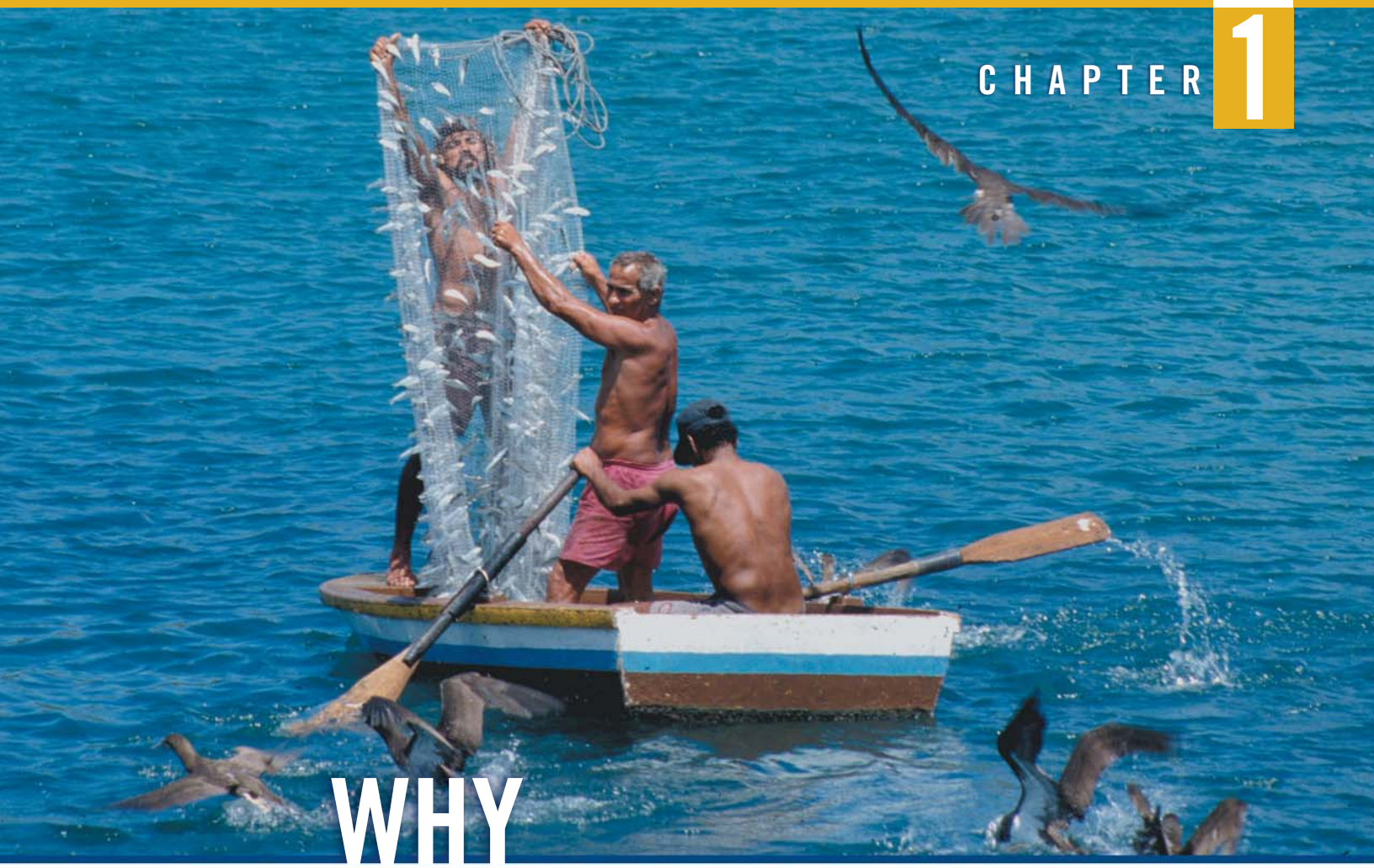
CHAPTER 1



WHY CARE ABOUT FISH?

Fishing is fundamental to coastal and riparian societies—an ancient activity that predates even agriculture. For millennia, harvesting resources from the seas, lakes, and rivers has been a source of sustenance and livelihood, and a mainstay of local culture. That is nearly as true today as it was a century ago. Fishing remains a bulwark of local employment in many communities, a key to food security for millions, and a significant factor in the global economy. Yet, the nature of the fishing enterprise and the condition of the marine and freshwater resources it relies on could hardly have changed more radically in the last 100 years.

