# MODULE 2

## Theoretical structure of fisheries co-management in Indonesia

# ECOLOGICAL FACETS IN ADAPTIVE FISHERIES CO-MANAGEMENT IN INDONESIA

## *ECOLOGICAL SUSTAINABILITY IN FISHERY CO-MANAGEMENT*

Sustainable fishery development strives to satisfy the needs of the present generation without sacrificing the needs of the next generation. In Indonesia, sustainable development should maintain equal interactions between the facets of economic viability, socio-political acceptability and ecological compatibility (Figure 2.1). Furthermore, to be accepted on a socio-political level as a form of sustainable development, all fisheries management activities must also be ecologically compatible. Fisheries co-management should also reinforce the principles of the ecosystem approach to fisheries that was agreed to during the Fourth Meeting of the Conference of the Parties to the Convention on Biological Diversity (Bratislava, Slovakia, 4-15 May 1998, UNEP/CBD/ COP/4/Inf.9).

## *THE ECOSYSTEM APPROACH AND FISHERIES CO-MANAGEMENT*

Fisheries management is essentially a way of managing natural resources and biodiversity. Therefore, it should incorporate principles of the ecosystem approach. Principles 1, 2, 3, 9, 11, and 12 in Box 2.1 show that to achieve the noble purposes of an ecosystem approach to fisheries management, cooperation between government and users of fisheries resources is required. Cooperation and sharing responsibility between government and local users is the main characteristic of fisheries co-management.

FIGURE 2.1

**Three facets of sustainable development**

BOX 2.1

**Adaptation of 12 principles of the ecosystem approach to fishery co-management**

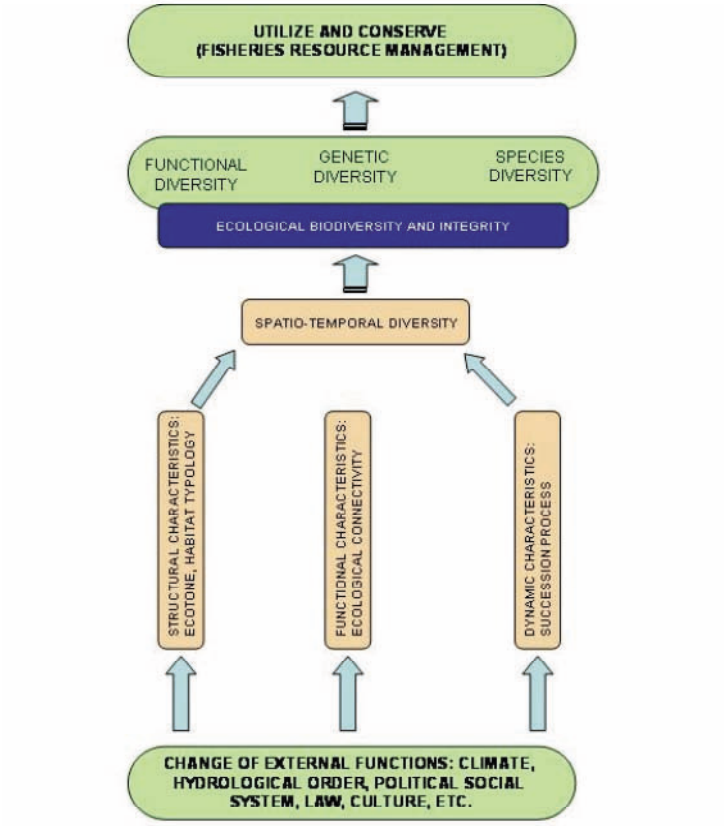
1. The goal of fishery management must be agreed to by the society.
2. Management must be decentralized to the lowest possible level.
3. Ecosystem management must consider the impact of an activity on the adjacent ecosystem or on another ecosystem.
4. In order to appreciate the potential benefit of any fishery management action, it is necessary to understand the ecosystem in an economic context, considering for example, mitigating market distortions, aligning incentives to promote sustainable use and internalizing costs and benefits.
5. One of the key characteristics of the ecosystem approach is the conservation of the structure and function of the ecosystem.
6. Ecosystems must be managed within the limits of their functioning.
7. The ecosystem approach must be applied at an appropriate level.
8. Ecosystem characteristics change over time. Therefore, recognizing the varying temporal scales and lag effects, objectives should be set for the long term.
9. Fishery stakeholders should be convinced that change is something that must occur.
10. An ecosystem approach to fishery management must find equilibrium between conservation and exploitation.
11. An ecosystem approach must consider all forms of relevant information, including innovation and scientific practice, original knowledge and local wisdoms.
12. Fishery management with an ecosystem approach must incorporate all sectors of the community, as well as scientific discipline.

