Chapter 7

Management Unit Plan

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7.1 Overview

Management Unit Plan is the key plan and/or the core plan in the master plan. Management Unit Plan consists of five sub-components as follows:

- Coastal Spatial Use Management Plan;
- Coastal Resources Use Management Plan;
- Urban Environmental Management Plan;
- Watershed Management Plan; and
- Coastal Ecosystem and Marine Wildlife Conservation Management Plan.

Scope, objectives and targets of the above Management Unit Plans are shown in Table 7.1. Coastal Spatial Use Management Plan, Urban Environmental Management Plan and Watershed Management Plan are based on physical areas. Coastal Spatial Use Management Plan covers shoreline and coastal water. Land area is dealt with by Urban Environmental Management Plan and Watershed Management Plan. Urban Environmental Management Plan covers urban areas in the Study Area such as Manado and Bitung areas, and Watershed Management Plan covers rural areas and other inland areas. Coastal Resources Use Management Plan and Coastal Ecosystem and Marine Wildlife Conservation Management Plan are target base management plan.

There are also corresponding current government administrative structures to deal with each management unit. The management unit concept aims to show clear responsibility to each agency and make it easy for related agencies to coordinate and to share their resources in order to tackle common problems. Coastal resources management is overseen by resources management offices such as provincial and municipality/regency fishery offices and forest offices, which are responsible for the coastal resources management plan. Coastal ecosystem and marine wildlife conservation management are dealt with by forest office for national parks, and LIPI for scientific research. In each unit,

information, human resources, and facilities/equipment also can be commonly shared and make coordination among related agencies easier. Those issues are shown in "Chapter 8 Institutional Supporting Plan."

These sub-components of Management Unit Plan were discussed at Provincial Steering Committee meetings (July 6 and September 25, 2001) and Sub-Steering Committee meetings (July 26, August 13 and October 9, 10, 11 and 12, 2001) as shown in Table 7.2.

Table 7.1 Contents of Management Unit Plan

Management Unit	Scope of Unit Plan	Objectives	Management Targets
Coastal Spatial Use Management	spatial use based on geographic feature (areal basis)	appropriate coastal spatial use	use and occupation of shoreline and coastal water
Coastal Resources Use Management	utilization and collection of resources (target basis)	sustainable coastal resources use	fishery resources forest resources mineral resources
Urban Environmental Management	pollution load from urban area and inappropriate coastal urban area use (areal basis)	minimizing of pollution load and improvement of urban environment	water pollution garbage coastal structure
Watershed Management	pollution load from non-point sources in rural areas (areal basis)	appropriate land use	non-point pollution sources
Coastal Ecosystem and Marine Wildlife Conservation Management	protection of coastal ecosystem, marine wildlife (target basis)	protection of marine wildlife and its habitat	coastal ecosystem dugong sea turtles

Table 7.2 Discussion of Management Unit Plan by Study Committee

Date	Provincial Steering Committee Meeting	Sub-Committee Meeting
July 6	to discuss approved planning framework	
July 26, August 13	-	to discuss management problems and management issues based on management units
September 25	to report the result of discussion by Sub-Committees, and discuss and suggest management issues	-
October 9, 10, 11 and 12	-	to discuss each unit plan

It was pointed out earlier that coastal problems are categorized mainly into six types of problems (see Chapter 2) and each coastal problem has a management aspect, which is explained in this section. The six types of problems are categorized into 5 management units and it is expected that five management units will handle these coastal problems effectively. The diagram in Figure 7.1 clarifies each administrative unit to manage a particular coastal problem.

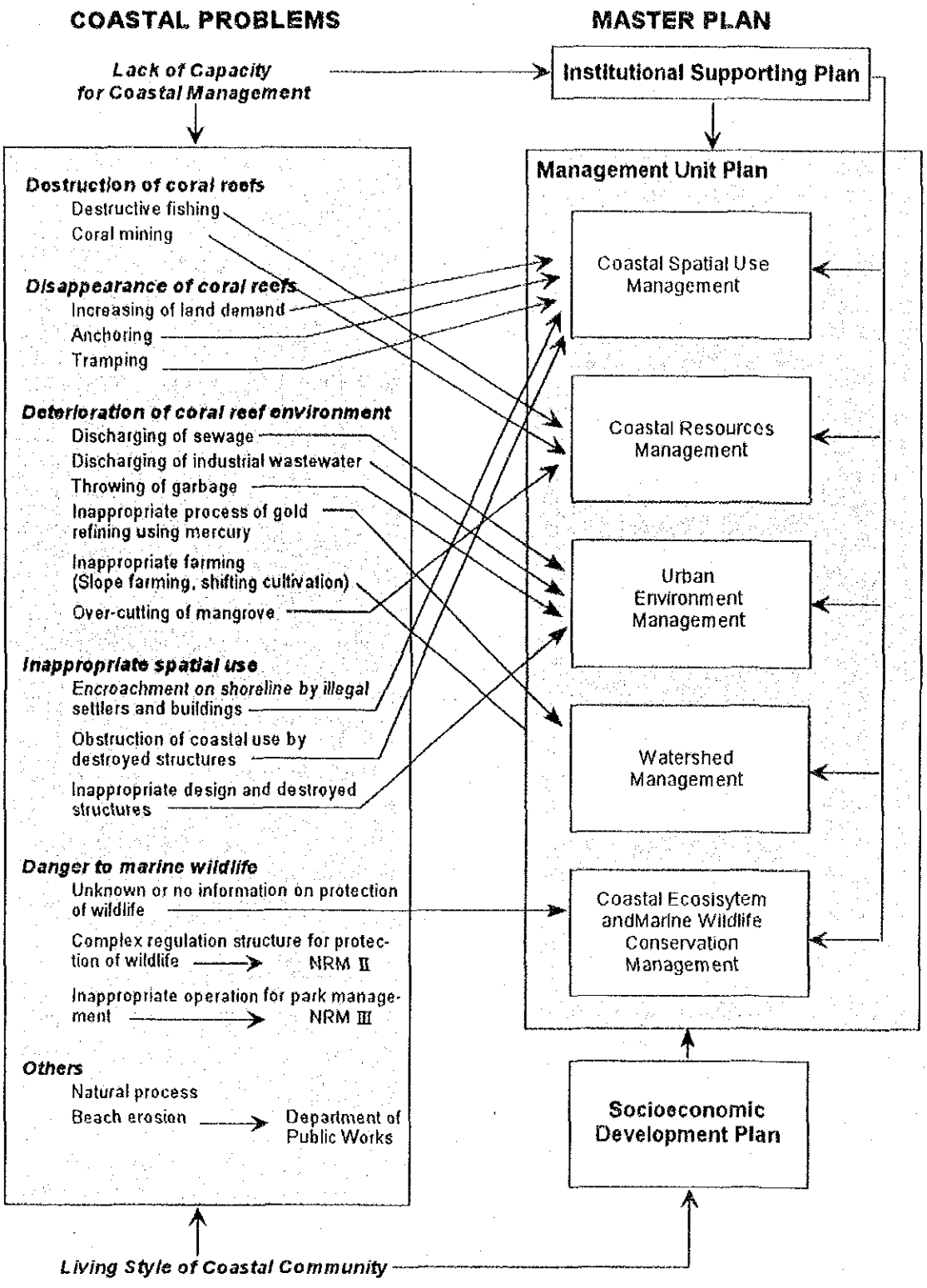

Figure 7.1 Coastal Problems and Master Plan

7.2 Coastal Spatial Use Management

7.2.1 Scope of Coastal Spatial Use Management

(1) Targets for Coastal Spatial Management Plan

In coastal spatial use management, management targets are the use of coastal area based on spatial potentiality in the coastal area. The term "spatial use" is defined as coastal area occupied and/or utilized by people based on spatial potentiality including geographical features and natural environmental conditions. For example, the coastal area is occupied by seaweed farming and pearl farming with facilities based on geographical conditions of the occupied area such as currents, waves and sea water quality. This is what we call "spatial use." On the other hand, hook and line fishing is not a spatial use, because fishermen target fishes not the space, and the boat does not occupy the space permanently. Management field of coastal spatial use management is defined as that area located on shore and coastal waters between around 100 m from shoreline and landward, called buffer zone (Presidential Decree No. 32 1990), and at 12 miles from shoreline to seaward (Regional Governance, Law No. 22, 1999).

(2) Management Problems

There are common management problems regarding coastal spatial use across Indonesia. Major management problems in coastal spatial use management are caused by lack of coordination among related agencies and coastal spatial use plan, illegal activities, and unclear relation of regulations. These management problems on coastal spatial use management are summarized as follows:

- conflicts among spatial use caused by lack of coastal spatial plan;
- non-management and control of spatial area especially coastal buffer zone, and disorderly spatial use such as encroachment on shoreline illegal settlers and structures; and
- obstruction of coastal use by inappropriate facilities such as seaweed farming, pearl farming and others.

(3) Management Issues

Based on the existing problems in the aspect of coastal spatial management, at least three management issues to be addressed are identified for achievement of appropriate coastal spatial use as follows:

- to clarify scope and authority of related regulations and government agencies which manage spatial use in coastal areas;
- to minimize conflicts on spatial use by coordination of coastal spatial use and activities among users; and
- to utilize and control the coastal area from the viewpoint of environmental conservation and development potentiality.

7.2.2 Strategic Approaches to Coastal Spatial Use Management

The objective of coastal management plan is "to achieve appropriate coastal spatial use" by stakeholders in the coastal area. In order to achieve this objective, the following strategic approaches should be taken in coastal spatial management plan. These strategic approaches are:

- to introduce coastal management zoning in order to utilize, coordinate and control coastal areas based on natural environmental, ecological and geological features and potentiality;
- to clarify responsibility of related agencies in coastal spatial management and make an integrated coastal regulation which aims at orderly management and integration of all existing regulations; and
- to introduce coordinated and integrated development license for coastal spatial use, which is based on coastal spatial use plan proposed in the master plan

Coastal management zoning proposed by the Study Team shows identified preservation, conservation and rehabilitation zones based on the ecological and natural environmental conservation viewpoint. Coastal spatial use should be based on this coastal management zoning together with social and economic situations and demands.

7.2.3 Establishment and Enforcement of Coastal Spatial Use Plan

It is required that local policy and guidelines for coastal spatial use planning will be established for effective and sustainable use of coastal area based on development potentiality and environmental value. The coastal spatial use plans at both Provincial and Municipal/Regency levels are the management tool to regulate and guide appropriate development activities and spatial use in the coastal areas. The plans would be scientifically sound, if these plans are based on the coastal management zoning prepared by the Study Team and the plans would be realistic, if social-economic interests and demands are taken into consideration.

In order to make an appropriate coastal spatial use plan, first, there is a need to prepare guidelines for coastal spatial use management.

(1) Establishment of Guidelines for Coastal Spatial Use Management

a) Components of Guidelines for Coastal Spatial Use Management

The Guidelines are bases for formation of coastal spatial use management of provincial and municipal/regency plans, which should be based on or referring to the national policy on the spatial use of the coastal areas. The Guidelines for coastal spatial use management should be legislated into Provincial and Municipal/Regency Coastal Management Basic Regulation proposed by the Study Team. The guidelines are composed of:

- provincial coastal spatial management policy;
- responsible agencies and roles;
- spatial use planning methodology;
- planning procedure;
- zoning criteria and management guidelines including coastal buffer zone, set-back lines of the buildings, and other technical criteria;
- implementation of coastal spatial use;
- financial sources; and
- binding and penalties, etc.

(2) Formulation of Coastal Spatial Use Plan Based on Coastal Management Zoning

Coastal Spatial Use Plan aims to minimize conflicts among coastal users, and maximize potentiality of coastal area; therefore, it is important for the provincial and municipal/regency governments to establish Coastal Spatial Use Plan based on the ecological situation and development potentiality of the area.

Based upon the forecast of the future goals of the coastal areas, to promote the socio-economic activities effectively and functionally, and to create favorable coastal environment for the human and natural environment, rational spatial use and development patterns should be realized by defining land and water areas into type of protection and utilization.

For this purpose, the Coastal Spatial Use Plan should be formulated to show the areas or zones divided by type of protection and utilization, and to regulate and promote the spatial use and development of the coastal areas of both land and coastal water, through implementation of the approvals on building and business permissions, in addition to the implementation of AMDAL.

a) Planning area for coastal spatial use

The coastal spatial use plan covers the areas of:

- 200 m inside of terrestrial area from shoreline at the high-high water level of spring tide, which covers the area for coastal buffer zone and adjacent hinterlands; and
- 12 miles in sea water area from shoreline at the high-high water level of spring tide in general, and 4 miles from the shoreline is an intensive coastal water which requires more detailed plans, because the spatial use and human activities, such as mariculture, tourism, navigation, are concentrated in this area; also, coral and other sensitive marine lives have habitat in the inshore.

In fact, the terrestrial area is subject to the existing RTRW (Regional Spatial Development Plan), so that the coordination and integration of the spatial use policy between RTRW and the coastal spatial use plan need to be made. In this sense, the local governments have responsibility to prepare the Coastal Spatial Use Plan of the coastal areas in their jurisdictions.

b) Formulation process for coastal spatial use planning

The Provincial Coastal Spatial Use Plan should be established first, then Municipal/Regency Coastal Spatial Use Plan should be established following the provincial plan. The reason is that environmental impacts in the coastal area affect not any limited area nor any particular administarative units but affect the area influenced by the flow of coastal water which passes administrative boundaries.