During that time, the increase in the world's population and the need for economic development has brought a rapid expansion of commercial fishing and an overwhelming increase in our capacity to exploit fish stocks worldwide, largely under open-access conditions. In the last half century a tide of new technology—from diesel engines to driftnets—has swept aside the limits that once kept fishing a mostly coastal and local affair. Greatly enlarged fleets, fish-tracking sonar, and factory ships that can catch and process in any waters mean that fish can be targeted with greater accuracy and deadly dispatch. The result has been a rapid depletion of key stocks, and serious disruption and degradation of the marine and freshwater ecosystems they live in—what many have termed a "global fisheries crisis."

At the same time, the revolution in fishing practice and technology has not been uniformly shared. A great number of fishers in the developing world still ply their trade at a smaller, more traditional scale, using small craft and equipment and either consuming their catch themselves, or selling it locally. In addition, as ocean catches have dwindled, aquaculture—the practice of farm raising fish and shellfish—has burgeoned in recent years to take up the slack to meet food and income needs in developing countries, or to meet demand for high-priced seafoods such as shrimp and salmon. As a result, fishing today is not one but many different activities, pursued at different scales, by different groups of fishers, and with differing equipment and economic returns.

This complexity can make it difficult to understand the dimensions of the problems that global fish stocks and fishers face, or how the actions of consumers play into these problems. The contrast between large-scale commercial and small-scale community-based fishing, between the global seafood trade worth billions of dollars and local consumption of fish for subsistence by fishers earning less than $1 per day, between high-end shrimp aquaculture for export and low-end carp production in farm ponds in rural China, can be hard to reconcile. What is the condition of the world's fish stocks? What are the environmental and social costs of our current fishing practices, and who pays the price? Will aquaculture relieve the pressure on ocean fish stocks? Are we making progress toward curbing overfishing and managing fish stocks for long-term productivity?

The purpose of *Fishing for Answers: Making Sense of the Global Fish Crisis* is to address these and similar questions and to give non-technical readers a sense of the condition of fisheries today, exploring the dimensions of the fishing enterprise, and the environmental and socioeconomic problems related to fisheries management. Chapters 2–4 provide background information on commonly used terms in fisheries management, as well as descriptive statistics on types and status of the world's fisheries. These chapters are meant to aid the reader in untangling the complexity and confusion surrounding policy and management problems that are discussed later in the report. Chapters 5–10 examine some of the major issues such as the role of aquaculture, the differences and conflicts between large-scale and small-scale fishing, the impact of fishing on ecosystems, and the effects of global trade policies on fisheries management. These chapters also highlight the importance of those fishing sectors that comprise the majority of the world's fish-dependent people, but are routinely ignored by policy-makers and consumers alike in developed countries—namely small-scale and inland water fisheries in developing countries. We quantitatively describe the importance of these sectors, identify data gaps, and compare the relative significance of small and large scale fisheries in terms of resource pressure and management issues. Finally, Chapters 11 and 12 examine the management strategies currently in play—from international treaties to modern approaches to fleet monitoring and stock assessment—and recommend modest steps toward more sustainable fishing.

This report is not meant to cover all aspects of fish biology and management as these have been covered in numerous textbooks and reference materials, such as *Marine Fisheries Ecology* by Jennings et al. (2001) and *Handbook of Fish Biology and Fisheries* by Hart and Reynolds (2003). Neither does this report replace authoritative sources of updated fisheries statistics, such as *The State of World Fisheries and Aquaculture* series, published by the Food and Agriculture Organization of the United Nations (FAO) every two years. Readers who are interested in more technical studies of fisheries and their management are strongly encouraged to refer to these and other publications cited throughout the report.

We hope that *Fishing for Answers* will help consumers, environmental organizations, and policy-makers deepen their understanding of the issues surrounding global fisheries, and find their potential roles in creating a political and economic environment that will foster sustainability in fishing. The goal is to get consumers to understand how their seafood choices and purchases affect global fish stocks and ecosystems, and that this understanding and awareness will encourage them to support the growing market for "sustainably managed" fish and shellfish products. Finally, we hope that the report will educate the broader public on fisheries issues and related policies in order to build support for some of the difficult policy choices needed to sustainably manage fish stocks and fishing effort around the world.

Box 1-1: What is a Fishery?

The term "fishery" can be confusing, because it is used differently by fisheries experts and in the technical literature, and by the media and in non-technical literature. From a technical point of view the term exclusively refers to the commercial activity of harvesting fish. In reality, however, "fishery" is often used to refer to the fish resource itself by non-technical audiences.