*Source*: Malawi principles for the ecosystem approach. Formulated during a Workshop on the Ecosystem Approach (Lilongwe, Malawi, 26-28 January 1998), and presented at the Fourth Meeting of the Conference of the Parties to the Convention on Biological Diversity (Bratislava, Slovakia, 4-15 May 1998. UNEP/CBD/ COP/4/Inf.9).

Fisheries management is a human endeavour that strives to exploit natural resources while trying, as far as possible, to preserve and maintain ecological integrity and connectivity (Figure 2.2). A fishery system is influenced by external factors beyond the system itself. Among these factors are climate, the hydrology system, legal and cultural systems. Therefore, changes to external factors may lead to several other changes, namely: (1) changes to the ecosystem structure that can change habitat type; 2) changes of functional characteristics, such as change of ecological connectivity; and 3) changes to the ecosystem's dynamic characteristics that may emerge in the form of a succession process. The three forms of changes will subsequently influence the diversity, physical, chemical and biological characteristics of the ecosystem, and possibly its temporal and spatial characteristics. On a different level, spatial-temporal diversity will influence natural diversity and ecological integration and those changes will subsequently affect the fisheries stock; either changing the stock diversity in relation to its function in the food chain, biogeochemistry cycle or other ecological functions. Eventually, all those changes will culminate in the preservation and utilization processes of the fisheries resource that constitutes the focus of fisheries resource management.

FIGURE 2.2

**Diagram of fishery management viewed from the perspective of resource use and conservation in the context of maintaining the relevant system of ecological connectivity and integrity**




*ECOLOGICAL INTEGRITY*

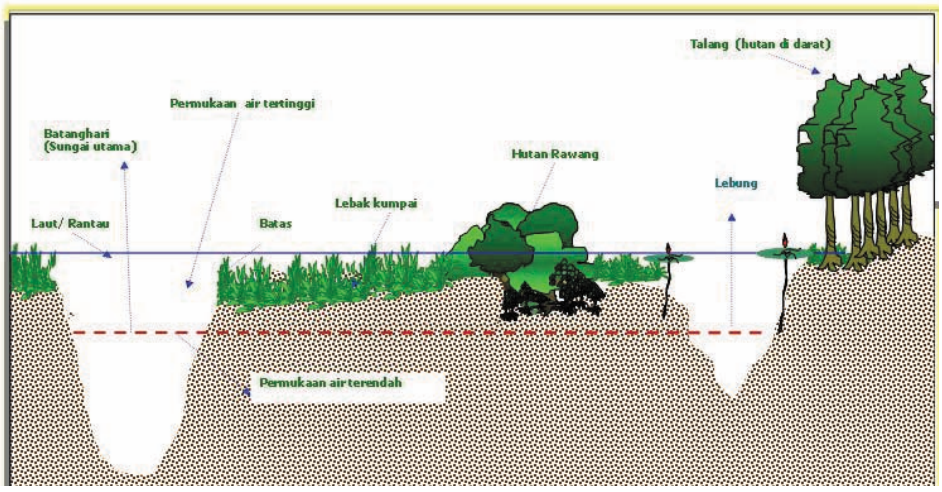
Ecological integrity in an aquatic system means that water continues to show characteristics similar to the type of ecosystem found in a similar geographical area. For example, the aquatic ecosystem of Lebak Lebung in South Sumatra Province can be categorized as having good ecological integrity if there are still habitats commonly found in the same type of water within the same geographical area (Figure 2.3). The organisms living in the mentioned habitats must also have a structure and pattern of behaviour similar to the structure and behaviour of biota in the same type of water ecosystem (film demonstration 2.1). In general, intact water ecosystems have structural and ecological functions and a good state of ecological integrity.

