INLAND FISHERIES
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This document highlights the special characteristics of inland water fisheries and the challenges involved in making sure that fish resources and fish supplies are protected. It describes general environmental management objectives and specific fishery practices. It states that generally management decisions regarding the environment are taken outside the fishery sector. It also provides advice on how inland fisheries can be managed in such a way to benefit people and the environment. The document then gives some suggestions on management options that allow sharing of responsibilities.

Introduction

Rivers, lakes, reservoirs, swamps and other wetlands are known as inland waters. Traditionally, the fish in rivers and lakes were used for food and for local sales or trading. But the nature of inland fisheries is changing. The waters are now often shared with many groups of people who are not involved in fishing. These groups are associated with large projects and industries such as dams, mining and agricultural irrigation schemes. These activities often bring in much more money than fishing activities. However, these projects can pollute and otherwise damage natural environments, including fish habitats, and bring significant change to the life of local residents. Some conservation groups are reacting to increasing environmental damage, and often ask for restrictions to be placed on some or all of the activities that affect rivers. These restrictions sometimes benefit fisheries, but may also limit fishing and, as a result, cause problems for fishing communities.
While there are certain things that should be done to minimize environmental damage and higher amounts of fishing, communities that depend on fishing do not usually have enough influence to determine the way waters are managed. Since governments and developers believe more money comes to an area through non-fishery uses of inland waters, fishers tend to be seen as less important, and their activities are often given lower priority, often the true value of inland fisheries is not known. While everyone living around inland waters, including those engaged in fishing operations, is entitled to have their needs considered, all residents should take responsibility for conserving the natural resources of inland waters.

The environment of inland fisheries

If countries are to act in a responsible way they should protect fish habitats and other natural resources (that is, the environment) from destruction and pollution. They should also try to plan activities in such a way that damage from human activities is minimal. When we talk about managing inland resources we are really talking about planning the way that resources such as rivers and lakes and the surrounding landscape are used by people.
Developing policies to safeguard the environment is usually the responsibility of national governments. Sometimes this responsibility extends beyond national borders because river or lakes, for example, can cross several countries or national border lines. When this happens there should be international cooperation among the countries.

Where fisheries projects exist in waters shared with other countries, international agreements are needed when fishing activities in one country affect those activities in another country. For example, migrating fish may no longer appear in countries located downstream if the waters upstream are over fished, if environments are heavily polluted or if dams across rivers block fish movements up and down the river. Countries that share inland waters have a responsibility to make sure that they follow international laws and agreements about how these waters should be used. To be successful, both international agreements and domestic policies concerning the use of inland waters should be based on an understanding of how development activities affect the natural environment.

When large projects such as dams, mining or agriculture are being planned, it is very important to make sure that fishing interests in inland waters are considered. While it is difficult to predict how different uses of inland waters will affect the environment, countries should do all they can to estimate the extent of environmental damage by undertaking studies such as environmental impact assessments. Such studies are designed to identify biological and social changes that will result from development projects. After the impacts have been identified, a project may be cancelled or corrective actions can be planned. For example, negative impacts from an industrial project that pollutes inland waters can be offset by measures to control pollution and to rehabilitate fish habitats.
In talking about impact assessments we should be aware that they should not focus solely on the environmental effects of a single project. Rather they should, as far as possible, assess the collective impacts of projects. In other words, how will all the activities in a given area affect local resources and local populations? These studies should be done by national governments or by local project managers.

One way to safeguard fishing interests is to develop plans that deal with the needs of everyone using inland resources. Organizations should be established as a means for individual fishers or other stakeholders (that is, people that have an interest in inland fisheries) to express their views and concerns regarding changes to their environment. The stakeholders should be encouraged to attend meetings when important issues are being discussed and they should be given access to studies and reports about activities affecting local fisheries. Fishers or their representatives should participate in these organizations by agreeing to priorities for inland water use by non-fishery projects. Likewise, fishery managers should share information about fishery plans with people involved in the other projects.