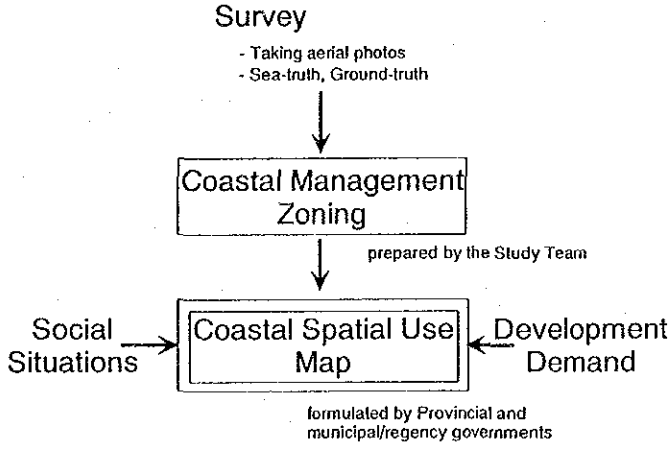

Figure 7.2 Process of Coastal Spatial Use Plan

Therefore, municipal and regency governments should formulate detailed Coastal Spatial Use Plans from the wide range viewpoint of coastal area. Coastal Spatial Use Plan needs to consider both Coastal Management Zoning Map which shows the

coastal natural environmental and ecosystem conservation, and socioeconomic demand and development direction (see Figure 7.2). It is important to make a good balance between social situations and development demand by discussion among stakeholders.

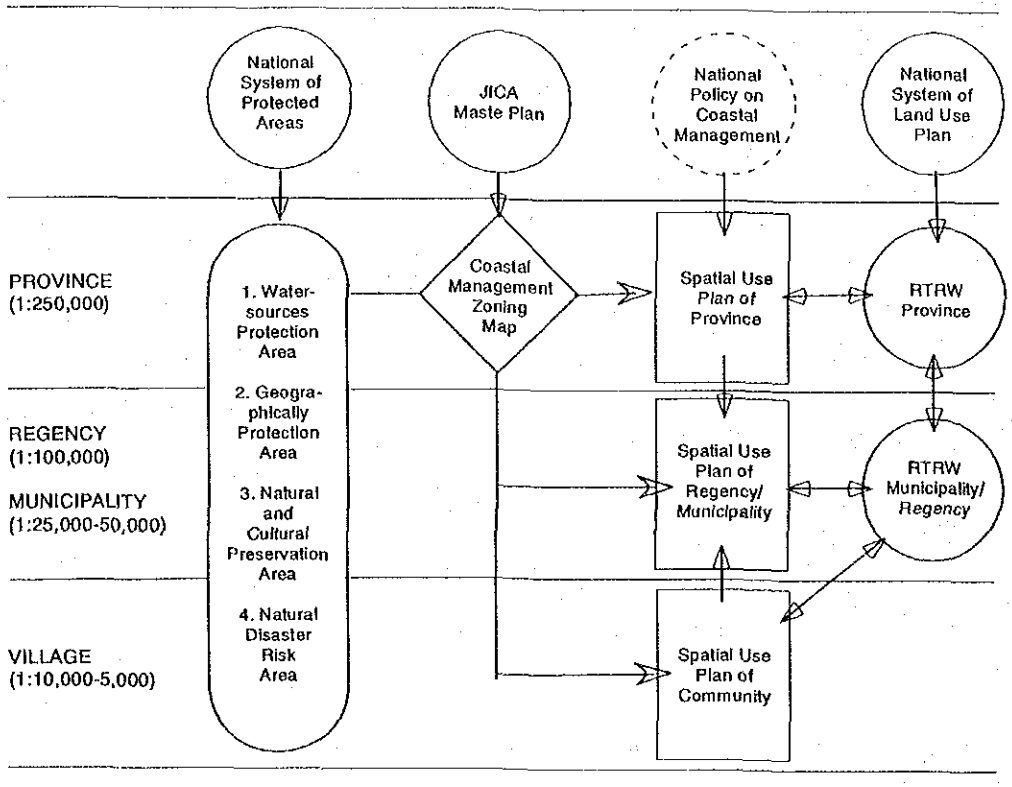

Figure 7.3 The position diagram on the Formulation of Coastal Spatial Use Plan

c) Spatial use types and categories of spatial use zoning

The coastal spatial use plan has to show the protection and utilization policies on the areas, same as the land use plan in RTRW. The various types of the spatial use plan are categorized into two: Protection and Utilization:

- **Protection:** includes natural preservation, cultural preservation and natural disaster risk areas, which are the items of the National Protection Area system, provided by Presidential Decree No. 32, 1990 regarding the Protection Areas. The Coastal Management Zoning maps prepared by the Study Team provides the important basis for the determination of the protection areas in the coastal water.

- **Utilization:** includes port and other coastal development areas, settlement, fishery, tourism, agriculture, plantation, forestry, etc. The items in this category are almost the same as the items of the land use plan in RTRW.
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Table 7.3 Spatial Use Types

Categories	Sub-categories	Spatial Use Types
Protection	Natural Preservation (Coastal Management Zoning map provides important information on natural preservation in the coastal areas)	National and Provincial Parks
		Marine Protected Areas incl. Marine Sanctuary (spatial and/or seasonal)
		Protection Terrestrial Forest
		Protection Mangrove Forest
	Cultural Preservation	Historical or Archeological Sites
		Indigenous or Traditional Areas
	Natural Disaster Risk Area (Master Plan of Coastal Area Protection in North Sulawesi, PU map provides important information on natural disaster risk in the coastal areas)	Shoreline and river mouse Protection
Utilization	Port and Coastal Facilities	National, Provincial and Local coastal structures, Markets, Storage, Yards, etc.
	Coastal Development Promotion Area	Industry, Commercial, Residential, Services, etc.
	Coastal Development Control Area	Coastal development activities, which change the shoreline function and may affect the marine eco-system are controlled in the area.
	Village Settlement Areas	
	Fishery	Mariculture
		Floating Devices
		Zoning by type of fishing boat and gear
	Tourism	Tourism and Recreational Centers
	Agriculture	Intensive Agricultural Area
		Extensive Agricultural Area
	Plantation	Plantation Area
	Forestry	Forestry Area

d) Formulation process of coastal spatial use plan

The organizations to formulate coastal spatial use plans are PICMO at the provincial level and KICMOs at municipality/regency level. The detailed descriptions on "How to formulate Spatial Use Plan" are shown in Appendix-A.

- **Preparation**: carry out technical surveys on the existing coastal spatial use and prepare spatial use plans for the North Sulawesi Province, Manado and Bitung Municipalities, and Minahasa and Bolaang Mongondow Regencies.

- **Coordination:** Formulate and implement the spatial use planning of the coastal areas with the agencies concerned such as BAPELITBANG, BAPPEDA, Banda, BAPEDALDA, Fishery, Tourism, Transportation, and Legal Offices.
- **Formulation**: formulate coastal spatial use plans in coordination with the relevant governmental agencies and with public participation, and submit to the Provincial Coastal Management Committee for evaluation.
- **Evaluation:** The Provincial Coastal Management Committee evaluates the plans and submits the plans to the Provincial/Municipal/Regency Assembly and to the Governor/Mayor/Bupati for their approvals.
- **Monitoring**: monitor and update the data and information on the spatial use of the coastal areas.
- **Comply**: other related government agencies such as fishery, Forest, Tourism, Infrastructure Offices shall comply coastal spatial use plan.

7.2.4 Establishment of Rational Procedure for Application of Business and Building Permission in Coastal Area

The approval system for the permissions of building and business is the essential tools for the spatial use management. There is such a system existing in the area, however, the current system does not function because the developer gets permission for the business but not for the building, although separate permissions for both are required.

The regulations on the procedure and criteria for the evaluation of the application of business and building permissions are provided, however, these regulations are not often strictly enforced in reality. Adequate procedural system for the building and the business permission on coastal area is necessary.

(1) The Existing Procedure System

Clarification and establishment of the procedure and criteria for the evaluation of the application of business and building permissions in the coastal areas are necessary. Figure 7.4 and Table 7.4 show the flow of the existing procedure of the building and business permissions.

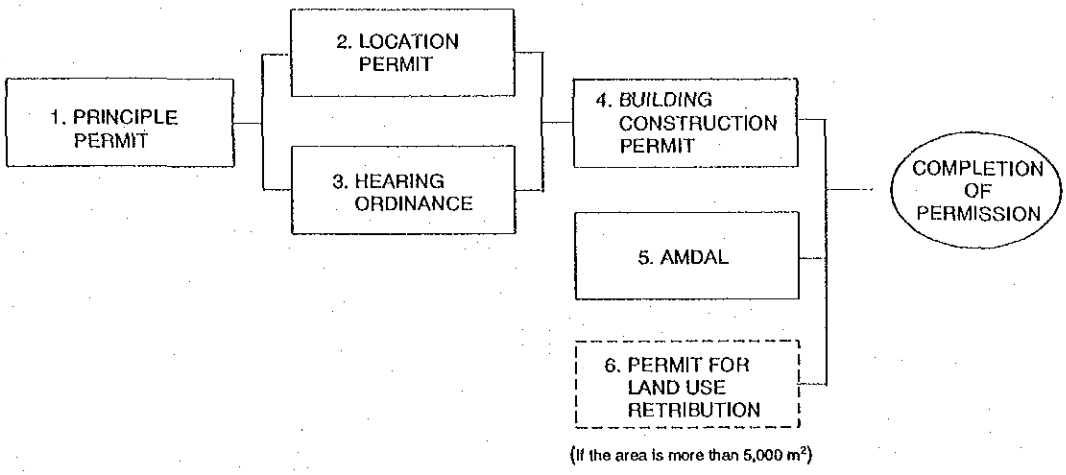

Figure 7.4 Existing Procedure and Criteria for Business and Building Permits

Table 7.4 Type of Business and Building Permits

	Permit (*Ijin*)	Responsible agencies	Criteria/examine
1.	Principle Permit (*Ijin Princip/ Persetujuan Prinsip*)	Regency/ Municipality Government	Spatial Plan (*RTRW*)
2.	Location Permit (*Ijin Locasi*)	*Dinas Tata Kota* and related governmental sections, and National Land Board (*BPN*)	Land Tenure
3.	Hearing Ordinance (*Ijin Undang-Undang Gangguan*)	*Dinas Tata Kota* and related governmental sections, and *BAPEDALDA*	Initial Assessment
4.	Building Construction Permit (*Ijin Mendirikan Bangunan*)	*Dinas Tata Kota* and related authorities (*Dinas*)	1) Spatial Plan 2) Building setback line (*GSB*) 3) Building coverage ratio (*KDB*) 4) Coastal buffer line (*GSP*) 5) River buffer line (*GSS*)
5.	Environmental Impact Analysis (*AMDAL*)	*BAPEDALDA*	EIA
6.	Permit for Land Use Retribution (>5,000 m^2)	*Dinas Tata Kota* and related governmental sections, and authorities (*Dinas*)	Spatial Plan (*RTRW, RDTR Kawasan, RDTRK, RTRK*)

(2) Proposed Procedure for the Building and Business Permission

Proposed permission process of the building and the business on coastal areas is shown in Figure 7.5. Related agencies endorse approval of the building and the business to KICMO.

Finally, KICMO issues permission to a developer for construction of building and establishment of business.

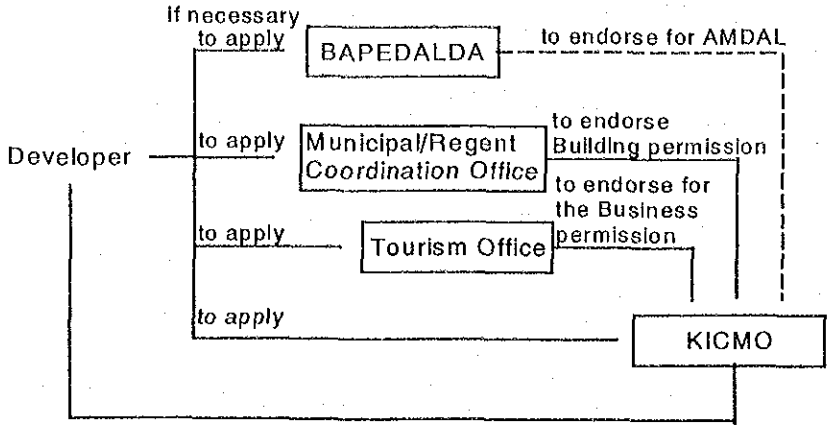

Figure 7.5 Proposed Permission Procedure for Building and Business

The municipal/regency coastal spatial use plan is the basis for the evaluation of the coastal development permission. Some structures require an Environmental Impact Assessment (*Analisis Mengenai Dampak Lingkungan Hidup*: AMDAL) based on Environmental Impact Assessment Guidelines; developers also should obtain permission of the AMDAL from BAPEDALDA, if it is necessary according to the guidelines.

7.2.5 Setback of Building Structures from Shoreline

Presidential Decree No. 32 1990, regarding Protection Areas, prescribes the Coastal Buffer Zone as "a limited use area along the shoreline, where it is important to conserve the function of shoreline" and defined as "the area shall be at a minimum 100 m from the shoreline at high water level." However, there are no further detailed regulations, and this buffer zone has not yet been implemented except in Manado municipality at present. As a result, structures and facilities including houses, restaurants, piers, ports and reclamation occupied the buffer zones in other municipalities/regencies. Manado municipality has applied this buffer zone on:

- the area 35 m from the shoreline in general;
- the area 15 m from shoreline in the zone of Boulevard; and
- the area 40 m from the shoreline in the zone of Molas and Bunaken areas.

These zones have been indicated in the RTRW Manado; however, detailed regulations are not stated in the plan and the management of spatial development and use seems not working at present.

The "Coastal Buffer Zone" can be defined generally as follows:

- area for public use and/or facilities;
- area for safety to avoid disaster arising from the sea side; and
- area for minimizing the impacts caused by human activities to the coastal ecosystems.