In the context of modern fisheries management, the ecological integrity of an

aquatic system is a characteristic that should be monitored, understood and continuously maintained. Community users of fishery resources are the community members who are dealing with the resources on a day-to-day basis, so they are very well suited to act as the observer. They are sometimes able to recognize naturally occurring phenomena that are not quickly identified by modern science. In a fisheries co-management framework, therefore, the roles of government are to provide a format, institutional framework, and formal organization to store, process and utilize the knowledge and information.

FIGURE 2.3

**Types of habitat commonly found in *Lebak Lebung* (flood plain) in South Sumatra (Hartoto, 1992)**

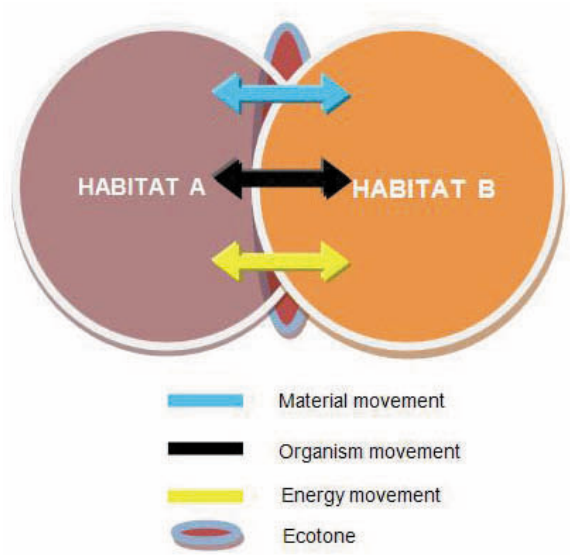



*ECOLOGICAL CONNECTIVITY AND CONSERVATION EFFORTS*

The habitats in an aquatic ecosystem are adjacent to each other. The ecological characteristics of the site that is adjacent to the border of a neighbouring habitat generally shows some characteristics of each habitat. This site is referred to by the term "ecotone" (Figure 2.4).

FIGURE 2.4

**Diagram of ecological connectivity describing interaction of material, energy and organisms moving across the ecotone.**




The ecological connectivity in a water ecosystem is easily disturbed by, for example, the construction of a dam in a river, the conversion of mangrove forest to fish/shrimp culture ponds, the construction of a road that crosses a flood plain, and many other causes. Even damaged fishing nets that are not lifted from the water column may cause damage to ecological connectivity because they disturb fish movement. Within the fisheries co-management regime, fisher folk, in cooperation with the government, can play a role and share the responsibility of securing the sustainability of ecological connectivity in a fisheries system.

In line with the mandate of Fisheries Law No. 31 of 2004, fishery management is advised to incorporate mechanisms to support ecosystem conservation, species conservation and genetic conservation. In the past, conservation was understood in a narrow sense as an activity of natural resource preservation, i.e. in the sense that natural resources should not be used at all, should be managed in the unexploited form so as to be preserved in their original condition for as long as possible.

However, in the context of Indonesian fishery management, conservation is defined as the management of water resource exploitation in such a way that we can obtain the maximum sustainable benefit for the present generation, while maintaining the potential of the resource to satisfy the needs and aspirations of future generations. In fishery management, conservation includes the protection, mitigation and rehabilitation of fish resources and their environment (Box 2.2).

BOX 2.2

**Definition of protection, mitigation and rehabilitation for the purpose of applying conservation principles to Indonesian fishery management**

| | |
|---|---|
| **Protection:** | human efforts to prevent further damage to an aquatic resource by limiting development activity. |
| **Mitigation:** | human efforts to reduce the impacts of development activity on aquatic systems by way of retaining some natural diversity (physical and biological aspects), by limiting certain activities in the aquatic environment. |
| **Rehabilitation:** | an activity that aims to recover the structure and function of physical and biotic diversity by re-establishing the patterns that existed prior to the initiation of development activities. |

*Source:* Hartoto, 2004

*THE ROLE OF THE COMMUNITY IN PROTECTION, MITIGATION AND REHABILITATION*

In several parts of Indonesia, traditional wisdoms based management in such a way to maintain the ecological integrity and connectivity of ecosystems, as well as protect, mitigate and rehabilitate fishery resources and their environment. In fact, anthropological research suggests that traditional wisdom was used hundreds of years ago to conserve and manage fisheries resources. For instance, at Prambanan temple, the relief on the wall of the temple depicted a big fish with very large scales, which is thought to be of the genus *Tor spp.* According to anthropological information, the fish was only allowed to be eaten by common people after it was touched by the hand of king. This is an example of traditional wisdom related to conservation of fisheries resource in the past. The following chapter describes the application of conservation principles that were implemented in a participatory way between local users of resources and the government.

