1. INTRODUCTION

1. Background of the Study

The Sixth Five-Year Development Plan (1994-1998) was implemented to address the issue of the growing regional disparity between the Java Island and the outlying regions. The eastern region of the country was targeted as a focal development area, and the government has pursued measures to eradicate regional poverty disparities that exist.

The potential fishery resource volume in West and East Nusa Tenggara provinces is especially high, and in the midst of a stagnant growth in agricultural production, the fisheries industry has continued to maintain a 2 percent growth in production volume. To improve the livelihood of the poverty level population, the government has focused particularly on measures to promote fisheries in this region.

In this study, a development study to promote coastal fishing communities aimed at establishing a stable supply of fishery products and improving the income of small-scale fishermen in West and East Nusa Tenggara provinces and a feasibility study centered on improvements of the fisheries infrastructure have been conducted.

2. Outline of the Study

(1) Objective of the Study

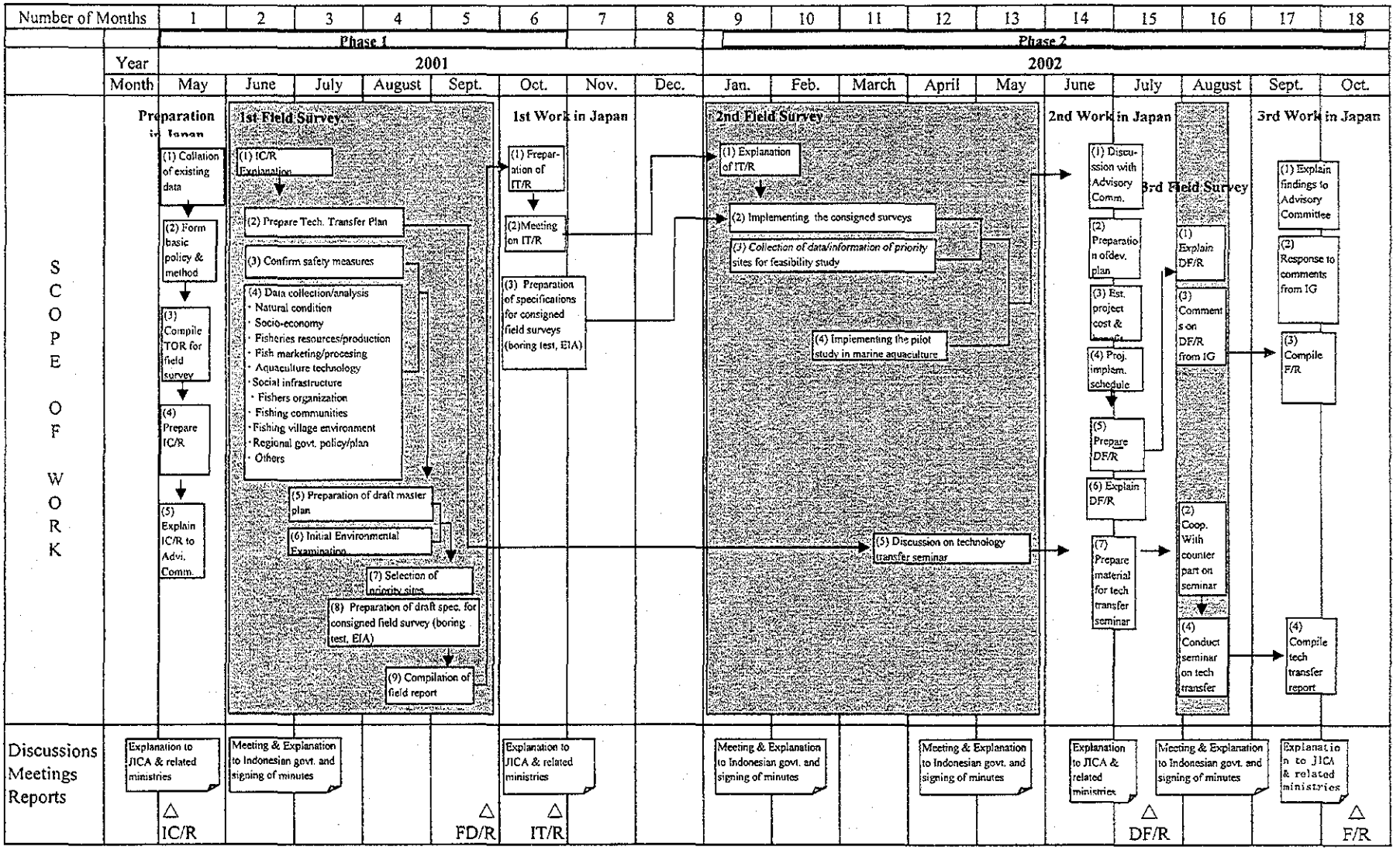
A Master Plan (MP) was formulated aimed at establishing a stable supply of fishery products and improving the income of small-scale fishermen in West and East Nusa Tenggara provinces located south of Sulawesi Island. In addition, feasibility studies were implemented for four priority zones in the Sumbawa and Flores island region aimed at improving the fisheries infrastructure. In addition, technology transfer activities for the government officers of the Fisheries Office in the study area were provided in conjunction with the implementation of the project's activities and programmes.

(2) Study Area

The study area selected for the MP is West and East Nusa Tenggara provinces located south of Sulawesi Island (excluding Timor Island). Four priority zones in Sumbawa and Flores islands located in the West and East Nusa Tenggara provinces were selected for the feasibility studies based on the MP.

(3) Study Approach

The study was divided into two phases. During phase 1, the MP for West and East Nusa Tenggara provinces was formulated, and two priority zones from both Sumbawa and Flores islands were selected. During phase 2, a detailed study including a financial analysis was implemented for the four priority zones that were selected during phase 1, and the feasibility of the project in each zone was defined.



Overall Work Flow Chart of the Study

II. PRESENT CONDITIONS

1 National Plan

1.1 Macro Economy of Indonesia

Indonesia showed the high economic growth until 1996, with an average economic growth rate per annum at 6.7 percent between 1975 and 1995, but it decreased to 4.7 percent in 1997 because of the monetary and financial crises. In 1998, the figure dropped drastically to a record – 13.2 percent.

Following the government of President Habibi, which promised to restructure the financial system and to exclude corruptions that were rampant in Indonesian society, the government of Wahid also announced its intent to continue the structural reforms under the guidance of the IMF. This contributed to an economic growth of 0.2 percent in 1999, due to the recovery of production in the industrial and agricultural sectors.

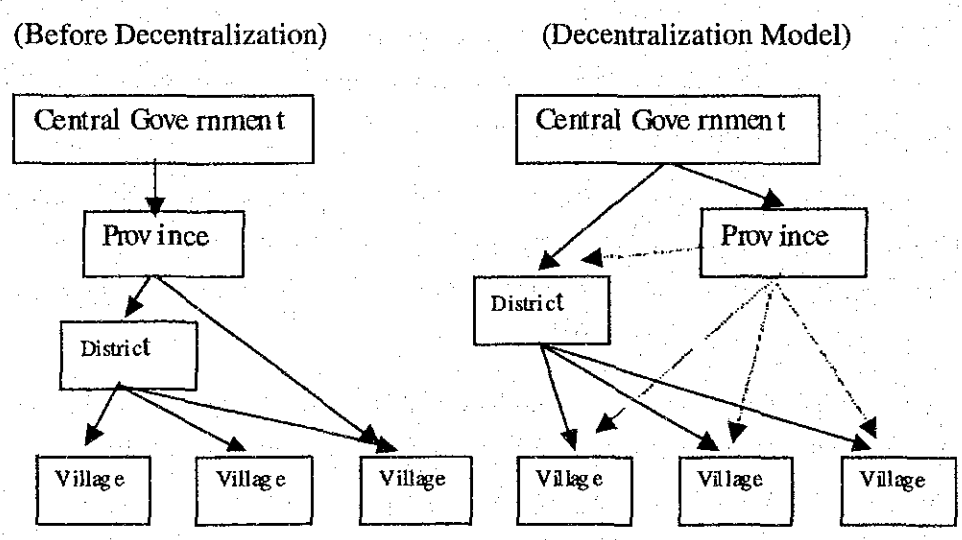
However, the fragile in banking sector continues to remain stagnant and corruption continues to prevail. Although the economic growth rate in 2000 indicated that Indonesia's economy was recovering, there are many major problems such as increased international debts and the uncertain return of foreign investors.

The growth rate of the gross national product (GNP) in the second quarter of 2001 was 3.5 percent, the same ratio as the previous year of the same period, which was also targeted in the 2001 budget compilation. However, the inflation rate from September of 2000 to September of 2001 was 13.0 percent, which exceeded the target of, 9.3 percent in the 2001 budget. The industrial production index showed a 7.5 percent increase in the first quarter of 2001 equally identical to the same period of the previous year. The unemployment rate was calculated as 6.5 percent, based on the number of unemployed to the economically active population in 2000. Export has increased by 28 percent in 2000 after a two-year downturn, and the trade balance was reported as US$ 24.8 billion per annum in August of 2001 ("The Economist" 6-12, October, 2001)

1.2 Decentralization Policy

Before the basic laws for autonomy were legislated in 1999, revenue flow was controlled by the central government to provincial governments. And most of the revenue collected from the local governments was re-distributed to Java Island, which was one of the complaints of local governments. Following the resignation of former President Suharto, the movement toward autonomy and decentralization became concrete. It was pointed out that the reduction in the development budget of local governments caused by the economic crises and the desire to restructure the national budget by having local governments take over expenditures in education, social welfare and etc. contributed to this movement.