Fishery managers do not normally make decisions about the plans other users of inland waters make and that will have impacts on the environment. However, when steps are taken to increase fish productivity or to introduce new species of fish, the managers do make decisions affecting the natural environment of their local communities.
Responsible fisheries seek to protect the interests of the fishery and also to minimize any undesirable effects of its own activities.

**Improving inland fisheries production**

Fisheries enhancement involves activities designed to increase the size and numbers of fish available in inland waters. It is also used to conserve endangered species and to raise the productivity of particularly valuable fish stocks. Fisheries enhancement has become quite common throughout the world, especially in places where non-fishing activities have threatened or eliminated important species of fish or where simply more fish are desired.

There are several ways to enhance a fishery. Stocking, or adding fish to a body of water, can be done to increase supplies of fish. Stocking is also done to encourage the growth of favored species or to introduce new species in waters. When the fish that is being stocked in inland fisheries comes from an aquaculture hatchery, the practice is called culture-based fisheries. In some areas, juvenile or small adult fish are taken out of their natural waters and reared in fish ponds to which nutrients and fish food are added. The fish in these ponds are farmed. It is possible to alter the fish genetically (for example, by choosing the best fish to breed or by manipulating their chromosomes) in order for example, to promote better growth or resistance to disease. Later, the farmed fish are harvested for food or released back into their native waters.

Natural fish populations can also be improved through traditional knowledge and practices such as placing brush or plants in water bodies. These practices are complex and usually based on established and accepted community values and beliefs. These practices are regarded as aquaculture if the
that is stocked is accepted as owned by an individual or a group (i.e., the growers) during the grow-out period until harvested (that is, the period that it takes for the fish to reach maturity ready for harvest). All these practices are parts of aquatic production systems in many parts of the world and they support food security and rural livelihoods.

In addition to being stocked in natural waters or in aquaculture ponds, some species of fish are used for the ornamental fish trade. Rather than being used for food, these fish are sold for display, such as you see in gardens or aquariums.

Healthy population of fish lead to better diets and increased incomes for people living in fishing communities. However, enhancement activities can negatively affect natural fish supplies. Sometimes as new species are introduced, the original (native) species die out. Most conservation efforts in areas where the environment has been changed by human activities concentrate on re-establishing sustainability of the resources (that is, the ability to use the resources for a long period of time without causing damage to them). Studies should be done on enhancement activities, and the introduction of inappropriate species should be avoided if the studies indicate that these activities are harmful.
Most of the world’s inland waters will never be returned to the way they were originally. When a dam is constructed, wetlands are drained, river channels are altered, lakes are polluted or a new species of fish is introduced into a body of water, it is difficult to re-establish the original conditions even when the harmful activity stops. Some natural features of the area may need to be rehabilitated. This means that an attempt is made to restore the waters to something like its natural state in which fish can thrive.

When a river has been artificially straightened by an industrial or navigation project, a series of corrective steps can be taken. These steps range from such activities as adding boulders and special vegetation along the river bank creating islands in the river. In areas where fish migrate upstream or downstream but are prevented from doing so by a dam or some other structure, fish-passes, locks, and bypass channels can be constructed to allow the fish to swim over or around the structure. If nearby flood plains in which fish thrive and spawn are permanently cut off from a river channel, artificial structures like levees can be removed to allow the river to flood and to let the fish move between river and floodplain.

Likewise, water quality can be improved in polluted rivers and lakes. Pollution (such as wastes from factories) which threatens fish stocks can be treated by constructing waste water treatment plants.

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Apart from developing fisheries for food, many countries now use some of their inland waters for recreational purposes. While individuals may fish for food in a recreational area, the fish caught are reserved for personal use rather than commercial sale. Recreational fishing can provide significant economic and financial benefits to inland
water communities. Recreational fishers spend money for licences and access to the area, gear, transport and accommodation. The people who gain financially are the resource owners (who may charge a fishing fee), employees and guides in the fishery area, boat owners, and people who provide travel and accommodation services.