*THE SANCTUARY SYSTEM AT JAMBI PROVINCE: CO-MANAGEMENT IN THE PROTECTION OF FISH RESOURCES*

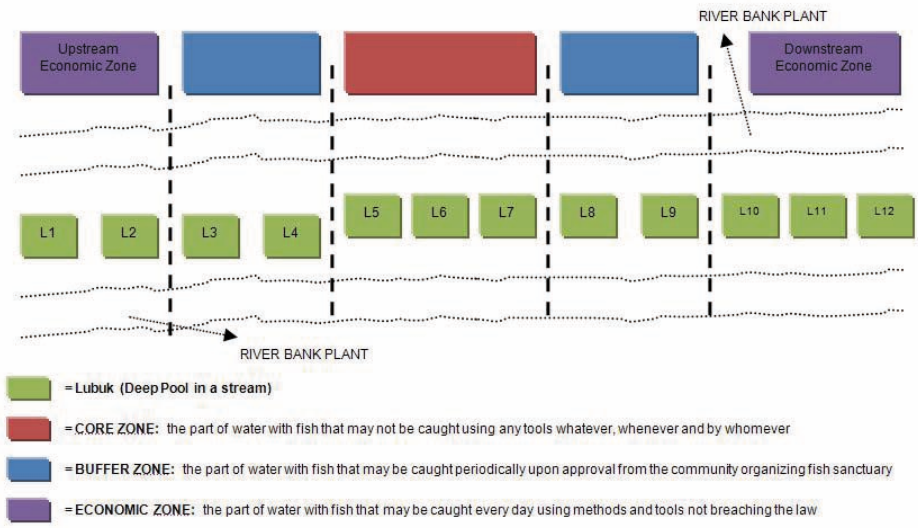
Since 1995, the Fisheries Provincial Services of Jambi Province, together with the local community, have developed a modern terrestrial and aquatic fishery sanctuary system. This system has used broodstock to re-seed fish stocks, generating a buffer population of fish which may be caught by fishers. The sanctuary is zoned for different uses.

The application of the metapopulation concept is realized by the establishment of a zoning system within the fishery sanctuary. A metapopulation consists of a group of spatially separate populations of the same species which interact at some level. Metapopulation theory emphasizes the importance of connectivity between seemingly isolated populations. Although no single population may

be able to guarantee the long-term survival of a given species, the combined effect of many populations may be able to do this.
A diagram of the zoning system that is used in the sanctuary is presented in Figure 2.5. There are four fishery sanctuary systems in Jambi Province. All are managed by a co-management system which has been established between the Fisheries Provincial Services and the local community (Hartoto, 2000).

FIGURE 2.5

**Zonal management of a riverine fishery sanctuary in Jambi Province**




*THE FISHERFOLK OF MINA BADA LESTARI: MITIGATION IN MANINJAU LAKE*

Following mediation by the Centre for Limnology Research (LIPI), a fishermen's union, Mina Bada Lestari, has collaborated with the marine fishery office Agam Regency in establishing the Bada Fish (*Rasbora argyrotaenia*) management plan in the 9 800 ha of Maninjau Lake. One aspect of the management activity is the construction of ten units of *Rasau* (an enclosure made of branches which is designed according to the traditional practice of the community) as a kind of fish-attracting device (Figure 2.6). Through meetings with members of the fishing community at Maninjau Lake, agreement was reached that of the ten *Rasau* enclosures, three have been earmarked as core zones where fish may not be caught at all. This is in an effort to protect the stock of Bada fish.

The establishment of the *Rasau* enclosures is a good example of a fishery mitigation activity that has been established through co-management between the government and resource users in order to protect a valuable fish stock (Bada fish realizes a price of US$25 /kg when it is smoked.)