Law No. 25/1999 that regulates the financial balance between the central government and local governments, following the legislation of regional autonomy law No. 22/1999, tried to transfer the central subsidies to balanced funds by categorizing the financial resources of local governments into local revenues, balanced funds, loans and grants. The balanced funds are differentiated according to resources that are generated from land, building, and natural resource taxes, general funds, and special funds. The revenues from the land, building, and natural resource tax expanded the gap between rich and poor provinces. In order to alleviate the difference in earnings, general funds were introduced. Of these general funds, 90 percent was allocated to districts directly and only 10 percent was allocated to the provinces.



The allocation of the development budget from the provinces to the districts is decided according to the type of project. The autonomy laws allow the local governments to regulate and decide the use of new revenues, which are called retributions. When facilities such as PPI are constructed using district funds, the retributions become the revenues of the districts. Therefore, some districts formulated and financed new projects under the decentralization process. If a PPI (Pusat Pendaratan Ikan = Fish Landing Place) is constructed using the district's financial resources, the user fees will go into the district's coffers. Therefore, some districts formulate new projects independently. But in actuality, there have not been many changes in revenue resources either before or after decentralization, which remain dependent on the central budget, with the exception of the shift from subsidies to balanced funds as shown in the following table.

Changes of Financial Resources Before/After the Decentralization

Unit: %

	NTB		Sumbawa District		Sikka District	
	1997/1998 actual	2001 budget	1997/1998 actual	2001 budget	1997/1998 actual	2001 budget
Previous years surplus	8.16	4.25	2.55	4.60	5.74	4.60
Local Revenue	22.62	20.21	8.04	3.10	1.41	1.96
Share of tax/non-tax & Grant from Balance fund	5.14	75.54	7.46	91.77	1.96	96.99
Contribution & Subsidies	64.08	0.0	81.95	0.00	90.89	0.0
Other Revenue	0.0	0.0	0.0	0.53*	0.0	0.0

Note: Asterisk mark denotes revenue from province.
Source: Financial Department of each local government

1.3 Economic Development Policies

In order to reform the national administration system from a highly centralized model aimed at structural efficiency to a regional autonomy model licensing greater authority to various sectors, excluding foreign policy, defence, finance and court affairs, a new decentralization policy was commenced under Law No. 22/1999 by the former administration in January 2001. However, the transition from the old system to the new was too rapid. Thus, instead of providing political and economic benefits to the people, regional autonomy has caused various problems. Moreover, local elites, both in the provinces and the districts, do not fully understand the autonomy concept and its ultimate objectives. The new Megawati administration started reviewing and revising this law to maintain a unified state.

The current national development plan is a 5-year plan known as PROPENAS (Program Pembangunan Nasional - 2000-2004) that has the following five (5) national development priorities common to all sectors:

National Priority I: To establish a democratic political system and to maintain national unity

National Priority II: To reign by the law and to establish good governance.

National Priority III: To promote economic recovery and to strengthen fair and sustainable development based on a national economic system.

National Priority IV: To improve the people's welfare and the quality of religious life and to create an active culture.

National Priority V: To promote regional development

Among these priorities, Priority III and V are closely related to the goals of this master plan.

(1) Outline of National Priority III

National Priority III will be executed through the development of the economic and natural resources, and environmental sectors. To achieve this priority, the social and national economic strength (especially small and medium enterprises and cooperatives) are to be

strengthened by developing a national economic system based on a fair market oriented mechanism supported by natural and human resources with abundant productivity and independence. The targets of the economic sector during the five-year development plan are as follows.

- To escalate the economic growth rate to 6 ~ 7 percent by 2004
- To suppress the inflation rate within 3 ~ 4 percent
- To reduce the unemployment rate to 5.1 percent
- To reduce the poverty line ratio to 14 percent

To achieve these targets, various measures in the economic sector will be executed based on urgent economic recovery programmes and sustainable economic development programmes. These programmes have been divided into seven (7) groups with short and mid-term priorities as shown in the following table.

Programmes	Priorities
1. Poverty alleviation and provision of basic social needs	Short: Reduce impact of economic crises on low income class, expand employment opportunities, protect labour rights Mid: Improve labour's quality and productivity, and improve social insurance system, develop agriculture, foods and irrigation
2. Development of small / medium enterprises and cooperatives and social participation in national development	Short: Achieve early repayment of current debt, form favourable economic environment, develop capital procurement route Mid: Improve productive resources access, develop self-reliant management potential
3. Stabilization of economy and finance	Short: Adjust micro/macro economy, effective use of expenditure, reorganization of banks and private sector debt, phased economic decentralization (keep macro economic and financial balance between central and regional Mid: National income increase, better efficiency of public debt management, strengthening of bank control/monitoring, thorough monitoring of private sector debt
4. Export promotion of non - petroleum / gas products including tourism	Short: Activation of Industrial capacity by abolition of commercial barrier, budget increase of commercial field, promotion of export products and tourism Mid : development of competitive industry, market strengthening
5. Investment promotion based on capital participation	Short: Better efficiency of investment permit works, development/strengthening of capital market, promotion of private sector participation Mid : Reorganization of national corporation
6. Provision of facilities and infrastructure	Short: Maintain public service level through management/repair of public facilities and infrastructure Mid : Expansion of private sector business chance through continuing reorganization and reform of public facilities and infrastructure
7. Natural resources utilization under consideration of environmental maintenance / protection	Short: Better efficiency and productivity of resources utilization, thorough monitoring/security of utilization conditions, provision of laws, resources protection Mid : Reservation of resources structure, development of means of resources information and acquisition, promotion of social participation to resources utilization/monitoring

PROPENAS has set up 28 directives on economic development policies. Among them, the directives that are to be taken into consideration when formulating regional master plans are summarized in the table below. The sections in bold type are key words used in the master plan for the coastal community development.

Field	Directions
Economic system	1. **Develop the people oriented /grass root economic system**, based on the market mechanism
	2. **Create healthy and fair competitive environment** minimizing monopolistic market structure
	6. **Ensure availability of basic needs, especially housing and food for the people, and availability of adequate public facilities at affordable tariffs**, and assure the elimination of excessive red-tape in licensing ....
	11. **Empower small, and medium size business and cooperatives**
	13. **Promote partnerships and other forms of mutually beneficial business alliance among cooperatives**, private companies and state owed enterprises
	18. Develop a comprehensive and integrated mechanism for advancing manpower, with the aim of **improving the competence and self reliance of workers**
Government role	3. **More effective role of the government through improved regulation, better public service , subsidies and incentives**
	15. **Improve provision and maintenance of public facilities** in order to support balanced economic development, serve community needs at affordable price and open up isolated areas
Poverty alleviation	21. **Increase efforts to accelerate poverty alleviation and reduce unemployment created by the economic crisis**

(2) Outline of National Priority V

The following four items are the objectives in regional development.

Objective I: To boost social initiative and participation by increasing the effectiveness of the regional autonomy through upgraded regional capabilities, improving its administration and extending the impact and efficiency of public services.

Objective II: To re-establish the national economy, support measures to strengthen a sustainable development base and realize an early balanced economic growth between regions by developing regional potential through economic, rural and urban development, frontier area development and land preparation.

Objective III: To promote the capacity building of inhabitants through strengthened regional community organizations, poverty alleviation, social protection, improving the self-reliance of society, and to support the people's right to participate in social, economic and political activities.

Objective IV: To make concerted efforts to reach an early solution to the problems in Aceh, Irian Jaya and Maluku provinces based on the principle of national unity and the people's will, potential, and culture in the regions.

The following two issues in regional development that are commonly shared by all sectors are given below. The sections in bold type are key words used in the master plan for the coastal community development.

(a) Careful measures are required to maintain social, economic and legal national unity within the framework of a rich and diversified culture of the Republic of Indonesia. The following measures will be taken.

- Improve the capacity of the regional government by preparing and establishing laws that will serve as a guideline for decentralization and establishing the professionalism of the regional staff.
- **Strengthen the financial capacity of regional governments by improving the institutional and managerial capabilities of regional governments**, and achieve a financial balance between the central and regional areas,
- **Develop sources of regional income taking into consideration the capacity of the societies and inhabitants, the potential and protection of natural resources and the natural environment,** by allocating stronger authority to regional governments

(b) Development between regions related to the following issues:

- **Execute regional development in order to activate regional potential and capacities** through various policies to encourage the development of the regional economy, and the development of residential, rural, and urban areas, fast growing areas and developing frontier areas.
- **Strengthen the capability of societies and inhabitants** to improve their living standards and environment.

1.4 Proposed National Budget in 2002

In the Proposed Budget for 2002, which was unveiled in the first week of September of 2001, the revenues and expenditures proposed under some major assumptions are summarized in the following table (This proposal needs the approval of National Assembly by the end of 2001).

Proposed National Budget for 2002

Unit: Rp. Trillion

Description	2002 Budget proposed		2001 Budget approved	
		% against GDP		% against GDP
Revenue	289.4	17.1	286.0	19.5
- Tax Revenue	216.8	12.8	185.3	12.6
- Non-tax Revenue	72.6	4.3	100.7	6.9
Expenditure	332.4	19.6	340.3	23.2
- Routine Expenditure	195.0	11.5	213.4	14.5
- Development Expenditure	47.1	2.8	45.4	3.1
- Balanced Fund	90.3	5.3	81.5	5.5
Surplus/Deficit	43.0	2.5	54.3	3.7
Financing	43.0	2.5	54.3	3.7
- Domestic Funding	25.4	1.5	34.4	2.3
- Foreign Financing (net)	17.6	1.0	19.9	1.4
Major assumptions				
Growth rate of GDP	5%		3.5%	
Inflation rate	8%		9.3%	
Exchange rate	Rp.8,500/ US$		Rp.9,600/ US$	
SBI interest rate	14%		15%	
International price of oil	US$ 22 per barrel		US$ 24 per barrel	
Oil production	1.2 million barrels		1.46 million barrels	

Sources: The Jakarta Post, 8th, September, 2001
Bali Post, September 8, 2001
Tempo, September 11-17, 2001

It is assumed that a balance to reduce deficits and to encourage economic recovery will be maintained. The characteristics are as follows.