There is unlikely to be a commercial food fishery and a recreational fishery in the same place. Since recreational fisheries may bring more money into an area, they can push out fisheries that exist to provide food. To avoid such conflicts, countries should recognize the potential both of commercial enhancement fisheries and recreational fishing.

Elements of good management

A well-managed fishery is essential for long-term conservation and sustainability of inland resources. To encourage environmentally safe practices, all organizations (national, regional, local) including those of a non-fishery nature who use inland waters, should make their management policies known publicly. Laws and policies should be clearly thought out, with the views of all groups taken into account. Fishers should operate within the framework established by the environmental regulations and violators punished where laws or regulations are not followed. In extreme cases, people may have their fishing rights suspended.

Fishery management plans should include an organized way to handle conflicts regarding inland waters use. There can be conflicts between a fishery and other
activities and directly between different fisheries. For example, disputes can arise between food, recreational, and commercial fishers. As new commercial and recreational fishers move in to an area, subsistence fishing communities can suffer. The important thing is to recognize the rights and responsibilities of all resource users and to involve all of them in working out conflicts.

In order to settle disputes and establish policies for sustainable fisheries, factual information about the environment and the resources is required. Many types of information are needed before appropriate methods for managing fisheries can be determined. For example, it is important to know how and by whom the waters are used, and how the fish are priced and sold. Such information is required before detailed fishery planning can be done or the impacts of other (non-fishing) projects can be evaluated. Once impacts have been determined, it is necessary to anticipate how people might adapt to changes in their communities.

Collecting and reporting information about the fisheries has become an important goal in many countries. However, inland waters are difficult to monitor because the streams, small lakes, marshes, etc. are so varied and spread out, and may sustain many different small communities of people. As a result, studies are often done only at the most significant landing sites on the largest rivers and lakes. This approach requires caution since it may not provide an accurate picture of distant fisheries and smaller communities.

An important aspect of monitoring is to collect and record information about fish catches in different regions. This information needs to be gathered at regular intervals, making it possible for authorities to eventually put together information (data) from different regions. A total picture of national and international fisheries can then be developed.
Often the best solution for environmental monitoring and for fisheries management is to set up local management groups in fishing areas. These groups allow people who live and fish there to regulate the fishing, keep records and make responsible decisions. To be successful, local communities need to establish among themselves a clear allocation of rights and responsibilities for keeping the waters and surrounding land healthy. Where appropriate, countries should set up training programmes and extension classes to help communities learn to make and carry out policies for their fisheries.

Another advantage of involving local management groups is that they have first-hand experience with the waters, the fish and the land. They know for example, how to pattern their fishing seasons around fluctuations in river water levels and around the times when fish breed. When fishing communities are organized as co-managers, it is easier to ensure that rules and regulations are followed.

Management practices

Fisheries can only be successful in efforts to ensure continuing supplies of fish if excessive fishing is avoided. Fishing communities may place limits on fishing although enhancements and environmentally fishing methods can also be used.
If a river or lake has many species of fish, it is difficult to know if it is being overfished. It probably is being overfished, if the larger species of fish decline and the smaller fast-growing species take over. When this happens, the number of fish caught may increase, but its value declines and eventually the entire fishery may be threatened. A way to correct over fishing and ensure continued fish supplies is to allocate fishing rights among people who use the waters.

The assignment of fishing rights includes making careful decisions regarding who can fish in the areas and how long their access rights will continue. Once rights are assigned, it must be clear as to who is allowed to fish in a particular body of water regardless of whether they are fishing from boats, from the shore or from rafts.

Many different types of ownership and access rights exist in inland waters. These rights range from complete private ownership of small lakes and ponds to areas that are open to all people. Sometimes access rights belong to local communities or to the government and access is restricted to those who have been granted licences. In cases where there are no recognized access rights, water resources can be thought of as open to all people. Where access is open to everyone, fishing often provides an occupation of last resort for landless peoples. Fish in open access areas may sometimes be seen as famine crops.