Technical definition: A fishery consists of the *fishing activity focused on certain fish, shellfish species, or a group of species*, often in a certain geographic area. For example, the Pacific halibut fishery refers to the commercial fishing industry centered on Pacific halibut. Likewise, the Bluefin tuna fishery refers to the commercial exploitation of Bluefin tuna, either on the high seas or in national waters.

In the non-technical literature and in the media, the term "fishery" is often used in reference to the *actual stocks—or populations within a certain geographic area—of a particular fish or shellfish species (or group of species)* that are the subject of fishing activities. For example, the Pacific halibut fishery is used in the popular media to refer to the stocks of Pacific halibut that are fished commercially. In this sense, the media can refer to a fishery (in reality they mean the stock) as being healthy or depleted, overfished or underexploited, reflecting the condition of the resource.

HOW IMPORTANT IS FISHING?

Fishing and the activities surrounding it—processing, packing, transport, and retailing—are important at every scale, from the village level to the level of national and international macroeconomics. For one, fishing generates significant revenue. In 2000, the global fish catch was worth US$81 billion when landed at port; aquaculture production added another US$57 billion (FAO 2002a); and the international fish trade totaled over US$55 billion (FAO 2002a).

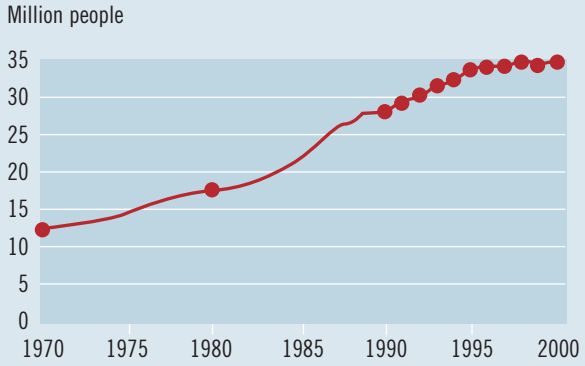
Income from fishing is particularly important to developing economies, which often depend heavily on revenues from natural resources such as timber, mining, oil, and fish. Fisheries (the collective term for fishing and the fish resource, see Box 1.1 for definition) are a major foreign exchange earner for developing countries, which produce more than half of all internationally traded seafood (Sabatini 2001). Fishery export revenues in developing countries increased rapidly from US$10 billion in 1990 to US$18 billion in 2000—a growth rate of 45 percent when corrected for inflation (FAO 2002a).

Fishing is also a crucial source of livelihoods in developing nations, particularly for low-income families in rural areas where job options are limited. In fact, small-scale and subsistence fishing often acts as the employment of last resort when more lucrative labor opportunities cannot be found. FAO estimates that some 35 million people are directly engaged, either full- or part-time, in fishing and aquaculture, and this may be a substantial underestimate (*See Figure 1-1*). Over 95 percent of them live in developing countries, and the majority are small-scale fishers (FAO 2002a; WRI et al. 2003). In some countries, these subsistence fishers contribute more to the national economy than large-scale commercial operators—because of their larger numbers and in spite of their lack of high technology (see *Chapter 5* for further discussion on the small-scale fishing sector).

The contribution of fisheries to the global food supply is also significant. In 2000, fish constituted 15.3 percent of the total animal protein (or 5.7 percent of all dietary protein, including grains) consumed by people worldwide (FAO 2003a). More importantly, about 1 billion people—largely in developing countries—rely on fish as their primary animal protein source (calculation based on Laurenti 2002). Among the countries most dependent on fish for food security are small island states such as Maldives and Kiribati, and sub-Saharan African states such as Ghana and Malawi, many of which depend on fish for more than 50 percent of their animal protein (Laurenti 2002). Residents of Solomon Islands, for example, consume some 51 kilograms of fish per person each year—about 83 percent of their animal protein. By comparison, people in the United States, Canada, Australia, France, and Germany get less than 10 percent of their animal protein from fish (Laurenti 2002).

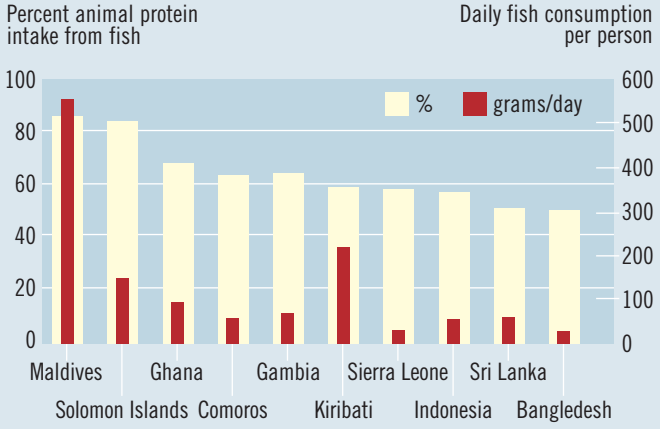
Because of their importance as a food and income source for the poor, managing the world's fisheries resources wisely is a crucial element in national strategies to reduce poverty. But the challenge of attaining fisheries management that is environmentally and socially sustainable is becoming more formidable every day. Demand for fish is growing and will likely continue to grow over the next three decades, while current management practices cannot even maintain today's catch (FAO 2002a).