- The deficit is set at 2.5 percent of the Gross Domestic Product (GDP), although the percentage of revenue against the GDP is set at less than the 2001 Budget.
- The routine expenditure was decreased by three points, although the development expenditure and the balanced funds, which are allocated to local governments, have increased nominally.
- To reduce the expenditure, subsidies such as fuel and electricity have been reduced, and this may affect the lives and businesses of fishermen.

There was some controversy about the GDP growth rate just after the announcement of the proposed budget, and it was reported that the rate was revised at 5 percent based on the world economic recession caused by the terrorists' attacks in the USA. (Nihon Keizai Shimbun, October 10).

The following five national priorities were quoted from the 2000-2004 National Development Program in President Megawati's speech on the proposed 2002 national budget at the plenary session of the House of Representatives.

- Develop the welfare of the people.
- Develop a political system.
- Speed up economic recovery.
- Improve regional development.
- Uphold the law.

These five priorities, which were basically succeeded from the former government, were changed slightly. (For example, the first priority was listed as the fourth priority and the forth priority was listed as second priority in the 2000-2004 National Development Program.) The unemployment problem caused by the economic crisis was considered to be a main issue as well as issues in basic social services such as education, health and social welfare.

In the area of regional development, the following points were included in the speech.

- There is a need to wisely and carefully observe the division of balanced funds and possible regional financial loans.
- There is a need to use balanced funds to meet the local government's duties and responsibilities to society.
- There is a need to have an iron will to eradicate barriers to trade and investment.
- There is a need to reinforce the principles of administering natural resources, and existing and future infrastructure.

1.5 Outline of Fishery Sector and Its Development Prospect

1.5.1 Fishery Product Trends of Indonesia and Fishery Development Potential

The latent volume of fisheries resources within the EEZ (Exclusive Economic Zone) of Indonesia is estimated at slightly more than 6 million tons as shown in the table below.

Year	Evaluation Institutions	Latent Volume of Fishery Resources (Million ton)
1983	DGF, RIMF	6.6
1990	Naamin and Hardjamulia	7.7
1991	DGF	5.7
1995	CRIFI, FAO, DANIDA	3.67
1996	CRIFI Joint with DGF, LIPI, IPB	6.35
1997	NCMFRA	6.26

Source: Aziz, et al., (1998) Potential yield, exploitation rate and development opportunity of marine fish resources in Indonesian water.

Fishery production has continued to increase for the last 30 years, but the inland fisheries and aquaculture production volume has peaked at 660,000 tons since 1996, and excluding the production volume for seaweed, the production volume for marine fisheries has peaked at 367,000 tons since 1998 (see table in the following page).

Unit: Tons

	Total production	Subtotal for Marine Fisheries	Marine Fisheries		Subtotal for Inland Fisheries	Inland Waters		Brackish Pond Culture
			Fish Catch	Seaweed		Fish Catch	Cultured Fish	
1990	3,162	2,370	2,251	119	505	292	213	287
1991	3,349	2,538	2,440	98	488	294	194	323
1992	3,543	2,692	2,590	102	514	301	213	337
1993	3,795	2,886	2,768	118	554	309	245	355
1994	4,013	3,080	2,970	110	587	336	251	346
1995	4,262	3,292	3,181	111	609	330	280	361
1996	4,452	3,383	3,222	161	**665**	**336**	329	**404**
1997	4,579	3,613	3,487	126	596	304	292	370
1998	4,642	3,723	**3,676**	47	565	289	276	354
1999	4,419	3,432	3,301	131	598	309	289	389

Note: The highlighted figures indicate peak fishing season.

These figures may be reflective of the impact sustained from the economic crisis of 1997. However, according to the CRIFI (Central Research Institute of Fisheries) evaluation findings in 1998 on the latent volume of resources, development in the surrounding water areas of Java Island, specifically the Malacca Straits, the South China Sea, and the Java Sea that border land areas with a highly dense population, is saturated. Therefore, future development should focus on the ocean areas in the eastern region of Indonesia (including the study area) and the Indian Ocean for future growth in fish catch volume.

1.5.2 Fisheries Administration

The fisheries sector was formerly under the Directorate General of Fisheries in the Ministry of Agriculture. In1999 the Directorate General of Fisheries was promoted as a new Ministry of Exploration and Fisheries under President Wahid's administration. In 2000, this new ministry was changed to Ministry of Marine Affairs and Fisheries (MOMAF) with five Directorate Generals, namely for Capture Fisheries, Aquaculture, Coastal and Small Islands, Capacity Building and Marketing and Surveillance of Marine and Fisheries Resources, and one Research Center Board as Marine and Fisheries Research Center. The organizational chart of the new ministry is shown in Figure 1.5.1.

1.5.3 Fishery Laws

Fishery law No. 9/1985 is an all-encompassing law that covers all aspects of the fisheries sector. Under this law, the provincial Fisheries Office has been delegated the responsibility to enforce general rules, as well as manage fishing licenses, data collection, develop and operate fisheries infrastructure, control fish export and import activities, manage research and training activities, protect the marine and coastal environment, ban destructive fishing practices, and establish the framework for official bylaws that are significant to the fishery law.

Due to the diversification of fishery activities stemming from rapid development of the

fisheries sector in recent years, the administrative responsibilities that oversee established regulations have become blurred, and clear definitions have become needed in some areas. For example, various ordinances from the Prime Minister's Office, the ministry and departments regarding diversified fishing licenses, foreign fishing boats, evaluations on latent resources, the introduction of Total Allowable Catch (TAC), establishing fishing zones, Fish Aggregating Devices (FAD) installations, and others have been issued. However, detailed regulations are needed for small-scale fisheries at the district level under the decentralization policy. For example, although there are regulations governing the installation of FADs in deep waters, there are none for FADs that are installed in shallow waters. As a result, some individuals have set up their own FADs in shallow waters and have begun to collect fishing fees from the fishermen.

On the issue of fishing grounds, there is a need to coordinate the existing conditions with regional decentralization laws, No. 22/1999 and No. 25/1999. Although in principle, free access to fisheries resources is promoted under fishing law, the 4-mile zone from the coastline is controlled by district government, the 4 to 12 mile zone is controlled by the provincial government, and the 12-mile offshore zone is under the control of the central government.

Under regional decentralization, some districts have begun collecting fishing fees from fishing boats from other districts in order to secure their own financial resources. Presently, the intent of respective districts remains uncoordinated.

1.5.4 National Fishery Development Policies

(1) National Fishery Development Policies

During the economic crisis in the former administration period, the DGF launched a crash program called "Boosting the Export of Fisheries Commodities 2003" (PROTEKAN), medium term fisheries program. However, its revision work started early this year and it is still continued.

To achieve this target, PROTEKAN (Program Peningkatan Ekspor Hasil Perikanan) formulated a strategy and operational policies composed of strategy and development programs in the following seven areas. The sections in bold type are key words used in the master plan for the coastal community development.

Strategy:

Develop fishery businesses in the fishery capture and aquaculture sectors as well as increase the capabilities and skills of fishermen provide appropriate infrastructure support and increase the quality and post harvest efforts.

This strategy will be achieved by creating a favourable atmosphere in developing fishery business as well as **increasing the capabilities and skills of fishermen, increasing access to credit,** and developing a hatchery.

Operational Policies:

1) Fish Catch
   Increasing the fish protein supply within the country as well as increase national income through increased fishery export (around US$3.05 billion by the year 2003).
2) Aquaculture
   Developing the aquaculture business to increase national income.
3) Post harvest and marketing fishery products
   Improving the quality of fishery products and developing new fishery products.
4) Human Resources Development
   Developing the capabilities and skills of fishermen, the fish farmers and fish processors. This will be accomplished by through training and educational courses.
5) Development of Institutions
   This includes development of fishermen organizations, rural economic and government institutions.
   - **Developing and strengthening fishery cooperatives** to manage the facilities at the fish landing sites and fishing ports, and provide fishing material, processing and marketing.
   - **Establishing community based coastal management and improving existing traditional coastal management.**
6) Support of Other Institutions
   To increase cross-collaboration between sectors for information on investment, marketing and technology, training facilities, training and extension services, other relevant support services in developing fishery businesses and production.
7) Deregulation and Regulation
   Easing current restrictions and establishing a permit system to create a good business climate and to attract people to invest in the fishery sector.

The revision work of PROTEKAN started early this year and is still continued. The strategy and operational policies in general have not been changes basically except portions of capture fishery and aquaculture mainly relating to production target as indicated in the following (2) and (3)

(2) Capture Fishery Production

The operational policy of capture fisheries was revised in 2002, and the main policy is to protect the exploration of fish resources and increase the value-added of fish products. The specific goals are to develop small-scale capture fishing businesses, increase the export of fish products, improve fish consumption, and improve the surveillance system for the exploration of fishery resources. Furthermore, there are several activity plans for 2002, which are:

- OPTIKAPI (catching fish),
- OPTILANPI (managing fish auction/landing),
- OPTIHANKAN (developing businesses in fish processing), and
- OPTISARKAN (improving fish marketing), providing credit to small-scale fishermen and fish processors, strengthening fishermen institutions, etc.

The development targets for 2002 are 4.38 million tons for fish production, US$1.01 billion for fish exports, 3.91 million tons for domestic fish consumption volume, to create employment opportunities for about 40,000 people, and a non-tax state income of Rp 295.83 billion.