In countries with an established system of fishing rights assigned for long periods, it is in the self-interest of fishers to manage the resource in a sustainable way. Where the rights are assigned for too short a period, commercial fishers may attempt to make a quick profit by overly intensive fishing. This is particularly true where the granting of access rights are the result of an auction (that is, where fishers bid against each other to buy a right to fish for a specific period of time or for a specific amount of fish).
To compliment good ownership and access policies it may be necessary to impose restrictions on fishing gear. Fisheries managers should develop regulations limiting the use of fishing gear and methods that damage fish or their habitats. Damaging gear may need to be banned, but the needs of fishing communities must be kept in mind.

A variety of gear is used in inland waters depending on the type of fishing done, traditions and on water conditions at different times throughout the year. Commonly, more affluent fishers use costly more effective gear, while poorer fishers may only be able to afford simple, basic gear. Care should be taken that poorer fishers are not victimized by gear restrictions.

To supplement gear restrictions, common management policies often involve establishing a minimum length allowed for fish caught. For example, the use of nets with large mesh size may be required so that the smaller fish can escape capture. Likewise, seasonal restrictions on fishing may be set to discourage over fishing and to protect fish during breeding seasons. Conservation or sustainability measures such as controlling over fishing, and restricting gear, season or size restrictions are intended to protect fish populations.

It is also important to avoid wasting fish through spoilage. Fishers need to ensure that harvested fish remain nutritious and of good quality until they are taken to market, sold or eaten. Fishers usually do not have any organized means of keeping the fish fresh between catching and selling. Smoking and sun drying (which result in lower quality) are common methods of preserving fish that are caught well before they reach the market. However, since
high use of wood for smoking can result in deforestation, improved methods of preserving fish must be developed.

Inland fisheries require good management of lake and river basins. Industrialization, urbanization, deforestation, mining and agricultural land and water uses often cause degradation of aquatic environments. This degradation is the greatest threat to inland fish production. Many of these threats occur together and interact. They often take place at the level of river and lake basins and also affect coastal areas. It is therefore important that the management of inland fisheries includes environmental issues and the institutional and socio-economic realities of lake and rivers basins.

Basin-wide approaches to the development of policy, legal and institutional management frameworks is necessary to regulate and reduce adverse interactions and conflicts between inland fisheries and other sectors. This type of approach also helps coordinate the planning and management of resources shared by fisheries and other users. Fishery administrators and stakeholders should participate in the formulation and implementation of such basin-wide integrated planning. Stakeholders from all sectors, including fishing communities, should be consulted whenever decisions and plans are implemented that affect the basin as a whole.
Good collaboration between different authorities can lead to the establishment of systems to monitor the basin management process. Such monitoring systems could also prove very useful in preventing adverse transboundary environmental effects in rivers and lakes.

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Financing is often an important consideration in ensuring sustainable fisheries. At the local level, purchasing gear and constructing facilities for preserving fish can be expensive. At the regional and national levels, money is needed to regulate and monitor fishing activities, take the necessary rehabilitation and conservation steps for inland waters and research environmental and social impacts in an area. In areas where industrial pollution threatens local fisheries, the costs for controlling sediments and chemicals can be very high. Fishing policies should require polluters to pay these costs.

Small-scale inland fishers are often not able to finance all the measures needed to establish and conduct sustainable fisheries. Governments should work with development banks and other financial agencies to assist small-scale and subsistence fisheries. Since non-fishery users of inland waters have greater access to outside financing, governments might consider organizing finance for management programs as well as anti-pollution programmes from these sources. In this way a financial management plan can be secured for all the users of the aquatic area.

The important guiding principle for inland water development should be that of maximizing benefits from all activities for as many stakeholders as possible while maintaining a healthy environment.
This booklet describes, in a non-technical manner, some important aspects of FAO Technical Guidelines for Responsible Fisheries No. 6 dealing with inland fisheries. The purpose of this booklet is to help familiarize FAO Members and other stakeholders with the goals and practices of responsible inland fisheries development and management. This booklet does not replace Technical Guidelines No. 6 but simply presents some of the complex information contained in those guidelines in a simplified form in an attempt to make it more accessible to all users of inland fisheries.