Figure 1-1: Number of Fishers and Fish Farmers



Source: Earth Trends, WRI 2003.

Figure 1-2: Nutritional Importance of Fish



Source: Laurenti 2002.

IS THERE REALLY A FISHERIES CRISIS?

The world's wild fisheries are in desperate need of better management. Over the last two decades, overfishing has become one of the major natural resource concerns in the industrialized world, and increasingly in developing nations as well (FAO 1997a; Berril 1997; FAO 1999a; FAO 2000a; FAO 2002a). The FAO estimates that 75 percent of commercially important marine fish stocks are either currently overfished, or are being fished at their biological limit, putting them at risk if fishing pressure increases or the marine habitat degrades (see *Boxes 1-1* and *1-2* for definitions). One recent analysis made an attempt to measure the magnitude of global fisheries decline. Researchers estimated that the quantity of large predatory fish such as cod, tuna, swordfish, and salmon—those most commercially desirable—has dropped more than 90 percent in the world's oceans since large-scale industrial fishing began (Myers and Worm 2003). While the methods and results of this analysis have generated considerable controversy among marine fishery experts, there seems to be broad consensus that many key commercial fish stocks have declined significantly as fishing has increased. Chapter 3 explores the question of the status of fish stocks in greater detail.

Unfortunately, pressure on fish stocks is primed to increase even as stock conditions continue to worsen. Demand for seafood products has doubled over the last 30 years and is projected to continue growing at 1.5 percent per year through 2020 as global population grows and per capita fish consumption rises (Delgado et al. 2003). The number of fishers and fish farmers is growing markedly as well, having doubled in the last 20 years (1980-2000) (FAO 2002a). That is a growth rate nearly three times faster than general population growth (UN Population Division 2003). Most of the increase in the number of fishers has occurred in developing countries as people turned to fishing for an alternative or supplemental source of income.

Recognizing the important role that fisheries play in employment and food security, and confronted with their perilous biological state, governments have reacted to the crisis, at least in writing. At the World Summit on Sustainable Development (WSSD) in Johannesburg in 2002, nations publicly committed to maintain or restore depleted fish stocks to levels that can produce their maximum sustainable yield[1] by 2015—one of the most challenging targets to emerge from this meeting.

Despite this urgency, most people have little idea of what the "fisheries crisis" is, or what it means to them. From a consumer's point of view—at least in most developed nations—the sad condition of fish stocks is not obvious. There are still plenty of fish available in markets and restaurants, although the types may have changed and the prices may be higher. So are we really running out of fish? Are coastal ecosystems nearing collapse? The answers to these questions are not widely understood outside of the circle of fish experts and others in the fishing industry. That is unfortunate, because solutions to the problem may require decisions to regulate fishing in politically unpopular ways—measures that will need strong public support to be successfully implemented.

Perhaps people would better understand the threat to global fisheries if they likened it to defor-

Box 1-2: Taking Stock: Fully Fished, Overfished, or Collapsed?

A fish stock is considered to be *fully fished* when increases in fishing effort do not significantly increase the amount of fish harvested, but substantially increase the risk of overfishing. *Fully fished* stocks are said to be exploited at their biological limit—a reference point below which the spawning stock is too low to ensure safe reproduction.

The term *overfishing* refers to the action of fishing beyond the level at which a fish stock can replenish itself through natural reproduction. In other words, if too many fish are harvested because of excessive fishing pressure, the stock reaches a point where there are not enough fish of spawning age to reproduce and sustain the stock.

Continued overfishing of a stock can result in removal of a high proportion of fish of all age classes—juvenile to mature adult. When few mature adults remain to spawn and few juveniles remain to grow to a harvestable size (a process called recruitment), such a stock is known as *depleted*.

Prolonged overfishing of a depleted stock can lead to its *collapse*, that is, the reduction in fish abundance to levels at which the harvest is negligible compared to historical levels. Depleted or collapsed stocks may require a long time to recover, even if fishing pressure has been reduced or eliminated entirely. Indeed, they may never recover their former productivity, due to changes in population dynamics, habitat conditions, and other biological factors that influence reproduction.