Unit: Tons

Type	2001	2002	2003	2004	2005	Increase rate
Crustaceans	32.8	32.4	35.2	43.3	61.3	18.0%
Tunas	85.9	82.0	90.7	109.4	163.7	19.1%
Other fishes	183.4	176.9	196.8	238.1	316.7	15.4%
Crabs	18.3	19.1	23.6	30.9	45.0	26.0%
Frogs	3.8	3.8	3.8	3.8	4.0	1.8%
Tropical fish	0.7	0.7	0.7	0.7	0.7	-
Snails	3.3	3.7	4.6	6.2	9.4	30.0%
Others	34.2	35.9	41.3	53.7	80.5	25.0%
Total	362.4	354.5	396.7	486.1	681.3	16.9%

(3) Aquaculture Production Plan

The Directorate General of Aquaculture (DGA) has formulated its aquaculture development plan for the target year of 2005. Under this plan, the targeted seaweed production volume for 2005 is 314,291 tons (development area of 5,238ha), 70,050 tons for fish culture (development area of 1,751ha), and 1,071,097 tons for brackish water pond culture (development area of 669,436ha) (see Tables 1.5.1 and 1.5.2).

Of the culture production volume, prawns, seaweed, and the fish species (grouper, tiger grouper, tilapia, snapping turtles) are exported and the targeted production has been established as shown in Table 1.5.3. The targeted export volume for tiger grouper is about 10,000 tons and 2,000 tons for grouper species.

In addition, the DGA has estimated that mariculture will employ about 87,000 people and about 2.3 million people in brackish water pond culture by 2005 (see Table 1.5.4). The potential development area for mariculture and brackish pond culture in both NTB and NTT provinces has been estimated at 152,800ha and 131,000ha, respectively (see Table 1.5.5). However, as will be explained later, the development of potential water areas for mariculture must be restudied (see section 2.5.5 Development Potential).

(4) National Fishery Budget

The national fishery budget is summarized as shown in the following table provided by the Directorate General of Fisheries.

Unit: Rp. Million

	1998/1999	1999/2000	2000*	2001
	Actual	Actual	Actual	Allocation
Routine	17,942	22,936	21,403	33,649
Development	123,142	233,710	341,265	348,192
Foreign Aid	49,910	193,620	307,696	123,192
Total	141,084	256,646	362,668	381,841

Note: Asterisk mark denotes for nine months April to December.
Source: Pre-study Report, February 2002, JICA.

The fisheries budget was only 0.1 percent of the national budget of Rp. 340.3 trillion in 2001. Its share of non-tax revenue was 0.3 percent or Rp. 295.3 trillion. The national fisheries budget is dominated by the development budget. A future financial issue is how to obtain a development budget when expanding non-tax revenues.

2 Fishery Activities and Fishery Villages in NTB and NTT

2.1 Natural Conditions and Social Infrastructure

2.1.1 Natural Conditions

(1) Geography

The study area that covers the West Nusa Tenggara (NTB) and East Nusa Tenggara (NTT) provinces is just an archipelago located in the eastern part of Indonesia and stretches east and west over about 1,000km. NTB is mainly composed by Lombok Island with Capital Mataram and Sumbawa Island located in eastern part of Lombok Island. NTT mainly consists of Timor Island where Capital Kupang is located (outside study area), Flores Island, Sumba Island and Alor Island. Both provinces are archipelagos with more than 1,000islands, large and small, in the ambient sea area

Wallace Line passes through the Lombok Strait between Lombok Island of NTB and Bali Island. From a viewpoint of ecosystem of animals and plants as well as geographical property, the western part of archipelago from Bali Island belongs to Asian territory, while the eastern archipelago from Lombok (NTB, NTT) to Australian territory. Wallace Line stands for the boundary line between the said archipelagos.

In Sape Strait at the border between NTB and NTT, Komodo National park centred around the Komodo Island (approx. 2,200 km^2, in Manggarai District, NTT) is located and it has been designated as World Natural Heritage.

Since both NTB and NTT provinces are located on the boundary line between Australian Plate and Sumba Shelf, the archipelagic area from Lombok Island to Alor Island is the volcano belt with many active volcanoes, resulting in frequent occurrence of the earthquake.

(2) Meteorological conditions

The climate of NTB and NTT is rather dry in comparison to Java, Sumatra and other central and western parts of Indonesia, and this tendency becomes more distinguished to the eastern area. In particular, Flores Island is much influenced by Australian Continental climate and in the most parts except the mountainous areas of Ngada and Manggarai Districts; the dry intensity level is very high, compared with other areas.

There are two seasons; dry season (May to October) and rainy season (November to April). The precipitation in rainy season is about 20 days per month on an average, while in dry season it hardly rains with average monthly precipitation being less than 3 days. The amount of precipitation is roughly 1,000mm~3,000mm throughout a year. In Timor Island with Kupang city and Manggarai District of Flores Island with deep mountains, the annual precipitation amount is approximately 3,000mm, while in other areas, it ranges

1,000mm~2,000mm. The precipitation amount concentrates to rainy season (especially January to February) all over the areas, and the precipitation at that time seems so intensive. Moreover, the rivers in eastern Flores Island dry up in dry season and accordingly the flow rate becomes nearly zero. However, the river flow seems to become a swift current and discharges into the sea the precipitation in rainy season, because there are large boulders on the riverbed and the mountain sides are unable to retain a great deal of water. Atmospheric temperature is 20~25ºC in average and 30~32ºC at maximum, and humidity is 60~80 percent throughout a year (Table 2.1.1~2.1.7).

(3) Oceanographic conditions

The study area that covers Lombok and Sumbawa islands in NTB and Flores and Sumba islands in NTT and other many small islands, is surrounded by sea, and it is roughly divided into four sections; the north coast area facing Flores Sea, the south coast area facing Indian Ocean and Save Sea, the inner bay area and the inland sea area. Generally it is difficult to obtain the detailed wave data, because the wave observation has not been carried out, and the fishing ports and general harbours have been constructed at rather calm basins, resulting a fewer cases of wave analysis for design wave conditions. However, owing to the reconnaissance results and also comprehensive appraisal and judgement on topography and meteorological conditions, wave conditions are summarized below.

In the north coast area, the wind waves appear from east in dry season and west in rainy season, and in the coastal zone high waves appear during north-west monsoon in rainy season. With regard to recurrence probability waves in PPI Maumere (Nangafure) located in Sikka District of Flores Island, wave height is 1.6m (North direction) with a return period of 20 years as shown in Table. According to the topographic map, the fetch is short. So the wave period is estimated to be 5~10 sec at the longest.

Recurrence probability wave height in PPI Maumere (Sikka District)

Unit: cm

Direction	2 year	5year	10year	15year	20year
N	76.9	105.2	129.5	145.6	158.0
NNE	28.6	39.2	48.3	54.4	59.1
NE	21.8	30.1	37.2	42.0	45.7

Source: Review Design Bangunan Laut PPI Maumere, Draft Laporan master Plan Buku-3, Pemerintahan Daerah Tingkat I Prop. NTT Dinas Perikanan, 1996/1997

On the other hand, in the south coast area, swell waves and long period waves appear from Indian Ocean and Save Sea. In this sea area also the waves with 10~15 sec period usually appear. In Lakey region located at the southern end of Dompu District in Sumbawa Island, which is a world-famous as a surfing point, the long period waves of 20~30 sec appear according to the visual observation on wave breaking conditions on the reefs. According to the data as per Figure 2.1.1 published in 1988 by Map Bureau of U.S Army, the waves of SE~E direction from April to August and of South direction from September to March dominate. Only in September, the wave height exceeds 4.0m, and generally the wave height is less 4.0m throughout a year.

Wave features by area

Area	Wave features
North Coast	Waves by monsoon, Musim Barat; short-period waves
South Coast	Swell waves from Indian Ocean; wave height -less 4m through the year; long-period waves
Inner Bay/Inland Sea	Calm; wave height -generally less than 1m ; short-period waves

In the inner bay an inland sea areas, the basin is very calm due to no attack of waves from the open seas. The tide level difference in the Study Area is more than 2.0m in almost all areas and more than 3.0m partly in some areas as shown in Table.

Design tide level in existing PPI

Unit: m

	District	Place		H.W.L.	M.W.L.	L.W.L.	Tidal Height
NTB	Lombok Barat	Lembar		+3.16	+2.11	+1.06	2.10
		Tg.Papak		+2.00	+1.10	+0.20	2.20
	Lombok Timur	Badas		+1.91	+0.90	-0.11	2.02
		Tanjung Luar	*	+2.82	+1.25	0.00	2.82
	Sumbawa	Badas		+1.91	+0.90	-0.11	2.02
		Tl.Santong	*	+2.55	+1.27	0.00	2.55
	Bima	**Bima**	*	+1.80	+0.90	0.00	1.80
		Tl.Sape		+2.27	+1.20	+0.13	2.40
		Tl.Waworada		+3.29	+1.60	-0.09	3.38
	Kodya Mataram	Ampenan		+3.29	+2.35	+1.06	2.23
NTT	Sumba Timur	**Waingapu**	*	+3.96	+1.96	0.00	3.96
	Manggarai	Lab.Bajo		+1.00	0.00	-	2.00
	Ende	**Ende**	*	+3.40	-	0.00	3.40
	Sikka	**Maumere**	*	+2.72	-	0.00	2.72
	Flores Timur	Oka	*	+2.80	+1.40	0.00	2.80

Note: Places indicated in bold letters are existing PPIs.
Source: ATLAS Sumberdaya Wilayah Pesisir Dan Laut, NTB
For places with asterisk marks data from Drawings and Plan Documents of each PPI

(4) Topographic and geological conditions

The coastlines are generally natural coasts, and the fishing communities are mostly formed behind sandy beaches. At the calm areas of the inner bay and inland sea areas, the houses cluster as far as the coast lines and the residences and any community facilities are protected by the simple revetment constructed by piling up the coral stones. In the coast of the north coast area, littoral current from west to east during north-west m0nsoon predominates, causing serious impact of littoral drift.

In the inner bay area, most of the coasts are shallow and Teluk Santong of Sumbawa District and Bima, Sape of Bima District make up the tideland zone. Especially in Bima coast, the sea bottom is deposited by sludge type sediment. This probably caused by accretion of such sludge as discharged from the residential area to the sea, because of the densely populated towns located in the adjoining area.