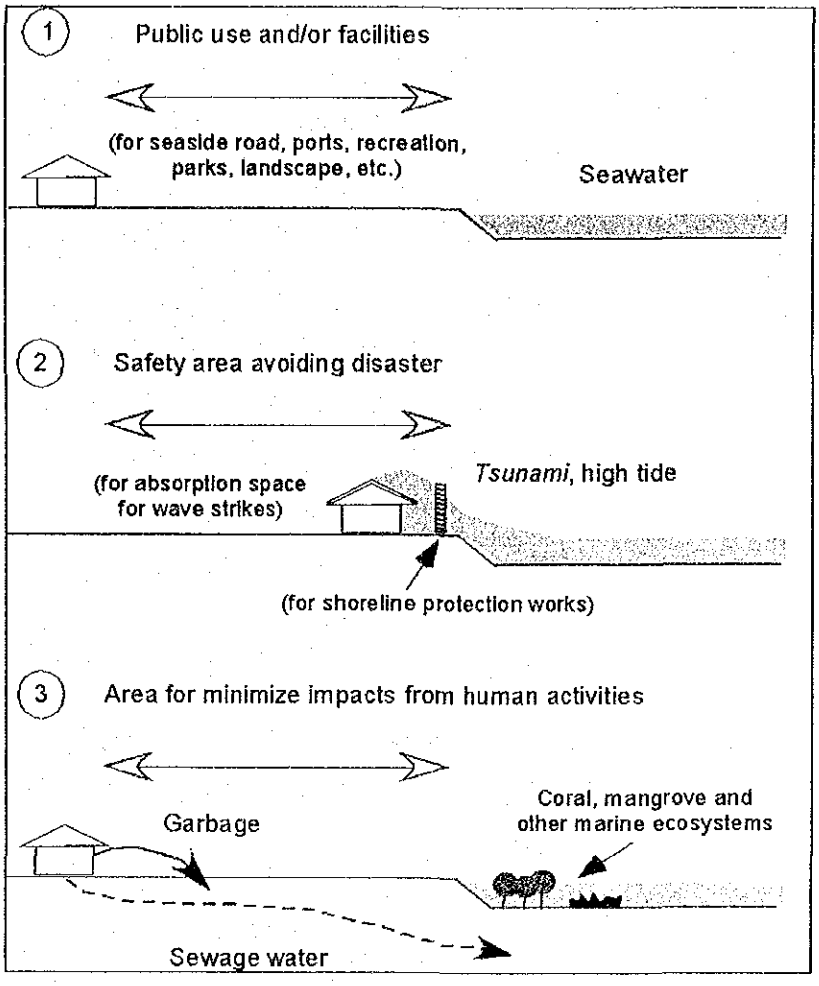

Figure 7.6 Functions of Coastal Buffer Zone

The Study Team proposes to apply the Coastal Buffer Zone in the Study Area as follows:

Definition of Coastal Buffer Zone

The area with at least 100 m from the high-high seawater level in the rural areas and 30 – 100 m in the urban areas shall be delineated as the Coastal Buffer Zone in general, except the mangrove forests which are specified as wide as 130 x P, where P = tidal range in the area.

Restricted building construction and utilization

Within the zone, permanent buildings, such as housing, commercial and industrial buildings and other facilities, are not allowed to be built in general.

Table 7.5 Proposed Guidelines for Coastal Buffer Zone

Areas	Guidelines for Utilization
General	• The utilization of the Coastal Buffer Zone permits planting and related land use which do not change the land function as shoreline protection, i.e. ordinary agricultural and plantation uses, and public facilities and use, which also do not change the land function, i.e. shore protection works, roads, parking, public recreation area, etc.
Rural Area	• In the rural zone, the demands to keep the buffer zone are not high in general, because there is no high demand on the public use and facilities and the economic values on the areas are less important, compared with that in the urban areas. The important thing is to protect the area adjacent to the sea from soil erosion and from chemicals flowing directly to the seawaters.
Urban & Semi-Urban Area	• The serious problems are found in the urban zone and semi-urban areas. Most of the seafront areas are already occupied by housing and other buildings and by private landowners, and it is very difficult to acquire or allocate those lands for the above spatial demands. Moreover, the seafront areas are very important for socio-economic activities, such as commerce, industry, sea transportation, fishery, tourism, etc., especially in the urban centers, such as Manado and Bitung. • The specific criteria on the area of the Coastal Buffer Zone within the already built-up zones in the urban and semi-urban areas will be required, taking the above situations into consideration. Special attention should be paid for the realization of the Coastal Buffer Zone in the following areas: - The areas with high risks for attacks of high wave and *tsunami* should be provided shoreline protection works or enough space for absorption of the wave attacks. - The areas with high demands for public use or public facilities should be examined development or re-development plans, considering the strengthening of the shoreline functions and space demands. - The areas with high potentiality for redevelopment, such as slum clearance for commercial and tourism development, also require examinations of the redevelopment plans of the areas. - The area in front of vulnerable corals and other marine ecosystems, such as the preservation, conservation and rehabilitation areas for coral reefs and mangrove forests, designated by the JICA Study Team, should be strictly controlled against human activities and coastal development.

7.3 Coastal Resources Management

7.3.1 Scope of Coastal Resources Management

In the coastal resources use management plan, the management targets and area need to be clearly defined as follows:

(1) Targets for Coastal Resources Management Plan

In coastal resource use management, the management targets should be coastal resources gathering and use. Coastal resources are defined as assets that are preserved in the coastal area, and can be used by people. In the master plan, coastal resources include fishery resources, forest resources and mineral resources, which are preserved in the coastal area. They are divided into renewable resources and unrenewable resources based on regeneration speed. Fishery resources and forest resources are categorized as renewable resources. Mineral resources such as coral rocks and coral sand are categorized as unrenewable resources. Because regeneration speed of corals is much slower compared with the speed of demand for utilization and consumption, although coral rocks and sand can be generated by biological process in the longer term. In principle, therefore, mineral resources use is prohibited in the master plan.

(2) Management Problems

In the North Sulawesi area, the most serious problems existing in coastal resources use are related to their utilization for human economic activities, especially destructive fishing practices such as dynamite fishing, mangrove cutting and coral mining happening daily in the coastal area. Through the survey and analysis of coastal management problems, it was determined that those impacts by human economic activities give the biggest and widest impact on coastal resources (see Chapter 3).

The management problems on coastal resources use are summarized as follows:

- coral reefs are destroyed by inappropriate coastal resources gathering such as destructive fishing, coral mining, and socioeconomic pressure; and
- coastal resources are disturbed because human activities destroy the natural environment which support coastal resources.

(3) Management Issues

Based on management problems in the aspect of coastal resource use, at least three management issues to be addressed are identified for achievement of sustainable coastal resource use as follows:

- to prevent environmental deterioration by introducing or encouraging the appropriate manner to gather resources;
- to achieve sustainable use of coastal resources based on resource potentiality; and
- to minimize conflicts among existing users of coastal resources.

7.3.2 Strategic Approaches to Coastal Resources Management

The objective of coastal management plan is "to achieve appropriate and sustainable resource use" by stakeholders in the coastal area. In order to achieve this objective, the following strategic approaches should be taken in the coastal resources management plan. These strategic approaches are:

- to introduce coastal management zoning in order to utilize, coordinate and control coastal resources based on natural environmental, ecological and geological features and potentiality;
- to clarify responsibility in coastal resource management among the government agencies and make an integrated coastal regulation which aims at orderly management and integration of all existing regulations in order to minimize the conflict existing among resource users;
- to introduce coastal resources management by stakeholders who utilize coastal resources, especially community based management for and by community people; and
- to empower the community in order to establish village level coastal resource management.

7.3.3 Territorial Boundary and Its Resources User Right for Communities

(1) Toward Solution of "Tragedy of Commons"

The most significant problems identified for coastal resource use in North Sulawesi are those concerning exploitations of coastal resources such as destructive fishing, over fishing, excessive cutting of mangroves, and coral mining. If there were no interventions introduced to stop those exploitations, the coastal resources in the area would be exhausted in the very near future and it would damage not only individual's economy but also affect directly and/or indirectly the area's economy including the nation.

Although a sense of crisis in coastal resources has been existing among those users living along the coastal area, they have not done much about stopping the exploitation of coastal resources; some fishermen are still practicing the destructive fishing and coral mining.

One of the reasons for above problem is to what we call the " Tragedy of Commons," Because coastal resources are not owned by particular individuals nor groups in Indonesia

and the sea in Indonesia is open access to anyone, it sometimes would not benefit individuals who manage the coastal resources, if others come and take the preserved resources. Then it is very natural to exploit their natural resources before others nearby take their resources away. Also it is difficult to see physically the amount of natural resources especially those under water, making it difficult to manage them.

(2) The Bases of Proposed Coastal Resources User Right for Community

Community based management (CBM) is not a new concept for coastal management in North Sulawesi and other provinces. Some of communities are still managing coastal resources use by community rule; some examples of CBM are seen Kulu, Ratatotok and Sangihe Talaud in this province. Those communities managing coastal resources have strong community leaders and/or imaginary territorial boundaries in the sea determined by geographical conditions and natural landmarks on the coastal area to identify the amount of coastal resources belonging to certain areas. The new concept of coastal resources user right is to secure the right to utilize their preserved resources before others utilize them. It can be expected that community people would accept coastal resources user right, which can increase the incentive of management. Lessons can be learned from historical experienced CBM as follows:

Lesson from Kulu

In the example of Kulu in Molas district, North Sulawesi, the people in this village have been practicing some form of CBM for coastal resources in the last 15 years. They replant mangrove trees along the coastal area by community participation; they plan the position of seaweed farming, and also they watch and protect their products from outsiders. It was found that the most significant reason for the villagers to practice CBM is a sense of belongingness of the coastal resources to the community, and the imaginary boundaries drawn each side on the sea to divide their territorial area from other villages seem to be working to reinforce this feeling, according to the Study Team's analysis of the CBM mechanism in Kulu.

Lesson from Ratatotok

The same thing is seen in Ratatotok. The people in village manage the position of *Bagans* setting up and other spatial use of their coastal area. The reason for this is the imaginary "territorial boundaries" commonly seen between Kulu and Ratatotok, even though the lines are not authorized by any authorities.

Lesson from Sangihe Talaud

In the past and until now, in some parts of Sangihe Talaud, coastal communities are practicing a traditional way of managing coastal resources by themselves. One of the components that make it possible for them to practice CBM is the territorial right for them to use the resources in their own territory. Not only are they able to keep their territorial boundary but they also have user right.

Learning from the existing CBM in the area, the Study Team would like to propose a solution for the existing problems of coastal resource management as follows. The Study Team suggests establishing user right for coastal communities on coastal resources. User right for coastal resources aims to achieve sustainable use of coastal resources through collective management by community, and sustaining a democratic order in society. In order to do that, it is essential to introduce territorial boundary in the sea to divide territories and make them belong to each village.

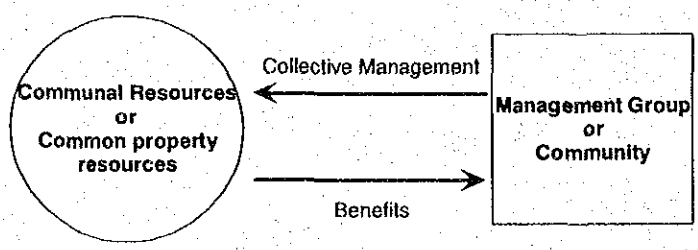

Figure 7.7 Concept of User Right

Table 7.6 Comparison of Methodology between Open Access and Establishment of Collective Management by User Right

	Open Access	Collective Management (User Right)
Management methods	Free rider on resources	Based on rules
Types of resources	Common property Global commons	Communal resources Common property resources
Ownership	No property	Common property
Users	All individual & groups No limitation	Limited members
Impacts	Decreasing usable resources	Sustainable resources use

(3) Proposed Mechanism for Coastal Resources User Right

a) Contents of coastal resources user right

Coastal resources user right gives priority to use of only coastal resources which are preserved within 3 miles (Fishery Law No. 9, 1985) from shoreline for communities

- fishery resources
- forest resources

Therefore, people can use the area for other purposes such as navigation, recreation and others. Although user right is lent to community by authority of the mayor of municipality/regency, and not handed over to communities. Moreover, user right is non-transferable to other communities/persons and to private sector.

b) Lender

According to Law No.22, 1999, Mayors of municipalities and regencies should manage coastal water from shoreline to 4 miles or one third of provincial boundary.

The following are proposed:

Mayors lend user right to community groups or fishery cooperatives through municipal and regency governments.

c) Establishment of coastal resources coordination committee

It is proposed that District Coastal Resources Coordination Committee be established by Mayors of municipalities and regencies. The Coordination Committees arrange and coordinate user right among communities. The Coordination Committee appoints Coastal Resources Coordination Officers at district level (*Kecamatan*). Actually, they coordinate coastal resource users and communities. The Coordination Officers also support community coastal resources management.

The Coordination Committees solve conflict regarding coastal resource use at community level. Conflicts located close to administrative boundary of municipalities and regencies should be coordinated by provincial Governors through PICMO.

d) Qualification of titleholder

Community groups at village level can lease user right. It is not extended to individuals and private companies. The groups should be authorized by the village head (*Hukum tua*) as Community Natural Resources Management Committee and/or fishery cooperative. These organizations approve resources gathering members and/or other persons who live in the village.

e) Right and duties of the holder to use right

Resource users can gather coastal resources in front of their community. On the other hand, resource users should obey community regulation regarding coastal resources. Resource users also report type and amount of gathered coastal resources to PICMO through authorized community group and government at coordination bodies.

f) Delineation of territorial boundary

Territorial boundary for user right should be delineated corresponding to community boundary. The direction of boundary for seaward is developed on geographical conditions with coordination with neighboring community by Coastal Resources Coordination Committee. An example of delineation of territorial boundary is shown in Figure 7.8. Finally, the Coordination Committee authorizes the boundary. However, methodology of boundary delineation is still an issue with regard to implementation of user right.

