareness levels in the community <i>are minimal</i> .	The community should be encouraged to avail themselves of this opportunity to raise their awareness and their self reliance to improve their social environment.	<ul style="list-style-type: none"> • Community leaders • Community
• Fishermen Organization & Fisheries Extension Sector Plan					
- Formation of new management organization	- The new management organization will encourage/ mobilize the existing fishermen groups and cooperative (KUD Mina) to participate in a cohesive organization for the benefit of the fishing community.	L, D, Lc, B	Impact will be moderate in the short term but in the long term with better management and greater participation, the impact will become significant as the individual groups, cooperatives and the new management organization undertake more collective activities for its members.	An awareness campaign on the merits & necessity of the new organization should be done in the community to seek their agreement in the formation of and participation in this new organization.	<ul style="list-style-type: none"> • Implementing body • Management organization • Fishermen groups • KUD Mina

- Extension programs	- The impact of these extension programs will be to revitalize the existing groups and cooperative by addressing their weakness and promotion of their self reliance attitude.	L, D, Lc, B	Impact will be moderate in the short to medium term but in the long term the impact will become significant as the groups/ cooperative become more active, more self-reliant, operate with more transparency and accountability.	The extension programs should be developed and modified over time to address the needs of the groups/ cooperative and to consider the changing nature of their activities and financial situation.	<ul style="list-style-type: none"> • Implementing body • Management organization • Fishermen groups • KUD Mira
• Education and Training Sector Plan					
Training of fishermen & processors - fishing techniques, safety, resource management - processing techniques - quality & sanitation	- Knowledge empowerment will impact on behavioural changes that may lead to improved quality of life fisheries practices.	L, I, St, B, R	Impact will be indirect and significant for the improvement of the fisheries activities and life of the beneficiaries and community	Equity of access to these training opportunities to be assured by the implementing body and management organization.	<ul style="list-style-type: none"> • Implementing body • Management organization
Training for institutional & management strengthening	- Training will improve the knowledge and facilitate sustainable fisheries management of the fisheries center's operation.	L, D, St, B, R	Impact will be significant as training of the upper level beneficiaries will be necessary for the continued operation of the center.	Equity of access to these training opportunities to be assured by the implementing body and management organization.	<ul style="list-style-type: none"> • Implementing body • Management organization

3 Project Costs

3.1 Condition for Cost Estimation

(1) Basic Conditions of Design Selection Process

The same as explained in Bima Priority Zone.

(2) Calculations of the Basic Conditions

The same as explained in Bima Priority Zone.

3.2 Breakdown of Project Costs

A breakdown of the project costs for the Central Flores zone is shown in the table below.

Unit: Rp million

Site	Sector		Estimated Project Costs	Foreign Cost	Domestic cost
Kalimati	Coastal resources management	Facility	-	-	-
		Equipment	1,615	1,615	-
		Activity costs*	571	-	571
	Landing, handling, shipping, processing fisheries support activities	Facility	12,100	11,642	458
		Equipment	2,203	2,203	-
		Activity costs*	737	-	737
Wuring	Landing, handling, shipping, processing fisheries support activities	Facility	5,165	4,415	750
		Equipment	-	-	-
		Activity costs*	47	-	47
	Improvements to fishing village environment	Facility	14	-	14
		Equipment	-	-	-
		Activity costs*	4	-	4
Paga	Coastal resources management	Facility	-	-	-
		Equipment	537	537	-
		Activity costs*	26	-	26
	Landing, handling, shipping, processing fisheries support activities	Facility	417	234	183
		Equipment	1,180	1,180	-
		Activity costs*	271	-	271
	Improvements to fishing village environment	Facility	8	-	8
		Equipment	-	-	-
		Activity costs*	4	-	4
Ende	Coastal resources management	Facility	-	-	-
		Equipment	2,223	2,223	-
		Activity costs*	502	-	502
	Landing, handling, shipping, processing fisheries support activities	Facility	11,257	10,827	430
		Equipment	1,878	1,878	-
		Activity costs*	949	-	949
Total			41,708	36,754	4,954

Note: Asterisk denotes for the first 2-year period. The evaluation period is set at 15 years as explained in section 4.1.2 (3)