Coastal features by area

Area	Coastal features
North Coast	Generally sandy beach; community in hinterland; offshore coral reef
South Coast	Mostly rock reef, gravel coast; offshore coral reef in bay area
Inner Bay/Inland Sea	Shallow beach and tideland zone; residences extend to coastal line

As the study area is located on the boundary line between Australian Plate and Sumba

Shelf, the whole areas are the volcano zone, and its impact becomes so remarkable towards the eastern area. In the whole north coast area of Ende and Ngada districts, an extensive arid zone extends with many volcanoes in Ende, Sikka, East Flores and Lembata Districts. The earthquakes have been occurred so frequently throughout Indonesia. Figure 2.1.2 shows that the earthquakes have been occurred so many times in the whole area except in Kalimantan Island and north-eastern part of Sumatra Island. Frequency of the earthquakes is very high in the study area. An earthquake of magnitude 6.8 occurred offshore of Maumere town of Flores Island on 12 December, 1992 as outlined in table below, and it attacked the eastern part of Flores Island together with Tsunami and inflicted serious damages on Sikka District and other areas as shown in Table 2.1.8 - 2.1.9. In particular, the damages on the facilities by Tsunami in the coastal area of Maumere town were very intensive to the extent that the coastline retreated by about 10m (Fig. 2.1.3). Because of the damages on the fishing communities in Babi Island and Wuring near Maumere, they have been moved to Nangahare and Nangafure separately under the government direction.

Summary of earthquake/Tsunami occurred in December 12, 1992 in Flores Island

Items	Description
Date and Time	13:29, 12 December, 1992
Hypocenter	South latitude 8 degrees, East latitude 122 degrees (at north-west approx. 30km of Maumere town in Flores Sea
Magnitude	6.8
Tsunami run up height	Average approximately 3m, max approximately 20m
Number of victim	Approximately 2,100 persons

Source: Badan Meteorogi dan Geofisika,

2.1.2 Social Infrastructure

As shown in the location map in this report, a national highway which functions as the arterial road, runs from east to west in the central section of each island in the study area. Although these arterial roads are paved, the road conditions are poor in the mountainous regions of Manggarai district in Flores Island, and Ngada and Ende districts where the roads are sinuous, in contrast to the coastal roads. The arterial coastal roads that connect the fishing villages are well paved, but the road condition of the arterial mountain roads (Manggarai, Ngada, Ende districts) that connect these areas to the coastal fishing villages are poorly paved and the traffic conditions are inferior.

The islands in the study area are linked by ocean and air transport (see Fig. 2.1.4). Ferry and cargo ports are located in the major cities, and they also serve as a major transport base for the cities outside the study area. The sea routes, commission frequency, and major travel time of the main ferry and cargo ports are given in Fig. 2.1.4. Regular air service is available at the small airports located on each island, but the main air transport base is Denpasar airport on Bali province located on the west side of the study area. Improvements to the fishing ports are given in section 2.7 Fisheries Production Base.

The index for social infrastructural improvements in the study area includes elements

of the living environment, and a comparison with the indexes for other provinces is given in Tables 2.1.10 to 2.1.15. However, these values are not limited to fishing villages, but are representative of the entire province. The characteristics of NTB and NTT provinces based on these tables are as follows.

The drinking water supply facilities are mostly the private property nation-wide, but sharing rate of joint ownership facility in NTB and public facility in NTT are considerably higher than national average rate. As to the drinking water sources, dependence rates on well water in NTB and spring water in NTT are considerably higher than national average rate. Toilet is provided at individual house in NTB, but in NTB almost all are others (non-private or public rest room, etc). Distribution rate of electricity is about 80 percent in NTB and 30 percent in NTT. Consumption rate of oil lamp in NTT ranks top. The wood materials are used as fuel for cooking in both NTB and NTT with higher rate than national one. To sum up, living environment in both NTB and NTT are exceedingly worse throughout Indonesia.

2.2 Outline of Fishing Activity and Fishing Village

Fishery sector in the study area has been playing the substantial roles in the aspects of regional economy and employment, accounting for about 3.3 percent of GRDP and being engaged by about 45,000 fishing households (about 2.6 percent of total households in the Area). Although the main economic activities of the study area are agriculture, the fishery is one of the most important sectors particularly in the eastern part of Flores and Alor where agricultural lands are geographically limited. In addition, fish is main source of animal protein for local people as certified by the official data that the rates of fish to total animal protein intake are 71.2 percent in NTB and 65.2 percent in NTT (See table below).

Region	GRDP by Fishery Sector (million Rp)	Contribution to GRDP (%)	Total No. of fishing households (units)	Occupancy to total no. of households (%)
Lombok	44,595	2.10	9,460	1.33
Sumbawa	71,627	5.62	6,884	2.64
NTB Total	116,222	3.42	16,344	1.68
Sumba	7,604	2.27	6,129	6.78
Western Flores	13,798	2.95	5,245	3.16
Eastern Flores	22,669	6.78	9,888	5.36
Alor	6,550	5.84	1,711	3.26
Timor	34,806	2.63	5,465	2.28
NTT Total	85,427	3.06	28,438	3.88
Study Area Total	201,649	3.26	44,782	2.62

Note: GRDP data of East Flores based on 1998. West Flores includes Manggarai and Ngada. East Flores includes Ende, Sikka, Flores Timur, and Lembata.

Source: Dalam Angka NTB and NTT 1999 and based on the compilation of data by the Study Team.

Province	Per Capita Animal Protein Intake (g/day)				Plant Protein Intake (g/day)	Total Protein Intake (g/day)	Ratio of fish to animal protein	Ratio of animal protein to total
	Fish	Meat	Egg/Milk	Sub-total				
NTB	4.44	1.12	0.68	6.24	43.22	49.46	71.2%	12.6%
NTT	3.66	1.58	0.37	5.61	38.37	43.98	65.2%	12.8%
Bali	5.19	2.37	1.69	9.25	45.85	55.10	56.1%	16.8%
Indonesia Urban	5.93	2.02	2.11	10.06	39.25	49.31	58.9%	20.4%
Indonesia Rural	6.16	0.88	0.99	8.03	40.21	48.24	76.7%	16.6%
Indonesia Average	6.07	1.33	1.43	8.83	39.86	48.69	68.7%	18.1%

Source: 1999 BPS Statistics

2.3 Development Policies and Fishery Development Policies

2.3.1 Provincial Development Policies

According to the draft 5 years development plans (Draft PROPEDA) both of NTB and NTT provinces, the provincial development policies are as follows. Keywords related to the master plan are delineated in bold letters.

NTB	NTT
1. Enlightening the religious teaching and practices in the daily lives	1. None
2. Enlightening Pancasila (the five principles) in the people's daily lives	2. None
3. Law enforcement for ensuring human rights	3. Enforcement of law and human rights.
4. Implementing democracy climate in the nation	4. None
5. Strengthening socio-economic society	5. None
6. **Empowering community and economy, specially the economic institutions such as cooperative, small/medium scale enterprises** based on the human resources and natural resources available	6. None
7. **Achieving people's welfare** indicated by increasing the quality of life and by **food sufficiency**, better housing, better health education and labor force.	7. **Increasing the quality of life of the people** through empowerment of the economy, development of education and health improvement.
8. Increasing work motivation in accordance to **decentralization**	8. Strengthening the decentralization process
9. Achieving of clean and good governance	9. Increasing **public services** by promoting transparency and democracy
10. Creating good education climate	10. None
11. Strengthening political institutions and social organization and institutions	11. None
12. None	12. Increasing networking and collaboration among the regions as well as among the nations.
13. None	13. Keeping the region in security, safety and peacefulness

Both provincial governments take similar policy stance in terms of basic *decentralization requirements such as human right, quality of life, actions of decentralization* oriented clean government, etc. However NTB emphases more on strengthening of its economy as well as national unity and religion related. NTT seems to emphases more on strengthening of integration amongst the region.

In terms of strategies, draft PROPEDA of NTB does not state anything, however those of NTT states achieving development through equal distribution by putting emphasis on community-based economic, education and health development.

2.3.2 Provincial Fishery Development Policies

In terms of fisheries development policies and strategies, draft PROPEDA states following simple description:

NTB	NTT
Fishery policies	**Fishery policies**
1. **Increasing welfare of fishery community** including fishermen and fish farmers through increasing fisheries production based on market demand both domestic and international market	1. **Empowering coastal community**
2. **Managing fisheries resources in sustainable manner**	2. **Optimizing the usage of fisheries resources**
3. **Empowering fishermen to improve their living condition**	3. None
4. **Improving the quality of human resources in fisheries sector and increasing access in obtaining a credit**	4. None
5. **Creating labor force and business opportunity**	5. **Developing business /investment in fishery sector**
6. **Increasing supply of food**	6. None
7. **Rehabilitating and conserving fisheries resources.**	7. **Controlling and conserving fish resources**
Development strategies	**Development strategies**
1. Arranging and planning the usage of the region in order to find out suitable and potential zones for developing fisheries sector in long term.	No description
2. **Identifying the subject/object of fisheries development** (who, how, many, what's need, what's problem, where, when).	
3. **Developing human resources** (skills, knowledge and technology in fisheries development)	
4. **Improving fisheries infrastructure**	

Economic development policies and fishery development policies of district level are still under preparation in all districts in the study area. However it is assumed policies of district level would be similar to those of provincial level caused by current situation of transition period of decentralization.