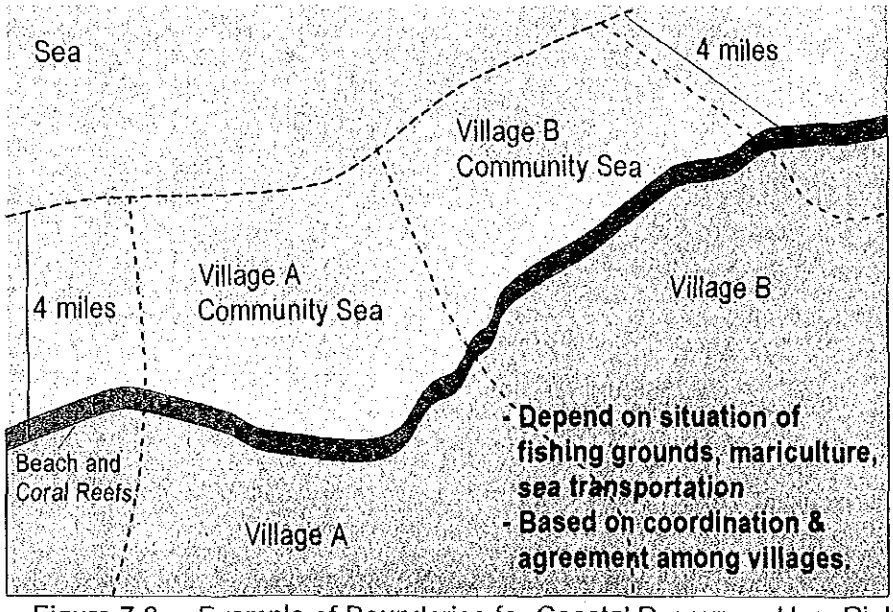

Figure 7.8 Example of Boundaries for Coastal Resources User Right

g) Redress of economic differentials of communities

There are different types and amount of preserved coastal resources. Provided that coastal resources user right is strict and exclusive right, so that economic differentials will be larger, because community people with poor resources in their coastal water cannot fish properly. As a result, amount of resources gathering will be decreased. Then, income of the community people also will be decreased.

To solve this matter, other resource users can obtain tentative short-term license and certificate (flag and/or signboard with or without fee from village head). The certificate should be prominently displayed in their boats, indicating the type of resources to be gathered and term of user license. It is important that head of village issue the license, even if no fee is charged.

(4) Identified Issues of Implementation of Territorial Boundary and Coastal Resources User Right

In order to introduce territorial boundaries and user right for each coastal village, some issues have been identified which may occur during implementation. They are as follows:

- How far should user right be given to coastal communities?
- Where and how should boundaries be drawn?
- Is it possible for users to manage the new system by themselves?
- Would it not create inequity among coastal communities based on the difference of the amount of coastal resources?
- How should a mechanism for solving conflict be established?

7.3.4 Sustainable Fishery Resource Use Management

(1) Community Based Fishery Resource Management

In the coastal communities in North Sulawesi, the small-scale fishers who fish coral fishes on and around the coral reefs are quite few in number. Some of them exploit fishery resources by using destructive fishing methods such as dynamite fishing, *soma paka*, *selo*, and others. According to some fishers in the area, they can recognize the reduction of the amount of fishes in the last 40 to 50 years. On the other hand, the traditional way to manage fishery resources that existed in the area has been faded away due to socioeconomic changes in the area and change of social structure of villages. As a result, the coral reefs were destroyed to the serious stage and the functions of fish nursery seemed lost to a great extent.

If these conditions remain unchanged by resource users, the fishery resources will be depleted completely in the near future and would not be able to recover their carrying capacity. The most urgent concern is how to preserve these destroyed coral reefs in order to improve their capacity to re-generate fishery resources. In order to attain this, the most rational approach is to achieve community based management for coastal resources including fishery resources. Without the fisher's positive participation to coastal resources management, it would not be possible to achieve the sustainable use of fishery resources.

In order to achieve community based coastal resources management, first, the concept of coastal management by communities needs to be introduced to the coastal communities, and the positive participation of not only fishers but also the whole coastal communities to the coastal resources management have to be achieved. The local governments should take serious action to raise such awareness of the importance of community based management (CBM) of coastal resources by various means. Using village extension officers to introduce CBCM to the coastal communities is recommended by the study. Community can learn coastal management concept in a concrete manner by going through problem identification of coastal management and coming up with solutions to the problems themselves. Timely technical support from outside of communities are inevitable for successful CBCM. Not only local government offices but also NGOs and academic institutions should cooperate with each other to give technical support to the coastal communities.

The benefit to introduce community based coastal management is many. First, the management cost would be minimized than by a centralized management of local governments, and the effectiveness and efficiency of the management can be maximized by achieving the most appropriate micro management of coastal resources. The most important element, however, to achieve CBCM, is not only awareness raising, but also capacity building of the communities by giving timely and the most appropriate technical support from outside of communities.

(2) Introduction of CBCRM Concept to the Coastal Communities

Users, particularly coastal community people, should manage not only fishery resources, but also any coastal resources including coastal spatial use as well. In order to achieve community based coastal resource management (CBCRM) in the area, this new concept of CBCRM should be introduced to the coastal communities first. Actually community based fishery resource management is not a new concept in the area. By the present time, some areas are practicing '*Sasi*," or "*Manee*," which is management of fishery resources in a sustainable way. However, the practice of such CBM is no longer existing in the area

except in a very limited area in North Sulawesi. Therefore, it is possible to say that the concept of CBCRM is a new idea to most areas in North Sulawesi.

CBCRM can be introduced by government officials such as fishery extension officers to the coastal communities. However, the Study recommends utilizing community human resources to do this role because it would increase the adoption of the concept and the sense of responsibility to the coastal area. Village extension officer from a village should be trained by local government agencies and he/she will be catalyst between local government authority and a village to introduce the new concept of CBCRM. The extension officer will facilitate communities to discuss coastal management issues and to identify priority issues in a village. Then study tours, seminars, and workshops should take place during the period of community discussion on coastal management issues. During this time, community will learn about coastal ecology, environmental impacts of human activities, consequence of pollutions, etc., and also management methods for fishery, mangrove, and other resources will be taught to the community people.

After a series of discussions, these coastal communities will come up with their own coastal management plan which includes identified priority coastal management problems, solutions, and budgets. Along with management plan, community should formulate *management groups for each management problem. These groups are the core groups of* organizing and carrying implementation of individual projects in their management plan.

(3) Rehabilitation of Fishing Ground

Most of coral reefs have been damaged by destructive fishing, coral mining and others. As we know, fishery resources are depleted on damaged coral reef compared with healthy coral reefs. It is required that destroyed fishing ground should be rehabilitated in order to improve fishery resources. Establishment of fish sanctuary is one of the tools for fishing ground rehabilitation.

Fish sanctuaries are categorized into three: permanent sanctuary, seasonal sanctuary and shifting sanctuary. Permanent fish sanctuary was introduced by Coastal Resources Management Project (Proyek Pesisir), USAID, in the area. In terms of fish sanctuary for fishing ground rehabilitation, fish sanctuary can be opened after rehabilitation of fishery resources, so that seasonal sanctuary and shifting sanctuary are proposed. They are established within community boundary by communities. Concept of fish sanctuaries is explained below:

a) Seasonal fish sanctuary

Prohibited areas are designated at spawning time. On condition that spawning sites cannot be pinpointed, a large area is to be seasonally designated as a fish sanctuary.

b) Shifting fish sanctuary

Shifting fishing sanctuary area is divided into sub-areas for the purpose of rotation between fishing area and prohibited area. After a sub-area has been used for fishing, this activity will be prohibited in the sub-area for the next several years. On the other hand, prohibited areas already rehabilitated are used for fishing in turn (see Figure 7.9).

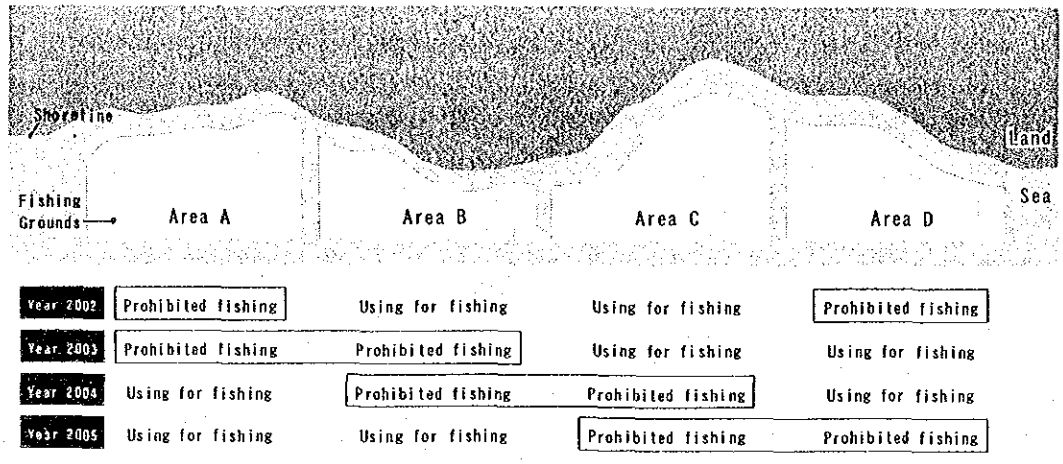

Figure 7.9 Concept of Shifting Fish Sanctuary

(4) Establishment of Community Artificial Reefs

The Study Team has identified that most of coral reefs haveve been damaged by destructive fishing, coral mining and other inappropriate activities. Damaged coral reefs give rise to deteriorated fishing grounds. This situation affects local fishermen especially poor fishermen. Because they fish close to reefs including reef flat and reef edge with non-motorized boats. It is necessary to rehabilitate fishing grounds. Therefore, the Study Team recommends that artificial reefs be introduced in communities.

On the other hand, establishment of artificial reefs have other roles. It is essential for coastal management fishermen to understand resources management. Establishment of artificial reefs provides opportunity for introduction of own resources and collective management at community level to fishermen. The Study Team already o set up two

artificial reefs, named InteCo Model, at Basaan and Basaan 1 in cooperation with community as pilot project. As a result, the Pilot Project for Community Artificial Reef Management, for the community artificial reef, is proposed as follows:

a) Selection of sites

The sites for setting up of artificial reefs are selected based on the following criteria:

- area where damage has been incurred by physical forces, and can be improved as fishing ground;
- data and information shown below for identification of appropriate site for setting up artificial reef can be obtained; and
- community is willing to cooperate and implement activities by themselves.

Environmental conditions of setting up artificial reefs are:

- flat sea bottom;
- no soft sea bottom;
- low turbidity water;
- no deeper than 20m; and
- strong current.

b) Field survey

Environmental conditions especially geography, sea bottom, slope, current and biological conditions should be investigated based on aerial photos and field observation.

c) Making artificial reef

Design criteria for artificial reef were as follows. In principle, artificial reef should be made and set up by community people, because the aim is for the community people to manage fishery resources by themselves. This would be an important factor for adoption of artificial reefs, to be easier to make and to carry to the site by community people.

Type of artificial reef : bottom type (there are lots of types)
floating artificial reef such as *bagan* and *lampoon* were already introduced in North Sulawesi

Materials of artificial reef : local materials such as wood, bamboo, rocks and others are recommended

Size of artificial reef : they should be carried to sites from shore by small fishing boat

Used tires and tricycle are prohibited as materials for artificial reefs, because it would be a serious problem if people start to throw these materials to the sea like disposal sites.

The Study Team developed a new type of artificial reef, named InteCo Model, made by concrete plates and steel pipe (see Figure 7.10 and 7.11). The structure of InteCo Model generates random streams, because the structure has various angles. The random streams aggregate fishes. The inside of InteCo artificial reef has a complicated structure which provides habitats for fishes and shrimps. Concrete plate also provides fundamental for growing algae, which is used for feedingaces.

Other alternative artificial reef is gabion type (See Figure 7.12). This type consists of wire-net and rocks, and can be made on boat.