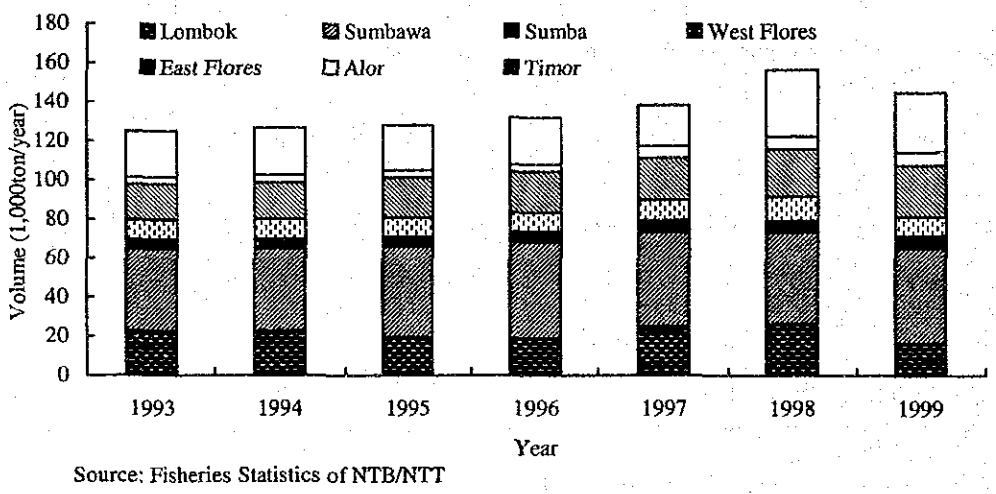
2.4 Capture Fishery Production and Its Development Potential

2.4.1 Fishery Production and Fishing Technology

(1) Recent trends of fish production

Marine fishery in the study area is conducted only by small-scale fishermen, except the

semi-industrial fishery (skipjack pole-and-line fishing by NES system[1]) operated in the East Flores and Timor. The regional fish production during the past 7 years (1993-99) had been gradually increased. The recent fish catches in Sumbawa and Lombok (NTB), however, had been stagnated causing the resource depression due to the excessive fishing efforts in the selected coastal waters and bays. On the other hand, the catch in the eastern part of Flores has been increasing with easy access to resource-rich waters by small-scale fishermen, although the 1992's Tsunami had caused the sharp drop of fish production in 1993. As well, the western part of Flores and Sumba are also faced to the rich pelagic fishery resources, but the respective increase of fish catch had not been observed due to the extremely small scale of fishing capacity (See Figure below, and Table 2.4.1 for details).



Source: Fisheries Statistics of NTB/NTT

Production Volume of Marine Fisheries (1993-99)

According to the questionnaire survey to fishermen, about 60 percent of fishermen in the study area felt the decrease of fish catch in recent years, while only 10 percent answered that it has been increasing. The similar responses were obtained for all areas except Sumba Island, and almost 100 percent of fishermen declared the decrease of fish catch in Lombok (See Figure below).

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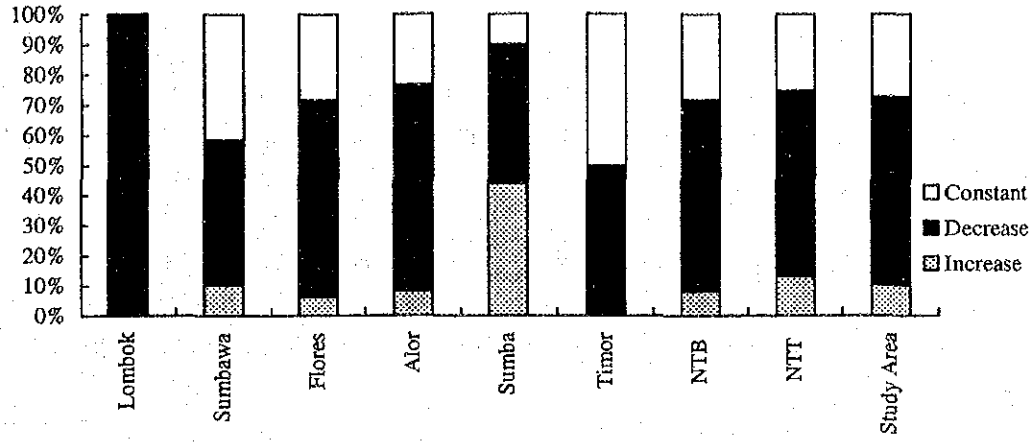
[1] Nucleus Estate and Small-holders (NES), that the company provides artisanal farmers/fishermen with production facilities & requisites, technical guidance, and opportunity to sell their products, as the core of production area. In Indonesia, It is widely observed as "Inti-Plasma system" particularly as one of the rural development methods in the isolated area.



Source: Socio-economic survey (June-July, 2001) by JICA Study Team

Tendency of Fish Catch Volume

This result is conformed to the current situation of fishery resources in the bays and the near shore, considering the existing operating areas and fishing capacity of coastal fishermen. As results of the analysis of problems and needs of fishermen (See Figure 2.4.2), most of fishermen have constraints on long distance to fishing grounds and the limited opportunity to purchase fishing gear, reflecting their highest needs on new fishing grounds and better fishing gears. Due to the lack of fund and increase of operational cost, however, they have to put up with the existing fishing grounds where can be reached using the existing fishing boat and gear.

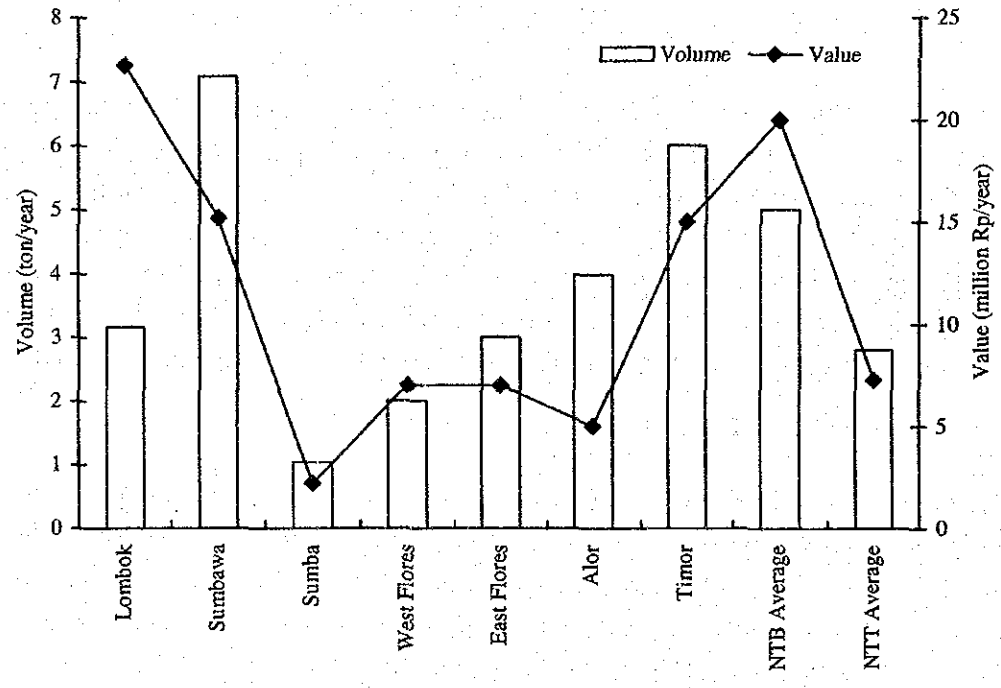
(2) Seasonal fluctuation of fish catch

The high season of pelagic fishery in the study area is generally from September to March (during north-west monsoon, wet season). Due to the high wave of open water during January and February, however, the most of small-scale fishermen face to difficulty to go out fishing. Except Sumbawa where the present main fishing grounds are shallow waters of bays and straits, fish production sharply drops in the regions from Flores to eastward during this period. The catch of pelagic fishes, depends on the regions, but differs usually more than 2 times between highest and lowest seasons, with particular difference in the Flores of 3 to 4 times (See Figure 2.4.1).

The main fishing methods for small pelagic fish, lift-nets (locally called as "Bagan") and some of purse-seines are operated inside the bays during night-time using lights to aggregate fish. Their catch, therefore, concentrates on the period except about 1 week around full-moon. This situation causes the daily fluctuations of landing volume and price of fish, resulting in one of the constraints to achieve the stable supply of fish. In addition, it is pointed out that these fishing methods cause the resource depression particularly in the shallow bays of Sumbawa, since their catch includes high composition of juvenile of economically important species.

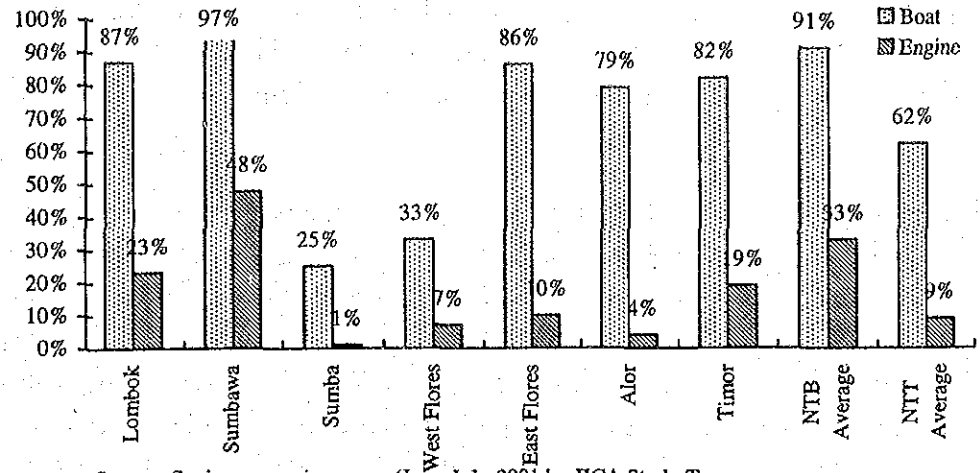
(3) Fishing capacity

Majority of fishermen in the Study Area comprise "Bugis" and "Bajo", the originated in the South Sulawesi, spreading into all over the coastal areas. Among the locally originated fishermen, the races of "Bima", "Ende" and "Lamaholot" (from Flores Timur to eastward) are abundant. In general, Bugis and Bajo mainly engage in net fishing such as lift-net and purse-seine, while the most of local fishermen operate hand-line and gill-net on smaller scale. Compared the fishing scale per household, Sumbawa is the largest scale with highest motorization rate, while Sumba and the western part of Flores are extremely small in fishing capacity with a low occupancy rate of boat and engine (See Figure below, and Table 2.4.3 for details)



Source: Socio-economic survey (June-July 2001) by JICA Study Team

Production per Fishing Household



Source: Socio-economic survey (June-July 2001 by JICA Study Team

Occupancy ate of Boat and Rengine by Fishing household

(4) Fishing Technology

Major fishing methods accounting the large productions in the study area are composed of gill net, lift-net and purse-seine in NTB, while pole-and-line fishing is taken place of lift-net in NTT (See Table below).