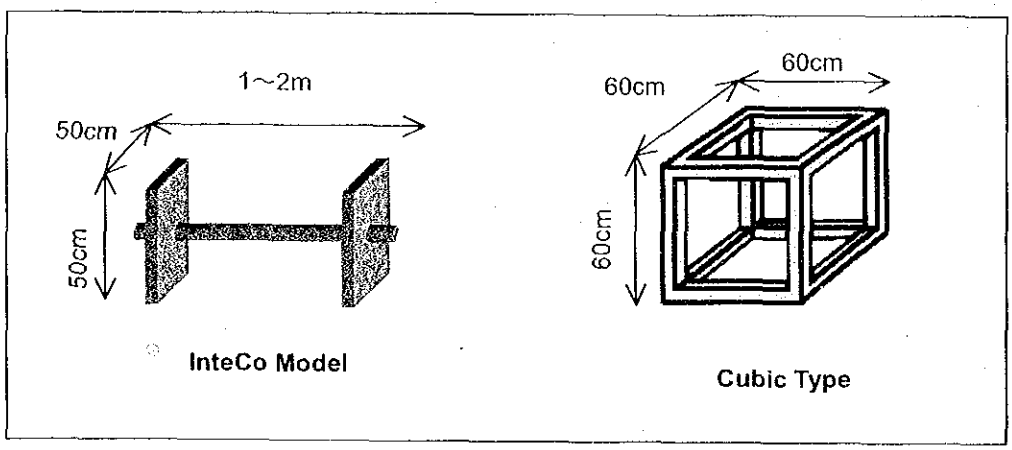

Figure 7.10 InteCo Model and Cubic Type of Artificial Reefs

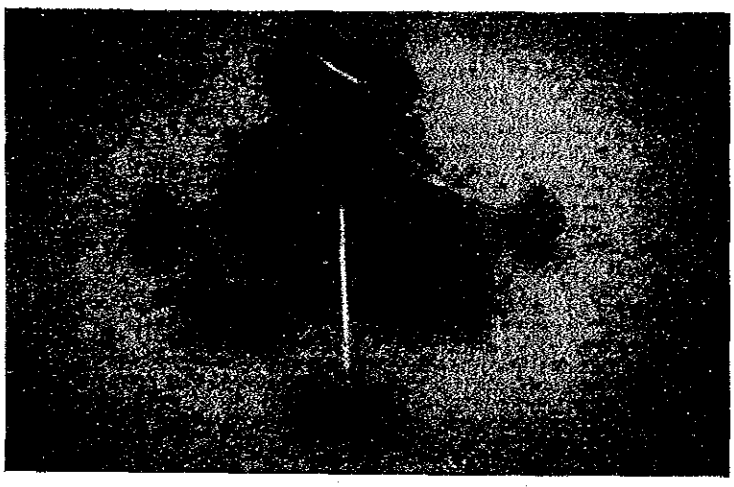

Figure 7.11 Setup of Artificial Reef Models

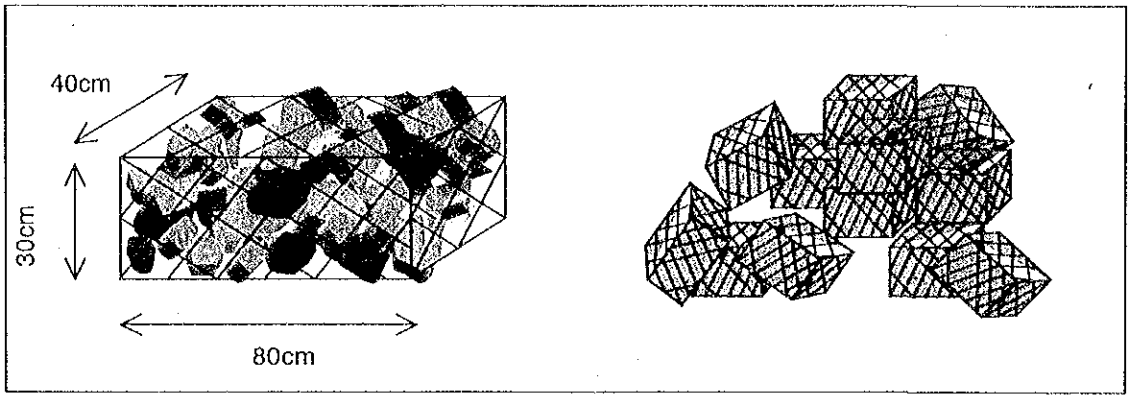

Figure 7.12 Gabion Type of Artificial Reef

Table 7.7 Construction Cost of Artificial Reefs

Type of Artificial Reef	Materials	Cost
Plate Type	Iron pipe (2m)	50,000
	Steel line (10m)	6,000
	Cement (10kg)	5,000
	Sand and Gravel (60kg)	18,000
	Total	Rp. 79,000
Cubic Type	Steel line (20m)	12,000
	Cement (10kg)	5,000
	Sand and Gravel	18,000
	Total	Rp. 35,000

d) Formulation of rules for community based artificial reef management

Main objective of setting up an artificial reef is to introduce and/or provide opportunity for community based fishery resource management to the communities, so that formulation of rules on the use of artificial reef is very important. At present, fishermen are discussing how to manage artificial reef in Pilot Project communities. The following aspects may be decided by village fishermen:

- prohibited fishing period and seasons;
- prohibited fishing gear and methods;
- reporting of total catch weight and number of fishes from fishermen; and
- monitoring.
  - conditions of artificial reef (damage, shape, slip, collapse, burring etc.)
  - fouling organism on structure of artificial reefs
  - attracted marine life around established artificial reef

7.3.5 Prevention of Coral Reef Destruction by Destructive Fishing Practices

Destructive fishing such as dynamite fishing, cyanide fishing, *paka-paka* and others is one of major destructive activities of coral reefs in North Sulawesi. Damaged coral reefs are delineated as rehabilitation zone. Then, these zones should be rehabilitated. However, it takes a long time for revival of damaged coral reefs. There is therefore an urgent need to protect the remaining limited number of healthy coral reefs in North Sulawesi. To fight against illegal fishing activities, the following three are included:

(1) Strengthening patrol and taking actions against illegal fishing

Destructive fishing is prohibited under Indonesian regulations. Patrol for illegal activities and destructive activities such as cutting mangroves and others should be strengthened. Patrol of coastal area should be prioritized, because North Sulawesi's coral reefs are in very critical condition. However, because it is difficult to patrol coral reefs by a single government agency, patrol activities can be shared by not only government agencies but also community and the private sector as follows:

- Task Force Team establishment consisting of government agencies;
- tourism sector; and
- community.

a) Task Force Team establishment

In the Philippines, Bay Watch was established by some of the local governments. Bay Watch exert all effort to curb illegal activities. Bay Watch membership consists of Coast Guard, Navy, Police, Department of Environment and Natural Resources, Department of Forestry, Provincial Governments, Municipal Governments and NGOs. They carry out patrolling and at least one person has power to apprehend violators. Fishermen caught are arrested and prosecuted.

An organization such as the Municipal/Regency Task Force Teams for coastal environmental conservation is proposed in the master plan. Member agencies of Municipal/Regency Task Force Teams are proposed as shown in Table 7.8. Functions of Municipal/Regency Task Force Team are as follows:

- to stop illegal activities on fisheries and other coastal resource activities;
- to generate community participation in the enforcement of conservation and protection regulations; and
- to provide legal support on environmental illegal cases under the regulations.

In order to achieve above objectives, efforts such as law enforcement against illegal fishing and inadequate natural resource gathering, monitoring and apprehension of violators of the laws, and protection and safeguard for the coastal environment and natural resources should be exerted.

Table 7.8 Member Agencies of Municipal/Regency Task Force Teams

Positions	Agencies
Chairperson	Mayor of Municipality and Regency
Vice Chairperson	Chairperson of KICMO
Member Agencies	National Government Agencies (Navy, Coast Guard, DKP) Provincial Government Agencies (PICMO, BAPELITBANG, Fishery Office, Forestry Office, BAPEDALDA) Municipality and Regency (KICMO, BAPEDALDA, Fishery Office, Forest Office, Environment Office)

b) Tourism sector

Tourism Sector utilizes natural environment as tourism resources. In North Sulawesi, tourism resources are healthy coral reefs and mangrove forest, rich biodiversity including fishes, marine wildlife, and clean coastal water. If this natural environment is damaged, tourism resources will be deteriorated. Therefore, tourism sector should make efforts to conserve coastal environment for their benefits. Local government agencies give conditions for issue of development license, e.g., tourism operators have duties of patrolling, monitoring and others. Tourism operators watch out for illegal activities surrounding their resort, and patrol when they go island-hopping and diving tours. They report to Task Force Team and/or Navy and police by radio communication, when they find illegal activities.

c) Community

The coastal water in front of community should be managed by communities. Community people should protect their own territorial coastal water. However, they do not have apprehension right so that community reports to Task Force Team, Navy, Coast Guard and/or Police and they, in turn, should cooperate with community patrolling in crime cases.

(2) Awareness raising

Destructive fishing is not only illegal fishing, but also legal fishing which affects coastal environment such as *sero*, fixed nets and others. According to the Rapid Coastal Community Survey conducted by the Study Team, community people can identify illegal fishers in their villages. The workshop for illegal fishers to raise the awareness to environmental conservation would be beneficial for behavioral change of such fishers.

This type of workshop is accepted better by the target group, if the organization is NGOs. Without alternative livelihood opportunities, it may be difficult to curb or solve the problem. It is necessary that alternative livelihood of coastal fishermen be considered.

On the other hand, illegal fishermen are not only local fishermen but also those from other municipalities/regencies and provinces. Therefore, coastal environmental protection measures should be undertaken at least provincial wide. The awareness of fishermen should be promoted through seminars, campaigns, broadcast and public announcements by proper media.

7.3.6 Development of Coastal Resources Statistical Database and Its Publication

Scientifically valid and good quality data and information are indispensable in order to manage resources effectively. Coastal resource management requires information on the following:

- What types of coastal resources are preserved;
- Where coastal resources are preserved;
- How much coral resources are preserved;
- How coastal resources are used;
- Why conflicts occur, if there are.

However, there is lack of necessary data and information for coastal resources management in not only North Sulawesi but also other provinces. Collected and analyzed data and information can be used for sustainable resource use and cost effective resource development. The information on coastal resources is not only about coastal resources but also environmental conditions that support preservation of coastal resources.

Overall view of coastal management information is described in Chapter 8. In this section, coastal resources information development is shown as follows:

(1) Monitoring of Coastal Resources

Regular monitoring is necessary. Coastal resources information including fishery resources, mangrove forest resources and coastal environment would be more beneficial. The Study Team conducted Pilot Project for four communities. Extension officers, who interface between community and the Study Team, and community and government agencies, conducted interviews on fish catch with community fishermen every day. They collected vital information for sustainable resource use. Obtained data can be used for

estimation of reproduction capacity of fishery resources. The following data and information are examples of required items:

- types of preserved resources;
- preserved sites of resources;
- amount of resources gathering;
- utilization of coastal resources;
- coastal environmental conditions;
- socioeconomic conditions of resource users; and
- problem identification.

Above data and information should be collected by management groups (7.3.4). These data and information should be sent to PICMO through KICMO or municipal/regency governments.

(2) Development of Coastal Resources Database

Collected data and information should be integrated into the Coastal GIS in order to utilize data and information for coastal management. Development of the Coastal GIS is described in Chapter 8.

(3) Publishing of White Paper

Information should be disseminated to the public in order to utilize the information effectively and to make people understand the situations of coastal area as common knowledge and also to give a sense of crisis. Policy of open access to information is one of duties of government agencies. Government policy should be transparent in order that government agencies appeal to people for coastal management. Provincial government should issue statistical books and white papers for coastal resources management. Provincial Coastal Resources Statistical Book should be issued in each year. White paper for provincial coastal resources management should be published at least every three years. Publishing of white paper aims at the following: 1) that the people may know the performance of provincial government, 2) that the people may know the situation of coastal resources in North Sulawesi, 3) that the people may understand the provincial policy for coastal management.

White paper for Coastal Resources include the following as an example:

Part 1: Analysis of the existing coastal resource use
(comparison with past 5 years)

Part 2: Review and analysis of polices and performance

Part 3: Coastal resources management policy for next period

7.3.7 Mangrove Forest Conservation

(1) Policy for Mangrove Management in North Sulawesi

Presidential Decree No.32, 1990 emphasizes the importance of mangrove protection. At the same time, the decree mentions that the natural resources in mangrove can be utilized if the functions of mangrove, such as maintenance of bio-diversity, providing the spawning ground for various marine biota, and protection of the shorelines from erosion, are not affected. Therefore mangrove is considered to be a natural resource that could be used with proper protection. In principle, mangrove forest management should be based on Coastal Management Zoning (see Chapter 6).

Concerning the methodology of mangrove management, the community based management (CBM) with support and supervision by the government is appropriate, for reasons shown below.

- Local people's knowledge on environments in mangrove areas, such as tidal and micro-topographic conditions which affect the mangrove ecosystem and their growth, is indispensable for the mangrove management.
- As mentioned already, almost all mangroves in the study area actually have been utilized for long period by people of coastal villages, as firewood and construction materials. Therefore, they know that the mangrove resources provide them benefit, if they are used in appropriate way. This benefit becomes a motivation for local people to manage the mangrove by themselves.
- The mangrove in the study area, around 75 km^2, is too large to be appropriately managed by only government organization.

(2) Formation and Implementation of Community Mangrove Forest Management Plan

It is already mentioned that Community based Mangrove Forest Management is important for sustainable use of mangrove forest in North Sulawesi. In this section, Community Mangrove Forest Management planning and implementation is proposed which is essential to management. This plan is integrated into Community Coastal Management Plan (CCMP) as one of components of CCMP.

As it was mentioned in previous sections of "Community Based Fishery Resources Management," the concept of CBCRM should be introduced into a community and after a series of discussions, management plans and groups will be established for each coastal management problem including mangrove conservation

a) Formation of community mangrove forest management plan

Mangrove Zoning

Community Coastal Spatial Use Map should be formulated by community based on Coastal Management Zoning (Chapter 6) and Municipal and Regency Coastal Spatial Use Map.

Mangrove regulation

Referring to the management guidelines in each area shown in this master plan, the mangrove regulations are drawn up. In the process of their preparation, advice and opinion from the Forestry Department (District) should be asked. The principal items of the regulation are: 1) formation of cooperation system of villagers for, 2) prohibited and permitted activities in each zoning area, and 3) penal regulations, and development of community mangrove and its utilization.

Plan of communal forest development

"Plan of Communal Mangrove Production Forest Development" is included if necessary. It is explained afterward in 4.

Plan for publicity and education

A system for publicity of the plans and regulations in all the villages should be built. Environmental education program is also necessary for the villagers to understand the importance of mangrove management. This plan should be considered in cooperation with existing village management group of publicity and education..

b) Implementation of the plans

Based on the plans and regulations, the management of mangrove is carried out. The management group for mangrove conservation conducts the activities.

Utilization of Mangrove and its Permission

Concerning the mangrove utilization, villagers who wish to use the mangroves should request special permission from the head of village. The criteria for

permission are clarified in Chapter 6. The head of village consults the mangrove management group about the utilization, and the committee examines the request. In case the request is approved, the management group must supervise and monitor to check if the mangrove is utilized in an appropriate way.

Rehabilitation

Rehabilitation in degraded mangroves and community mangrove forest development are carried out (refer to (3) "Plan of Community Mangrove Forest Development").

Monitoring

Being on the look out for persons practicing illegal mangrove utilization in the preservation area should be practiced. Monitoring survey is conducted as explained in 4 "Program on Monitoring".

c) Report on the mangrove management

The mangrove management group makes a report each year on the mangrove management, and it is submitted to the Forestry Department (District). The contents of the report are: 1) general condition of mangrove in each zoning area, 2) conditions of mangrove utilization and mangrove planting, and 3) problems of the management, and minutes of committee meeting.

d) Role of the local government

The Forestry Department (District) and PICMO support the CBM in the items shown below:

- Publicity and education to the local people on importance of mangrove conservation and the CBM;
- Supervision and advice to villagers in the process of planning;
- Technical advice for mangrove planting; and
- Periodical watching and monitoring of mangrove (refer to 3 "Program on Monitoring").

(3) Monitoring Program on Mangrove

In the mangrove management done by the CBM, the monitoring is also done by villagers, especially for the community mangrove. Also, the government should play an important role in the monitoring, because there is possibility of overuse of mangrove resources by the local people.

There is few data about mangrove conditions, such as its growth and areas, and the periodic changes of biomass and ecological conditions; this data is required for appropriate mangrove management. The mangrove monitoring is necessary to collect such data.

a) Monitoring by local people

Monitoring of mangrove utilization

In the natural mangrove areas in a village, periodic patrol (around twice a month) to report on illegal cutting is conducted by a group organized by the mangrove management group. If illegal activities are found, the head of the village imposes a penalty on violators according to the mangrove regulation.

In the community forest, monitoring and supervision are done by a group organized by the mangrove management group to check if mangrove is utilized according to the plan and regulation.

Monitoring of community forest

To understand the condition of the growth after planting and the regrowth after cutting, a survey plot (about 100m2) is set up in each 5 ha of mangrove. In the plot, diameter at breast height, height of tree, number of trees, and utilization in the year are recorded every year. Referring to these data, the utilization plan is made and renewed. The survey is organized by the mangrove management group and conducted by the villagers, with technical support from the Forestry Department (District). The result of the survey is reported to the Forestry Department (District) every year. This is described in "(4) Establishment of Communal Mangrove Production Forest."

b) Monitoring by the forestry department (District)

Monitoring

The Forestry Department at district level periodically patrols mangrove areas to check whether the mangrove is managed according to the plans and regulations made by the villages. The patrol is conducted twice per month in the preservation area, and once per month in conservation and restoration area. A cabin for base of monitoring is built near the preservation mangrove area.

Long term ecological monitoring

To understand the biomass change of mangrove in long term, 3 permanent survey plots, 1 plot around Rap rap and 2 plots around Likupan and Kulu, are set up. The size of the plot is approximately 5m wide and 500m long. The plot is divided into several sub-plots, whose size is around 5m wide and 20m long. In each sub-plot, species and number of mangrove tree, diameter in breast height, height of the trees, and soil condition are surveyed and recorded in every 5 years.

Report on mangrove condition

The Forestry Department (District) yearly makes a report on the mangrove condition in the regency, based on the monitoring report from the villages and the district department. The principal contents of the report are: condition of mangrove in each management area, result of the ecological monitoring, result of the monitoring conducted by villagers, and community forest development and its utilization. The report is sent to the Forestry Department (Prov.).

(4) Establishment of Communal Mangrove Production Forest

a) The needs for communal mangrove production forest

Since local people heavily disturb almost all mangroves in the Study Area, it is necessary from now on to decrease the human impact and to recover the mangrove. The mangrove cutting should be principally prohibited in existing mangroves; however, they are utilized in the daily life of local people as fuel wood and construction material. The communal mangrove forest is made for the purpose of supplying the wood resources to the local people.

Since the community mangrove brings about benefit to local people, the motivation for its formation by the local people will be high. Therefore, the mangrove planting is carried out by local people, receiving advice and support from local government.

b) Planning of communal mangrove production forest development

The draft of planning of communal mangrove production forest development is to be made by the mangrove management group with advice from the Forestry Department (District), and it is examined and approved in the village assembly. The approved plan is submitted to the mayors of municipalities and regencies through the head of District. After getting approval from the governor, the implementation stage

starts. In the process of the planning, the villagers receive technical advice from the Forestry Department (District).

c) Planting

Planting area and land preparation

It may be necessary to establish around 10 ha/100 families of communal mangrove forest. The ground where mangrove could be established is to be identified as the area of community forest.

Concerning the land preparation, it is not necessary in the area near the sea and inundated enough, because of the low salt concentration. However, in the area far from the sea and where salt concentration is high, the survival rate of mangrove seedling and seed is extremely low. This high concentration of salt is one of the critical causes for failure of mangrove planting. In such areas, before the planting, it is necessary to make drainage and conduct water from river in order to leach out salt. After planting, fences are set up around the perimeter of mangrove planting areas for protection against goats and pig grazing, if the necessary period required them.

Tree species

One of the important points for successful mangrove planting is selection of tree species. Suitable species for conditions of planting area should be selected. Rough guideline for the selection is shown in the table below.

Table 7.9 General Guideline for Selection of Tree Spices

Planting area	Mangrove species and utilization	
Area far from the sea (back part of mangrove)	*Avicennia* spp	firewood, fence
Middle part	*Ceriops* spp.	firewood, fence
	Bruguiera spp.	firewood, fence, board
	Sonneratia spp.	firewood, fence, board
Near the sea (front part of mangrove)	*Rhizophora* spp.	firewood, fence, board

Establishment of nursery and planting

In case of using propagule of *Rhizophora spp.*, *Ceriops spp.*, and *Bruguiera spp.*, it is taken from the mother tree and directly planted into the ground. In case of *Avicennia spp.* and *Sonneratia spp.*, which do not produce propagule, the seed is taken from the mother tree and planted in nursery, and the buds are replanted into

plastic bags to make seedlings. Otherwise, the buds taken from existed mangrove forest are directly replanted into plastic bags. It takes about 6 months for preparation of seedling from the seed. Water supply to the seedlings is most important task in the nursery management.

The planting is organized by the mangrove management group and conducted by villagers. Since the seedlings are severely affected by monsoon, the planting should be done during the month with weaker wind, which is March or April on the coast of Celebes Sea, while September or October on the coast of Molucca Sea. Generally the distance between planted seedlings is 1m by 1m.

d) Implementation for communal mangrove forest

After the planting, the mangrove management group coordinates the implementation of the management of communal mangrove forest. Until 6 months after the planting, replanting to the place where the planted seedling died should be done. After 10 years, the mangrove could be utilized. The mangrove management group regulates the amount of resource utilization, according to the mangrove regulation of the village.

If a villager wants to use mangrove wood, application is made to the head of village, stating the purpose of the utilization, amount, and cutting area. The application is then examined by the mangrove management group, and if approved, the villager can get the utilization permit from the head of the village. The amount of the utilization is recorded by the committee, and based on it the management plan of community forest in each year is made.

7.3.8 Prohibition of Coral Mining

One of the most damaging human activities on coastal environment seen in the area is coral mining. The coral rocks are utilized in various ways and mostly as construction materials, especially the base of houses, jetties, and roads. Coral rocks are also used for septic tanks, which are mainly installed in urban areas like Manado.

Coral rock are sold at around Rp 75,000 for 1 m^3 in 2000 which is an attractive, easy money for those who cannot earn much cash. If people continue to use coral rocks as construction materials, the society lose much value by deteriorating the coastal environment. It is, therefore, most urgent and most needed to stop this activity through strict enforcement of the presidential decree to prohibit coral mining.

Many strategies should be considered to stop coral mining. For example, community awareness should be raised on the impact of coral mining to the area development vs. individual gain. Secondly, the patrolling and monitoring should be strengthened by the community people to protect their area in the CBCRM project. Thirdly, the development of alternative materials for septic tank should be encouraged.

In the Pilot Project in this master planning study, one village (Raprap) took up the problem of public toilets as their priority issue, and planned to make 10 public toilets in the village. The toilets are made by concrete materials, easy to make and at reasonable cost. This type of toilets would be beneficial to the area, and should be encouraged by the local government authority.

7.4 Urban Environmental Management

7.4.1 Scope of Urban Environmental Management

(1) Targets for Urban Environment Management Plan

Urban Environmental Management in the master plan aims to minimize coastal environmental degradation caused by the population pressure from population concentration and industrialization in urban areas. The definition of urban areas referred in the plan is Manado and Bitung municipalities. Not only the degradation caused by pollution of coastal water by any kind of wastes from urbanization, but also inappropriate structures such as destroyed and unfinished structures and unmanaged urban facilities such as Manado port deteriorate the coastal environment from the viewpoint of townscape. The changing of townscape can be seen as a reflection of management level, so that townscape can be a management target for proper urban management

In this section, coastal environmental degradation includes water pollution and degradation of townscape in coastal urban areas.

(2) Management Problems

People have apprehension that Bunaken National Park is being affected by water pollution from Manado. The Study Team has very limited information regarding this matter. It is safe to say, however, that not only Bunaken National Park and its surrounding area but also Lembeh Island of Bitung will be influenced by increasing pollution load from urban areas in the future, if no pollution control is put in place. Water pollution is a combination of wastewater discharge from industries, commercial building, and households, and thrown garbage which contains toxic substances and high organic matters.

Population pressure demands more land to expand, and often gives an excuse for government to go for reclamation of coastal water. The reclamation of coastal water gives impacts on coastal environment.

Deterioration of townscape caused by inappropriate structures such as destroyed and unfinished structures and non-management of coastal facilities brings about not only obstruction of tourism and amenity utilization but also unsafe use of coastal areas and environmental degradation.

Four management problems on urban environmental management are summarized as follows:

- coastal environment is deteriorated by water pollution caused by discharging of waste water from households, commercial, industrial and other urban facilities;
- coastal environment is deteriorated by scattered garbage due to increasing generation of garbage and lack of sanitary structure and awareness;
- townscape of coastal urban area is deteriorated due to unfavorable building structures and poor maintenance such as unfinished structure, destroyed structure and disorderly facilities and structures by public and private sectors; and
- coastal water is vanishing due to land reclamation.

(3) Management Issues

Based on management problems in the aspect of urban environmental management, at least three management issues to address are identified to minimize pollution loads and impact of urban coastal environment. They are:

- to secure a balance between natural environmental conservation and urban development in coastal areas;
- to minimize pollution load into the sea from urban areas; and
- to improve and beautify townscape on developed coastal areas.

7.4.2 Strategic Approaches to Urban Environmental Management

The objective of urban environment management plan is "to achieve improvement of urban environment in the coastal area." In order to achieve this objective, the following strategic approaches should be taken in the urban environment management plan.

These strategic approaches are:

- to realize proper coastal urban use based on the features and potentiality of natural environmental, ecological, and geographical conditions;

- to minimize water pollution load in urban areas through development of sanitation facilities, implementation of proper pollution control of Manado and Bitung municipalities and raising awareness of people; and
- to improve the coastal townscape of Manado municipality as a tourism gateway of North Sulawesi through improvement of structures and facilities into environmental and scenic assets in the coastal areas especially Manado port.

7.4.3 Water Pollution Control in Manado and Bitung

The largest factor for the deterioration of the seawater quality and the conditions of the natural environment is the discharged wastewater, especially in the urban areas such as Manado and Bitung, where the big amount of discharged wastewater is generated from the households, market, industrial factories, and other facilities. The appropriate wastewater management should be taken in these urban areas, not only for improvement of the living environment but also coastal environmental conservation.

(1) Promotion of the Implementation of Planned Wastewater Management Plan of the Manado Municipality

Although Manado municipality already established a Wastewater Management Plan ("The Master Plan for Human Waste and Wastewater Disposal for the City of Manado, Directorate General of Cipta Karya, Department of Public Works, 1995"), this plan is not yet implemented well. The implementation of the wastewater management plan of the municipality of Manado needs to be promoted in order to minimize the deterioration of the seawater quality by wastewater.

a) Major components:

- development of sewage treatment system for Manado
- promotion of septic tank installation for toilet
- promotion of awareness for environment and sanitation

b) Proposed agencies in charge:

- Manado municipality should implement wastewater management plan.

(2) Formulation and Implementation of the Wastewater Management Plan for the Bitung Municipality

Water pollution of Bitung municipality is different compared with Manado. Bitung coastal water pollution with organic matters is not serious. However, Bitung coastal water has been polluted by spilled oil and industrial wastewater. Lembeh Island, which has healthy coral reef, is facing an urban area. It is possible that coastal water of surrounding

Lembeh Island will be deteriorated and affect the healthy coral reefs. It is necessary to implement Water Pollution Control Plan immediately.

a) Major components:

- development of sewage treatment system for Bitung
- water pollution control for industrial wastewater
- waste pollution control for domestic wastewater
- pollution control for bilge-water

b) Proposed agencies in charge:

Bitung municipality should implement wastewater management plan excluding bilge-water control. Bilge-water should be controlled by Bitung Port Authority and Head of Bitung Fishing port.

7.4.4 Improvement of Solid Waste Collection System in Coastal Areas

The major activity centers of both municipalities of Manado and Bitung are located in the coastal areas, and there are concentrations of markets, hotels, restaurants, land and sea transportation, and industrial activities in these areas. Therefore, these areas generate large amounts of solid waste, and are conspicuous to the people and visitors. In fact, there is lots of garbage scattered in these places, especially on the seaside roads, the shorelines, beaches, the areas around commercial buildings, etc. The waste collection system should be improved in these coastal areas.

(1) Promotion of the Implementation of Solid Waste Collection in Manado and Bitung

Solid waste management, especially waste collection in the coastal areas in Manado needs to be promoted in order to minimize the deterioration of the seawater quality, and clean the coastal areas, which are the international tourist gateway and center of the region.

a) Major components:

- solid waste collection for coastal beach zones
- solid waste collection system for port area
- solid waste collection for coastal water

b) Proposed agencies in charge:

Scattered waste on coastal area should be collected by Manado and Bitung municipalities. Solid waste of port area in Manado should be collected by Manado

Port Authority. In Bitung, on the other hand, floating garbage of Bitung commercial port will be collected by Bitung Port Authority, and that of Bitung Fishing Port will be collected by Department and Provincial Fishery Offices.