	Gill Net			Lift Net			Purse Seine		
NTB	Ton/Year	Units	Ton/Unit	Ton/Year	Units	Ton/Unit	Ton/Year	Units	Ton/Unit
	19,135	7,624	2.51	18,041	588	30.68	8,788	232	37.88
	Gill Net			Purse Seine			Pole-and-Line		
NTT	Ton/Year	Units	Ton/Unit	Ton/Year	Units	Ton/Unit	Ton/Year	Units	Ton/Unit
	21,661	16,729	1.29	16,579	325	51.01	13,066	160	81.66

Source: 1999 statistics of Dinas Perikanan NTB, and NTT.

1) Gill-net / hand-line

Gill net fishing boats are usually used as well as for hand-line fishing. Hand-line fishing is the most primitive by using the extremely small boats. These fishing boats are called as "armada semut (ants)", having the physical weak point so as not to be able to stand against heavy weather (rough sea). Due to the limited range of navigation, standard work-force is only about 1 hour/day on one way. It is a heavy stress on such boats if used for 2-3 hours on one way even equipped with a motor. Gill nets are comprised of various types, namely, drift gill-net, set gill-net, nylon mono-filament gill-net, trammel-net, and encircling gill-net, separately used depending on the object fishes, seasons and fishing grounds. As for productivity per unit, the NTB gill net is more efficient almost two times of NTT's because of the higher motorization rate (NTB: 86%, NTT 10%). Motorized boats can use about double longer gill nets than the non-motorized ones, which can be only operated in the near shore causing congestion.

In the areas (such as Labuan Bajo, Sape and Labuan Sumbawa) where the export-oriented demersal fishing are conducted under the contracts with fish collectors, the

hand-line fishing (sometimes bottom long-line) are operated using the motorized boats (with normally 2-3 days/trip catching 200-300 kg, maximum 7 days catching 1,000 kg). The motorization of fishing boats would be effective not only to increase fishermen's income but also to diversify the fishing grounds and to promote fishing on resource sustainable level.

2) Lift net (locally called "Bagan")

Lift-net is the second method of fish production in NTB but its producing capability is not high enough any more, 152kg/trip. Although the most of lift-net fishing production in Sumbawa Island (7,861 tons) come from Saleh Bay, present fishing ground in the bay seems to be over exploited, as same as Bima Bay and Sape Bay, with the highly concentrated fishing activities in the narrow water regions. The number of lift-net fishing boats should be controlled since it is observed that the lift-net's catch composes a lot of juvenile pelagic fishes such as scad, sardine and horse mackerel. Furthermore, the lift-net fishing is used with lamps at night to aggregate fishes, so that fish catch fluctuates depending on the lunar cycle which causes large fluctuations in fish prices at the market.

3) Purse seine

Purse seine fishing boats in the region are all categorized into mini-purse seine (Using the mini size net as short as 150-360 m long, 15-40 m deep, with the mini size fishing boat 8-10 m long, 2.5-3.0 m wide, with crew of 8 to 10 persons). They mainly operate daytime in the south coast and night time in case of the north coast of Sumbawa and Flores. These purse seine fishing boats are too small to go out further range, and have no space to equip with the insulated fish-hold. Thus their operation areas are limited to coastal waters normally within 2-3 hours from home place. It is necessary to enlarge the fishing boats and to secure the space for carrying fish with ice, so as to go out to the resource-rich offshore waters.

Actually daytime operation with mini purse seine net targeting at large pelagic is difficult technique, but it is successfully operated in several places of the south coasts of Flores and Sumbawa, mostly the less developed areas. Ensure to make encircling with purse seine net a small pelagic fish in the tropical waters, about 350 m to 400 m long net is necessary for about 500-3,000 kg bio-mass which has been normally formed in the region. Depth of net is depends on fish migrating zone but usually form a school near by surface, so that no necessary to have so deep one. Considering from balancing with net length of 350-400 m, the depth of 70 to 80 m in stretch would be enough.

All purse seine fishing boats in the study area, do not equip with any fishing machinery. Only one mechanism of purse winch is hand driven. After shooting the net encircled a school fish, then squeezing and closing the bottom of net is man-powered. It is a quite hard job and it has to be done as quickly as possible. This mechanism should be converted to powered purse winch by either main engine's power-take-off or individual engine 12-18 hp as a power source. The conversion, however, would be difficult to apply to small-sized boats and the short net would not be much effective.

4) Fish Aggregating Device (FAD)

Fish aggregating devices (FADs) used in the Study Area are floating types to aggregate pelagic fishes mostly in the eastern part of Flores (except Ende District), while limited in Sumbawa Island. The most of FADs are owned and managed by individual fishermen except deep-sea types installed by the fishing companies for plasma fishermen (pole-and-line fishing boats). The FADs can be divided into the following 3 types:

Type	Depth	Target Species	Fishing gear deployed
Shallow-water type	Less than 200m	Small pelagics	Purse-seine, Gill-net
Offshore type	200 - 1,000m	Large & small pelagics	Hand-line, Trolling, Gill-net
Deep-sea type	1,000 - 2,000 m	Large pelagics	Pole-and-Line

The major problems of FADs can be summarized as follows.

- Purse seine operation with FADs causes the excessive fishing efforts pressed onto the resources, if the juvenile fishes are much around FADs.
- The durability of FADs is short, normally one year. It is easy to be cut off by both natural and human effects.
- No licensing system to FAD is available at the moment.

2.4.2 Fishery Resources and Its Development Potential

(1) Available data on stock assessment

According to the most recent fish stock assessments made by the Central Research Institute of Fisheries (CRIFI) in 1999, the potential stocks are given only by wide-ranges. The water zones related to the Study Area are two divisions; 1) Makassar Straits & Flores Sea and 2) Indian Ocean. Acoustic survey has been done in Flores Sea covering only 2,600 km2, with a result of density of small pelagic fish of about 1.98 ton/km2.

(2) Current level of resources exploitation

Based on the existing data on potential fish stock of coastal and offshore waters (up to 12 miles from shoreline) assessed by the government of Indonesia as explained in the above, the current levels of exploitation at each region are globally estimated as follows (See Table 2.4.4 and 2.4.5 for details). In Indonesia total allowable catch (TAC) is stipulated at 85 percent of potential resources. The exploitation level of fisheries resources by region is estimated approximately as shown in the following table. For details refer Table 2.4.6.

Region	Total Allowable Catch (TAC) (ton/year)	Current Catch in 1999 (ton/year)	Level of Exploitation (%)
Lombok	31,797	29,855	93.9%
Sumbawa	66,653	48,770	73.2%
NTB Total	98,450	78,625	79.9%
Sumba	50,760	6,007	11.8%
Western Flores	56,050	9,807	17.5%
Eastern Flores	70,856	24,343	34.4%
Alor	40,184	6,734	16.8%
Timor	50,760	29,202	57.5%
NTT Total	268,610	76,093	29.4%
Study Area Total	367,060	154,718	42.2%

The exploitation of resources has been advanced. In NTB particularly in Lombok, while the relative low development of fishery gives much enough potential for future exploitation in NTT. Looking into the further small regions, some areas are resulted in over exploitation much exceeding the TAC levels, e.g., Saleh Bay, Waworada Bay, Sape Bay and Bima Bay. This phenomenon can be also certified from the Team's observation that most of catch from lift-net and purse-seine operated inside the bays was composed by juvenile pelagic fishes with partly including the larvae of demersal fish. On the contrary, in the most of landing sites located in the south coast of Sumbawa, the sizes of pelagic fishes caught by purse seine are relatively larger since they operate outside or around the mouth of the bays.

The level of exploitation of skipjack tuna in Eastern Flores and Alor islands where its migratory route is closer to the inshore waters is low. There is a general discussion that the development of this species of tuna should be under the international resource management. Therefore, resource development of skipjack tuna should consider this view point.

(3) Destructive fishing

Owing to the efforts of local government as well as through the NGO's activities, the fishermen using destructive fishing methods (dynamite or cyanide) in the Study Area have been gradually decreased. Great efforts have been made to the Komodo National Park (Manggarai District, NTT), not only to severely control the coastal resources and biological habitats through the daily surveillance, but also to provide small-scale fishermen with the alternative sources of income through the installation of fish aggregating devices (FADs) for pelagic fishery, promotion of mariculture, and education and training.

The destructive fishing activities, however, are still conducted in several other areas, remarkably in the eastern parts of Flores (majority come from Pulau Ende using dynamite) and some remote islands of Sumbawa (using cyanide). The main targets of former case are pelagic fishes for local consumption, while the later are targeted to the high-valued demersal and ornamental fishes for export. The income level of those fishermen, except the cases catching the export-oriented fishes, is lower than those using purse-seine and gill-net, but higher than hand-lining with non-motorized boats. The outline of dynamite fishing conducted by the existing dynamite fishermen of Pulau Ende can be roughly summarized as follows.