7.4.5 Beautification of Coastal Zone in Manado and Bitung

The coastal zones in both municipalities of Manado and Bitung are very important spaces for the socioeconomic activities of the people. The important commercial streets, ports, offices, industrial factories, tourist hotels and restaurants, and residential areas are located in the coastal zones of both municipalities. Beautification of these areas is important, because they also provide the spaces for pleasure and enjoyment of both visitors and residents as symbolic centers of the cities.

For the formulation of the beautification program, the aspects of the shoreline protection and environmental conservation are important, especially for the beautification of the seawall, seaside road and other structures in the coastal areas, in addition to the aesthetic aspect.

(1) Formulation and Implementation of Beautification Program for the Coastal Areas of Manado

Coastal Building Guidelines as design criteria should be established in order to prevent incoherent design of buildings and structures in the coastal area. It is required that these guidelines should be established in each urban area of Manado and Bitung by municipal governments, supported by PICMO, KICMOs, and Tourism Offices. The guidelines are basis for issuance of development permission to the private sector and other governmental agencies.

Coastal Building Guidelines prescribed are as follows:

- set-back of the building wall;
- building height and building ratio;
- recommendations on façade design, fence, color, plantation, signboards, etc.; and
- recommendations on the design of infrastructure.

The following are proposed:

1) Formulation of the beautification program for the most important coastal areas. The program includes improvement of the existing public works such as pavement of roads and sidewalks, side ditch, street planting and lighting, seawall, signboard, etc.

2) To regulate and maintain the existing and proposed building structures in good condition by respective public and private agencies, such as road pavements, drainage, waste bins, street lighting, planting, and buildings of hotel, restaurant, shop, residents, etc. based on the above design guidelines.

3) The beautification program of the coastal area along the Boulevard should be implemented with the other programs of recreational development of the waterfront of Manado, and beach and recreational development in Malalayang, which is mentioned in Section 9.3 of the Master Plan.

(2) Proposed Agencies in Charge:

Mainly Manado and Bitung municipalities should formulate Guidelines supported by PICMO, KICMO, Municipal Land Development (*Tata Kota*), Municipal Settlement and Regional Infrastructure Office (*Kimpraswil*) and other implementing agencies. Development permit will be issued from KICMO based on the guidelines.

7.5 Watershed Management

7.5.1 Scope of Watershed Management

(1) Targets for Watershed Management Plan

In watershed management, management target is the terrestrial area within a watershed connecting to coastal area. The term "watershed management" in the master plan is defined as management and control of land-based activities in rural areas in order to minimize pollution loads to coastal water. Major type of pollution source is non-point source such as discharged soil caused by agricultural activities, industrial activities and daily activities of people, although targets of pollution sources are point sources and non-point sources.

(2) Management Problems

Management problems regarding watershed management can be divided into two: sedimentation caused by discharged soil, and water pollution. It is obvious that the coastal ecosystem is deteriorated by inappropriate land-based activities, which can generate soil erosion, and then eroded soil washed into coastal water and covers coral reefs and other coastal areas. Other pollutants are toxic substances such as mercury and pesticide, and organic matters. Such toxic substances can be accumulated into organism. The coastal water is eutrophicated due to increasing nutrient salt.

Management problems on watershed management are summarized as follows:

- coastal environment is deteriorated by discharged soil caused by land-based activities and deforestation; and
- coastal environment is deteriorated by water pollution caused by inappropriate industrial activities and daily activities (generation of sewage and garbage).

(3) Management Issues

Based on the existing problems in the aspect of watershed management, at least three management issues to address can be identified for achievement of appropriate land use as follows:

- to manage watershed from the viewpoint of coastal environment conservation and coastal use;
- to minimize the amount of discharged soil into coastal waters; and
- to minimize pollution load to coastal areas from rural areas.

7.5.2 Strategic Approaches to Watershed Management

The objectives of coastal management plan is "to achieve appropriate land use" by related stakeholders. In order to achieve this objective, the following strategic approaches should be taken in watershed management plan. These strategic approaches are:

- to conserve watersheds and control water quality based on watershed units, which are facing coastal waters whose natural environment has been well-conserved, or the coastal area needs to be conserved;
- to preserve and conserve forest in steep areas, implement soil stabilization work in high erosion potential areas, and promote community based land management from the viewpoint of coastal environmental conservation; and
- to minimize pollution load such as sewage, human waste and solid waste.

7.5.3 Protection of Soil Erosion for Coral Reef Conservation

(1) Preservation and Conservation for Forest Area for Coral Reef Conservation

Possibility of soil erosion in the Study Area was already estimated in Chapter 2. Coastal Management Zoning for watershed conservation was also delineated in Chapter 6 including preservation, conservation and rehabilitation zones. The zones of watershed conservation are from the coral reef conservation point of view. In this section, objectives of watershed management is to minimize coastal environmental impact from the inland

especially eroded soil, therefore the methods of watershed management are proposed based on Coastal Management Zoning for watershed conservation.

Although the amount of eroded soil from forestlands in preservation zone and conservation zone is generally low, there could be high possibility of soil erosion, if land area is not conserved, for example, forest area becomes denuded area and/or converted to agricultural area. To control soil erosion, the forestlands should be preserved or adequately conserved, especially in the steep lands. Utilization of preservation zone and conservation zone was shown in Table 6.3 in Chapter 6.

(2) Soil Stabilizing Work in Rehabilitation Zone

In Coastal Management Zoning, rehabilitation zone where high possibility of soil erosion exists is delineated (see Chapter 6). Method of soil stabilizing works in rehabilitation zone can be divided into two: reforestation and construction of erosion control structures.

Inside the Forest Area, there are many degraded forests and grasslands. The Forestry Department (District) is in charge of reforestation program undergoing at the present. The program continues to increase and rehabilitate forest area and to reduce the amount of eroded soil. In the areas where severe erosion is observed, facilities to reduce the soil erosion, such as fences and check dams shown in Figure 7.13, are proposed to be established. Establishment of facilities in small scale, such as fences, is done by the local people, under the supervision of the Agriculture Department (District)

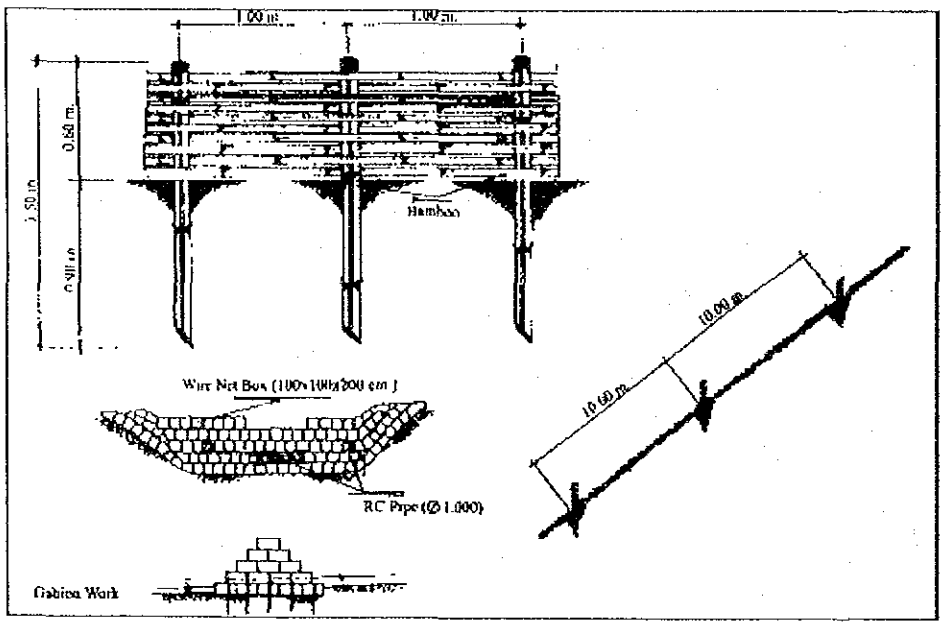

Figure 7.13 Examples of Erosion Control Facilities
(Bamboo fence and check dam)

(3) Guidance of Method of Soil Erosion Control to Local Farmers

In order to reduce the impact for coastal environment, some measures for soil erosion in high possibility areas of soil erosion are required. In existing soil conservation program, the BRLKT and the Forestry Department (District) conduct reforestation program in the forest areas, and the Agriculture Department (District) conducts regreening program out of the forest areas. In the reforestation program, some tree species, such as *Palaquium sp.*, *Talauma sp.*, and *Elmerilla sp.* are planted. The regreening program contains planting of fruit trees, terracing, agro-forestry system, and check dam construction. Based on these existing programs, the soil conservation plan is made as explained below.

a) Guidance of method of soil erosion control to local farmers

Farming techniques and systems explained below to reduce soil erosion are taught and transferred to farmers by the extension staff from the Agriculture Department (District). The farming techniques are practiced by local farmers.

Contour farming

In principle, any development activities including agriculture are prohibited in steep slope area. However, people encroach into mountains and hilly areas. Then, before you know it, people already live and cultivate steep slope areas.

By the planting of crops along the contour in steep slope area, the amount of soil erosion will decrease. At the same time, it is more effective to reduce the erosion if furrows are made along the crops.

Intercropping

In a farm, several crops are planted between main crops. The amount of erosion is reduced following the increase of land cover by means of intercropping.

Mulching

Mulching by use of organic materials, such as straw, sprig, and grass, is effective to reduce the amount of soil erosion. They also serve as organic fertilizer.

Terracing

On steep slopes, terraces are constructed along the contour in order to reduce the erosion and catch the eroded soil.

Edge planting by tree species

Trees are intensely planted around a farm in order to reduce the erosion and catch the eroded soil.

Agro-forestry

By the mixed planting with annual crops and perennial plants like trees and coconut, the amount of soil erosion will decrease.

b) Environmental education

According to the result of the Rapid Inland Community Survey done by the Study Team, there are few villagers who recognize that the soil erosion from upper watershed affects the coastal environment. It is important to educate the local people to know the relationship between environmental degradations in upper watershed and coastal area, and the importance of soil conservation. The extension staffs from the Forestry Department (District) and the Agriculture Department (District) visit villages and educate, cooperating with the organization of village autonomy, schools, and churches.

c) Soil conservation in clove plantation

In clove plantations, the ground cover by weed is strongly related to the amount of soil erosion because clove plants are planted not so intensely. In case the market price is low, the amount of soil erosion is relatively low, because the plantation is left without appropriate management and is covered by dense weed. On the contrary, in case the price is good, severe soil erosion would occur because the weeds are cut and the land cover becomes sparse. The amount of soil erosion in the clove plantation is strongly influenced by the economic situation. (The Study on Critical Land and Protection Forest Rehabilitation at Tondano Watershed (DF), JICA, 2001).

To control the soil erosion in the clove plantation, some measurers, such as the establishment of fences in the plantation and the introduction of agro-forestry system should be taken. Regarding agro-forestry in the plantation, the intercropping of vanilla between clove trees is recommended. Covering the ground by the leaves, the vanilla grows with clove trees as crop.

7.5.4 Pollution Control for Coastal Management

(1) Expansion of Community Toilet and Promotion of Toilet Use

This issue is discussed in "Section 9.4 Improvement of Rural Coastal Community Living Environment."

(2) Clean-up of Beach by Communities

It is commonly known that scattering garbage gives rise to deteriorated coastal environment through water pollution and gets entangled and sedimented with/on corals, mangroves and others.

It is easily seen that community people throw garbage into the sea and/or beaches. Therefore, it is important for communities to take action against throwing garbage in order to conserve the environment of community coastal water. In order to realize this target, promotion of people's awareness through workshop and beach clean-up event should be realized as soon as possible.

(3) Controlling and Reducing the Amount of Agricultural Chemicals

In the study area, the land which uses agrochemical relatively in big quantity are vegetable farms and wet paddy fields. The vegetable farms are mainly distributed in the highlands, such as Tomohon and Modindin. The wet paddy fields are distributed around Tondano Lake and Kotamobagu. These farms and paddy fields are located relatively far from the coast, and their area is not so large. In the coconut plantations which are distributed widely in the study area, a little agrochemical and fertilizer are applied. Therefore, the areas of source of agrochemicals are relatively small and far from the coast. However, considering negative impacts to the coastal environment, the amount of agrochemical applied should be reduced.

At present, some effort to reduce the agrochemical use by UNSLUT and the Agriculture Department (District) are seen, as shown below. This should be continued, and techniques should be extended to local farmers to gradually reduce the amount of agrochemical use.

a) Experimental use of bio-pesticide and natural enemies

Some materials extracted from some plant, such as *Derris sp.* and *Datura sp.*, are experimentally utilized for pesticide to be applied to vegetables and flowering plants in Tomohon. Some natural enemies are utilized for harmful insects. For example, in

Tomohon and Modindin, *Diadegma eurocephaga* (natural enemy) is utilized to exterminate *Plutela xylostella*.

b) Dissemination for local peasants

The Agriculture Department instructs the local peasants to apply less amount of agrochemical. Dissemination program for coastal management is described in Chapter 8.

c) Use of organic fertilizer

Organic fertilizers, such as chicken droppings and compost, are used in some farms in Tomohon. Release of nitrogen and potassium from these fertilizers is less speedy than that from chemical fertilizers.

7.6 Coastal Ecosystem and Marine Wildlife Conservation Management Plan

7.6.1 Scope of Coastal Ecosystem and Marine Wildlife Conservation Management

(1) Targets for Coastal Ecosystem and Marine Wildlife Conservation Management Plan

Management targets for coastal ecosystem and marine wildlife conservation management are divided into two as follows:

- coastal ecosystem; and
- marine wildlife such as endangered species.

The structure of coastal ecosystem is composed of water bodies (sea water and fresh water), seabed and its materials, organism (nekton, plankton, foulings, benthos etc.) and physical forces (water temperature, climate, current, waves etc.). To protect coastal ecosystem and habitats, at first, these elements of coastal ecosystem are deemed as one system which functions as an organic cycle, then the system is managed for protection as one system. Next, marine wildlife is one of indicators for coastal environmental and ecosystem conservation. Coastal natural environment and ecosystem are conserved through protection of target marine wildlife. In North Sulawesi, *Dugong dugon* and sea turtle, which are endangered species, can be used as indicator for coastal environmental conservation.