	Dynamite fishing	Hand-line fishing
Fishing gear	Dynamite about 10 pcs/day (unit price: Rp.10,000 or less, home-made by putting gunpowder into the empty bottle)	Hand-line
Fishing boat	3 – 4 GT with an inboard engine (9m long, 2.9m wide), equipped with air compressor. 4 –5 persons on board per boat.	Canoe (2-3m long), 1 person on board
Fish catch	10-15 pcs./dynamite x 10 dynamites/day (Estimate: 100 – 150 kg/day). Collecting fish by diving immediately after bombing. Over 50% of fish catch drops to sea bottom without being collected.	5 – 6 kg/day
Main species	Tuna, Scad mackerel (Layang), Eastern little tuna (Tongkol), Yellow-tail (Ekor kuning), etc.	Same as left.
Fishing ground	Sumba, Flores Timur, Manggarai, etc. 1-2 weeks/trip.	Around Pulau Ende
Post-harvest	Fish is salted/dried on board and sell to local traders in Ende.	Sold to local market by fresh.
Net Income	Rp.150,000 – 270,000 per day per boat (Estimate) - Boat owner (50%) : Rp.75,000 – 135,000 per day - 4 Crew (50%): Rp.19,000 – 34,000 per crew per day	Rp.15,000-18,000 per day

(4) Surveillance of fishing activities

1) Fishing license

The role of the central and regional government for fishing licenses that regulate fishing boat size and fishery resource management in specific water areas according to current laws is shown in the table below.

Responsible Governments	Licensing by size of fishing boats	Control of fishery resources by water zones
Central Government	Over 30 GT and/or 90hp	200 miles EEZ water
Provincial Government	10 - 30 GT	4 – 12 miles
District Government	Less than 10 GT	Within 4 miles

In principle, fishing licenses are issued by the central, provincial, and district governments according to this system, but it is not functioning at the district level. Thus, conditions pertaining to fishing boats are checked once every five years at the district level. Since the lifespan of wooden boats is short, fishing villages in the districts are constantly engaged in boat-building activities. But, data on scrapped boats and boat construction in the districts is unavailable.

Despite the existence of a fishery resource management system according to ocean area, resource management tasks such as surveillance activities by surveillance boats are practically nil due to the shortage of manpower at the central government level and an inadequate operations budget. Although the new Ministry of Marine Fisheries plans to strengthen the fisheries surveillance system, it has been hampered by financial restrictions and it will take time before measures can be put into effect. However, the government has recognized the importance of coastal resource management, and a national coastal resource management system at the village level is in the course of being implemented with ADB financial assistance. Although surveillance activities at the provincial and district levels have not been implemented, cooperation with the central government is being pursued through the creation of a resources management system at the village level as described above.

Under the current fisheries laws, Indonesian citizens have free access to fisheries resources. Subsequently, the consciousness of the coastal residents with regard to fisheries resources management is weak. However, outsiders who come into the region and conduct blast fishing or harvest a larger fish catch than the local residents are not a welcome phenomenon.

Thus, the objective of this study, which is fishing village development at the district level, should target a system of resource surveillance activities at the village level as part of a coastal resources management system that is financially viable and minimally burdensome.

Under the decentralization policy, the Bima district government collects fishing license fees; and other districts, which are beginning to adopt a similar policy, have begun to review a system of fees (July 2001). This activity is anticipated to strengthen the fisheries management system at the district level. Although it is simply seen as a source of revenue for the district government, it is important that measures, which will strengthen such a system and help the district government understand the need and importance of fisheries management, are proposed in this study.

2) Fish landing data collection

Current efforts made by the District Fisheries Office for collecting the landing data are as shown in the following table.

Prov./District		No. of Data Collectors	Place of Data Collection	Frequency
NTT	Lembata	2	2 Fish Landing Sites (Lewoleba, Balauring)	Twice a year
	Flores Timur	1 – 3/Kec.	Fishing Companies, Plasma Fishing Boats, and each Fish Landing Site	Once a month
	Sikka	4	Fishing Companies, 5 Fish Landing Sites (Kalimati/Wuring, Geliting, Watalia, Paga)	Once a month
	Ende	1	Only 1 Fish Landing Site (Mbongawani)	Everyday
	Ngada	3	3 Fish Landing Sites (TPI Aimere, Riung, TPI Marapokot)	Everyday (TPI) Once a week (Other sites)
	Manggarai	12	8 Fish Landing Sites	Once every 2 weeks
NTB	Bima	8	4 Fish Landing Sites (Bima (5), Sape (1), Waworada (1), Sanggar (1)	Once a month
	Dompu	5	5 Fish Landing Sites (Kempo, Huu, Kilo, Pekat, Dompu)	Once a week
	Sumbawa	12	11 sub-districts (Empang, Plampang, Lape/Lopok, Mayo Hilir, Sumbawa/Lab.Bades, Utan/Rhoe, Alas, Seteluk, Teliwang, Lunyuk)	Once a week

Most of data collectors are responsible not only for data collection but also for extension services, so locally called as "PPL" staff. Each PPL staff usually stays in the sub-district office (Kantor Camat) located far from the landing sites and the transportation means from office to the site are also limited. Thus, the frequency of data collection at landing site is limited to once a week or a month.

3) Fishing Ground Surveillance System

According to MOMAF's laws and institutions, the coastal water surveillance system within the 12 mile zone is conducted according to a system that is based on the participation of

each coastal village (SYSWASMAS)[2]. Each village is provided with a portable wireless unit and fishermen are required to report sightings of illegal fishing boats to the nearest regional fishing port. The local fishing port authorities are required to contact the MOMAF (Jakarta) and MOMAF, in turn, contacts naval headquarters with orders to take action. The naval headquarters dispatches a surveillance vessel from the nearest naval base (LANAL). The estimated time span from the first reported sighting by fishermen to the dispatch of a naval surveillance vessel is estimated to be two hours. However, due to budgetary restrictions, although this system is in effect mainly on Sumbawa Island in Western Indonesian waters, only a total of 200 portable wireless units have been disseminated thus far, and the system has not been able to function adequately. Subsequently, the eastern waters of Indonesia are completely open and uncontrolled.

The legal measures pertaining to illegal fishing boats (the authority to make arrests) have been given to only the police and military under the existing laws. Although MOFA is presently pursuing measures to revise the laws to enable about 600 PPMS nationwide to carry arms and to make arrests, about 420 PPMS will be trained annually at the Police Academy (Jakarta, Sukabumi, Lidu) with the cooperation of the Police Office. The aim is to strengthen controls against illegal fishing in the coastal waters of each region.

The number of naval bases in the water areas of the study region is limited; and due to the long coastline of the remote islands (vast coastal water areas), the establishment of the SYSWASMAS based on surveillance and notification by the local fishermen and villages is required in addition to the assignment of PPMS at major fishing villages to enforce control of these water areas. Furthermore, a system that will guarantee swift action to be taken with the cooperation of the fishing villages and the local police force is also an appropriate measure.

2.4.3 Development Issues

Based on the conditions explained above, the development issues in the fisheries sector in the study area is as follows.

(1) Fishing Ground Limitations

Fishing activities are concentrated in the inland bay waters and shallow water areas near the fishing villages and subsequently, the CPUE and fishermen income have dropped. This is due to concentrated fishing pressure on specific water area resources that has occurred over many years because of the small scope of the fishing operations of the fishing boats.

Therefore, there is a need to control the number of Bagan fishing boats and to shift to other types of fishing or to extend the scope of the fishing activities, disperse the CPUE, which has concentrated in specific water areas, and develop new fishing grounds. To achieve this, the capacity of the fishing boats must be increased; new fishing grounds must be developed by

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[2] System Pengawasan Berbasis Masyarakat (Community Based Surveillance System)

installing FADs; and technical guidance for fishermen and financial support such as credit activities must be provided.

(2) Devastation of the Coastal Reef Areas by Destructive Fishing Methods

Although destructive fishing practices such as blast fishing and the use of cyanide compounds has decreased, they are still conducted in some areas, causing coastal fishing grounds to be destroyed and resources to drop. For fishermen who have no other means of fishing, this is the quickest source of cash income that continues to be carried out.

Thus, there is a need to provide financial and technical support to enable fishermen to shift to other fishing methods. There is also a need to establish a fishing ground surveillance system based on cooperation between the district fisheries office and fishermen cooperatives.

(3) Difficulty Planning Development and Fisheries and Resources Management Due to Lack of Inadequate Data

Due to the inadequacy of essential data such as the number of fishermen and fishing boats and fish catch volume, it is difficult to devise measures on appropriate fisheries and resources management. This condition stems from the lack of district fisheries office personnel and budget to carry out adequate onsite data collection activities. The dispersion of fish landing and marketing sites in each area and the lack of recordkeeping activities have aggravated the situation.

(4) Fluctuations in Fish Catch Volume According to Fishing Season and Month, Unstable Fish Supply and Fluctuations in Fish Price

Bagan boats and purse seiners harvest much of the fish catch volume in the region, and the peak fishing period is concentrated in the 20-day period during the new moon phase. Fishing operations stop for all Bagan fishing boats and a segment of the purse seiners during the period prior to and following the full moon phase. This has produced great fluctuations in the fish landing volume between the months. In addition, fishing operations are also difficult to conduct during the monsoon season, which causes annual fluctuations in the fish catch volume. As a result, the fish supply is unstable and fish prices fluctuate. Therefore, measures to control the number of Bagan fishing boats and to shift to other types of fisheries, as well as to switch from night fishing to day fishing for purse seiners should be pursued to increase the ratio of daytime fishing operations and to reduce the factors that contribute to fluctuations in the monthly fish catch volume.

(5) Difficulty Procuring Fishing Equipment and Materials

Since the project site is located in a rural area of an urban site, the supply of equipment and materials to distantly located fishing villages is difficult and the procurement costs, including transport costs are high.

Some fishermen's cooperatives in certain areas are engaged in the retail of fishing