(2) Management Problems

Major management problems are deterioration of coastal natural environment and ecosystem as habitat, caused by destructive activities and inappropriate human activities. In addition, people still catch and kill endangered wildlife especially *Dugong dugon*. However, it is unclear whether *Dugong dugon* are under critical situation or not because data on their number and habitat in the Study Area is very limited. Management problems on coastal ecosystem and marine wildlife conservation management are summarized as follows:

- habitat of marine wildlife and ecosystem is deteriorated caused by human activities;
- marine wildlife especially *Dugong dugon* is not protected by people due to lack of environmental awareness for endangered species; and
- no effective management for protection of marine wildlife due to lack of scientific information.

(3) Management Issues

Based on the existing problems in the aspect of coastal ecosystem and marine wildlife conservation management, two management issues to address can be identified for achievement of protection of marine wildlife and its habitat as follows:

- to protect coastal ecosystem and habitat of marine wildlife; and
- to protect marine wildlife against inappropriate human actions.

7.6.2 Strategic Approaches for Coastal Ecosystem and Marine Wildlife Conservation Management

The objective of coastal management plan is "to achieve protection of coastal ecosystem and marine wildlife" by stakeholders in the coastal area. In order to achieve this objective, the following strategic approaches should be taken in coastal ecosystem and marine wildlife conservation management plan. These strategic approaches are:

- to protect ecosystem and marine habitat based on area management;
- to protect coastal ecosystem and marine wildlife effectively based on scientific data through scientific survey and monitoring by stakeholder participation; and
- to involve local governments, communities and academic institutes for coastal ecosystem and marine wildlife conservation management including monitoring.

7.6.3 Strengthening of Research and Monitoring

Coastal Environmental monitoring for coastal management has not been conducted in North Sulawesi, although some academic purpose studies or irregular surveys were conducted. However, coastal environmental monitoring is an important and indispensable tool for effective coastal management. Coastal environmental monitoring aims to:

- evaluate the existing site of coastal environmental conditions;
- prohibit certain uses of the coastal area or issue warning to users, as necessary, depending on the result of above evaluation;
- identify sources of impacts and pollution, and causes; and
- evaluate the current policies and measurements to manage the coastal area.

Table 7.10 Monitoring Parameters for Coastal Management

Monitoring Components	Monitoring Sub-Components	Parameter	Frequency
Water Quality	Basic parameter	water temperature, salinity, transparency, pH, DO, SS, COD, NH4-N, No2-N, NO3-N, T-N, PO4-P, T-P, Total coliform, Fecal coliform	12 times/year
	Toxic parameter	Cd, Pb, Cu, Zn, T-Hg, As, Cr (VI)	2 times/year
Sediment	Basic Parameter-1	OPR, Ignition Loss, COD, sulfide	4 times/year
	Basic paramter-2	particle size distribution	1 time/year
	Toxic parameter	Cd. Pb, Zn, T-Hg, As, Cu	1 times/year
Reef Fishes	Coastal fishes	species and density of fishes	4 times/year
	Fish catch	catch in number, catch in weight from fishery resources survey (see "7.2 Coastal Resources Use Management)	-
Coral Reef	Spatial distribution	distribution of coral, live coral ratio	1 times/year
	Quantity	line intercept transect	2 times/year
Seagrass Communities	Spatial distribution	distribution of coral, live coral ratio	2 times/year
	Quantity	Quadrat survey	2 time/year
Mangrove forest	Spatial distribution	distribution of mangrove forest, density and height of mangrove forest	1 time/year
Marine Wildlife	*Dugong dugon*	habitat (Dugong sightings) from interview survey	1 time/year
	sea turtle	nesting beach from interview survey	1 time/year

Source : JICA Study Team

7.6.4 Habitat Conservation

(1) Establishment of Provincial Protected Areas as Provincial Marine Park in Lembeh Island and Belang-Kotabunan

The Study Team has identified that the areas with most healthy coral reef in North Sulawesi are Molas (Manado), southern tip of Lembeh Island (Bitung) and Putus putus (Minahasa). Molas area is located in Bunaken National Park. The other two areas, southern tip of Lembeh Island (Bitung) and Belang (Minahasa), are still comparatively well-conserved, although size of conserved coral communities is smaller than Bunaken National Park. Distribution of seagrass beds is also conserved on shallow waters.

Indonesian Protected Area System, although only national parks are prescribed, aims to protect natural environment and ecosystem at the national level. The Study Team recommends the establishment of a protected area management policy for conservation of natural environment, ecosystem and land/seascape at provincial level as provincial protected area. Municipal and regency level of conserved areas shall also be established as municipal/regency protected areas. The reason that protected area should be established legally under regulation as legal bases is as follows:

- It makes possible the local government to be responsible for protection of the preserved areas;
- It makes possible legal punishment regulations/rules to be made;
- Budget allocation for protection can be secured; and
- It makes clear for the public the protected areas.

The following provincial protected areas are proposed by the Study Team.

- Provincial Lembeh Marine Protected Area; and
- Provincial Belang-Kotabunan Marine Protected Area.

The profiles of the above areas are as shown below.

Table 7.11 Profiles of the proposed Provincial Marine Protected Areas

	Lembeh Island	Belang - Kotabunan
Location	Kecamatan Bitung Selatan in Kota Bitung	Kec. Belang in Kab. Minahasa & Kec. Kotabunan in Kab. B. Mongondow
Number of coastal communities	10	10 (8 villages are in Kab. Minahasa)
Population in 2000	15,931	18,468
Length of shoreline	110 km	45 km
Types of shoreline	Rocky shores and partly sandy beaches	Sandy beaches and partly rocky shores
Sea water surface *1)	110 km^2	120 km^2
Coastal land surface *2)	22 km^2	9.0 km^2
Dominant land use	Coconut palm plantation	Mixed coconut palm plantation and extensive agricultural farms
Coral reefs with excellent and good conditions *3)	28.5 ha	12.5 ha ?

Source: JICA Study Team

Note: *1) the coastal water areas involve up to1 km in Lembeh Island and 5 km off-shore in Belang – Kotabunan area, and *2) the coastal land areas involve up to 200 m landward for both areas.

The locations of the proposed provincial protected areas are shown in Figure 9.1 in Chapter 9 of this report.

a) Rationale for establishment of Provincial Protected Areas

Provincial Lembeh Marine Protected Area

The Lembeh Island is facing Bitung municipality over Lembeh strait. The Lembeh Island stretches in a north-south direction and has a shoreline of 92.22km; the size of the island is 55.28km^2. The coastal areas along the Lembeh Island are rich in coral reefs in good condition; especially in the south part of the island, there are beautiful coral reefs with excellent condition at around Tj. Kubui and Pulau Napokeling. These places provide diving attractions of beautiful live corals and fishes. There is a calm bay at Walenikoko, good for coastal recreational development.

There are good coral reefs also in the north part of the island, where one can enjoy diving to see not only ordinary coral fishes and other marinelife, but also rare ones, especially some type of sea slugs. In addition to the above places, the good coral reefs and white sandy beaches also can be found in several beaches along the coastal line of the Island. The northwest side of the island has hard corals and soft coals on the sea bottom made of volcanic ashes. This is very unique under-water scenery.

Also on the steep slope geography, many different layers of animals are seen in a narrow area and it gives the uniqueness of the area.

The objectives of the plan are to establish and manage the Provincial Marine Protected Area in Lembeh Island to conserve the coral reefs and other coastal natural environment, and at the same time, to regulate and promote the tourism and other development and activities in the Marine Park in sustainable way.

Figure 9.2 shows the development image of the proposed Provincial Marine Protected Area of the Lembeh Island.

Provincial Belang-Kotabunan Protected Area

The coastal areas around Belang to Kotabunan are rich in coral reef in good condition. Its good condition is attributed to the bad access from urban areas like Manado. Between Basaan and Ratatotok, there are calm bays of Teluk Ratatotok, Teluk Bohungan, Teluk Totok, with several small islands, which provide beautiful scenery of the coastal area. Complex shoreline as geographical characteristic gives this area a unique feature. One of the three coral reef areas with excellent cover ratio (more than 76%) is seen in this area. Also, good cover coral reefs exist in this area, so that it can be described as an area with healthy coral reefs distributed in the Study Area.

The complex shoreline is composed of sandy beaches, rocky reefs, and mangrove forest stretching into inland; also underwater, sea grass belts are laying in relatively long area along the coast. The area is evaluated as one of the most diverse ecosystem area which has a variety of marinelife and unique underwater scenery.

Therefore, it is reasonable to say that the area has healthy condition to be decided as a core zone to preserve its ecosystem at provinciai level.

The objectives of the plan are to establish and manage the Provincial Marine Protected Area in Belang - Kotabunan Area to conserve the coral reefs and other coastal natural environment, and at the same time, to regulate and promote the tourism and other development and activities in Protected Area as Marine Park in sustainable way.

Figure 9.3 of Chapter 9 shows the development image of the proposed Provincial Marine Protected Area of the Belang – Kotabunan area.

b) Management bodies for provincial protected area.

The above-mentioned areas have been conserved well, so that they should be established as Provincial Protected Areas by provincial regulation. However, it is reasonable that Provincial Protected Areas should be established by Provincial Government, and managed by municipal/regency governments. Therefore, roles of government are as follows:

Table 7.12 Roles of Government in the Protected Areas

	Lembeh Protected Area	Belang-Kotabunan Protected Area
Establishing Bodies including formulation of management guidelines	North Sulawesi Provincial Government	
Management Bodies	Bitung Municipality	Minahasa Regency Bolaang Mongondow Regency
Fund Resources	North Sulawesi Province/ Bitung Municipality	Minahasa Regency Bolaang Mongondow Regency

c) Management methodology

Management methodology for Provincial Protected Area is as follows:

- Management zoning should be adopted for the provincial protected area management;
- Community people should be involved in the protected area management including operation; and
- Sharing of coastal management: entrance fee can be collected from tourists, and should be used for protected area management, not for general expenditure.

d) Sharing of Coastal Management

Financial Support by Sharing the Management Cost in the Provincial Marine Protected Areas

The objective of the plan is to provide financial support from the private tourism companies, which are operating in the Park and are benefiting from the Park, to the cost of park management of the Provincial Marine Protected Area.

Implementation agencies are as follows:

- PICMO and KICMOs coordinate with the private tourism companies, which are going to operate the tourist facilities and services in the Park; and
- PICMO is responsible for issuing licenses to the private tourism companies to operate tourism services in the protected area and for imposing charges to the private companies.

Sharing the Day-to-Day Management of the Provincial Marine Protected Areas

The objective of the plan is to provide human and other resources in the private tourism companies for day-to-day management work in the Parks.

Components:

- share the management programs of day-to-day monitoring, such as watching the people's activities, ad-hoc checking of the coral reefs in the Park;
- cleaning and beautification of the tourist areas;
- visitor education on protection of coral reefs and coastal management; and
- cooperation in the installation of buoys, tourist trails and signboards, etc..

Implementation agencies:

- The Marine Protected Area Management Offices prepare the programs for the day-to-day monitoring, cleaning and beautification of the tourist areas, development programs of installation of buoys, tourist trails and other basic visitor facilities; and
- The private tourism companies shall contribute to the park management programs.

(2) *Establishment of Certified System for Diving Operators and Boat Operators for Tourism*

Tourism sector utilizes the coastal environment as tourism resources. However, tourism activities such as boating and diving affect the coastal environment because of anchoring, trampling and touching. Certified system for diving operators and boat operators aims:

- *to minimize coastal environmental impacts from tourism activities;*
- *to interpret coastal environment and ecosystem situation for tourists; and*
- *to enlighten awareness of tourists for conservation of coastal environment.*

a) *Issues of certification*

Diving and Boat operators, who take a training course, can receive certification from PICMO or other incorporated agencies such as North Sulawesi Sport Diving Association. Certified operators should have knowledge of coastal environment and how to conserve coastal environment. It is recommended that only certified diving and boat operators can work in North Sulawesi in order to carry out sustainable coastal use.

The valldity of this certification is for one year only. After one year, certified operators should take refresher training.

b) Training program

Training course for certification of diving and boat operators includes:

- basic knowledge of conservation of coastal environment and ecosystem;
- related regulations;
- guidelines for coastal management including management zoning and coastal spatial use plan); and
- official procedure of tourism operation (reporting, collection of entrance fee).

7.6.5 Marine Wildlife Protection

Endangered marine wildlife is identified in North Sulawesi such as *Dugong dugon* and sea turtle. Although the Study Team had limited information on the marine wildlife, it is generally right to say that marine wildlife is not conserved well. Especially, *Dugong dugon* still has been caught and eaten even inside of Bunaken National Park. There are two types of control for marine wildlife conservation such as direct control and indirect control as follows:

- Direct control : prohibition of catching and consuming
  prohibition of trading
- Indirect control : conservation of habitat
  regulation of utilization

Indirect control aims to conserve habitat of marine wildlife (this matter was described in "7.6.4 Habitat Conservation"). With regard to direct control of marine wildlife, scientific research on marine wildlife and enlightenment program for conservation are recommended as follows:

a) Scientific research

It was mentioned that information on wildlife of North Sulawesi is limited. It is required that scientific research for marine wildlife be carried out in order to manage coastal environment effectively. The following research work is proposed:

Dugong dugon: preparation of inventory of grazing ground by interview survey, field reconnaissance and tagging of Dugong
Sea turtle : preparation of inventory of nesting beaches through interview survey, field reconnaissance surveys

b) Promotion of conservation awareness

It is necessary that people's behavior should be changed for conservation of marine wildlife. This should be conducted by government agencies and NGOs. The targets are fishermen who work around coral reef areas and community people