Source: Definitions based on FAO Fisheries Glossary (2003) and adapted for a non-technical audience.

[1] Maximum Sustainable Yield (MSY) or sustainable catch is defined as the largest average catch or yield that can continuously be taken from a stock under existing environmental conditions (Ricker 1975). MSYs are estimated through models (e.g., surplus production models) but, both "the MSY and the level of effort needed to reach it, are difficult to assess" (FAO Fisheries Glossary 2003).

Artisanal fisher with net, Brazil.

estation—an environmental problem that the public has come to be quite familiar with in general terms. Fish and trees are both renewable resources that can be sustainably harvested over the long term if managed wisely. However, these resources are currently being exploited faster than they can regenerate in many parts of the world. This exploitation has also caused widespread destruction of ecosystems, which threatens the whole basis of future productivity. In both cases, economic incentives still largely favor continued exploitation rather than sustainable management. A substantial amount of illicit harvesting—pirate fishing and illegal logging—also adds to the difficulty of managing the resources properly.

Of course, there are important differences between fish stocks and forests that make the fisheries crisis in some ways even more difficult to tackle than deforestation. One is that many fish species are not static like forests, but move freely across territorial boundaries and thus have to be managed jointly by more than one country. This requires coordination in policies, monitoring, and enforcement—a significant challenge.

Another difference is that it is much more difficult to monitor and assess fish than forests. They can't be measured to a high level of accuracy using helicopters, satellite imagery, or even boats. As a consequence, fisheries data are notoriously poor, obscuring the true dimensions of the "deforestation of the seas." We do not really know how many fish remain in the world's oceans, lakes, and rivers today, nor do we know exactly how many fish we remove from them every year, nor the condition of their habitats. All of this is vital information if we expect to manage fisheries wisely.

CAN FISHERIES BE MANAGED SUSTAINABLY?

There is no question that the world's fisheries can be managed to produce a significant harvest of fish without depletion. But how large this harvest can be, and how fishing operations must be managed to produce this harvest sustainably is still a topic of much debate and experimentation in most parts of the world. Exceptions to this statement exist, with some fisheries being managed sustainably today, and their numbers slowly increasing. Before the advent of large-scale commercial fishing, marine resources were managed and marketed on a more local basis. Many indigenous coastal communities developed well-elaborated rules for exploiting local fish and shellfish stocks, including restricting the number of community members who could fish a given area, and imposing harvest seasons and closed seasons to let stocks recover—some of the same strategies used today to manage fisheries. In this sense, traditional small-scale fisheries have a long history of sustainable use. Indeed, overfishing only became a real problem in the last century or so with the expansion of the fish trade into a truly global market.

But as maritime and fishing technology changed, increasing the range and intensity of fishing, fisheries management has become infinitely more complex. Authority over fisheries is no longer the province of local chieftains or community elders, but generally a state function, and more and more, an international effort. Fishing fleets now range over great expanses, increasing the difficulty and expense of monitoring and enforcing fishing regulations. Even the science of assessing fish stocks and setting quotas that will maintain or restore fish populations to viable levels remains notoriously imprecise because of its inherent level of uncertainty (see *Annexes A* and *B* for discussion on stock assessment and data limitations).

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Answering the question 'how many fish can we responsibly catch?' is not only difficult, but—as author Michel Berrill (1997) very suitably put it—is an attempt to "predict the unpredictable." Fisheries biologists work with models and assumptions, many of which are often inaccurate because of lack of information on the species or group of species, or because of information that is intentionally misreported by fishers. Fisheries experts have come to accept the inherent limitations of their calculations, realizing that their estimates of the number of fish in a given stock may be off by as much as 30 percent (Berrill 1997). Politicians, and the public, on the other hand, do not like uncertainty and demand accuracy in these predictions, unaware of the limits of current science.

The task of managing fisheries sustainably is made still more challenging because fisheries must simultaneously meet many different demands—national development, local food security, poverty alleviation, market demand, and global trade—each with its own set of pressures. Solutions to the problem of sustainable management must therefore be pursued as interlocking actions at different levels, addressing different user communities—small-scale fishers, commercial fishers, industry, recreational fishers, and many others. Conventional, centrally-lead fisheries governance has often proven to be poor at reconciling these conflicting demands. This is reflected in the inequitable allocation of rights and access to the fishery resources and fishing environments.

In recent years, the international community (NGOs, academia, policy makers, etc.) has generally accepted and begun to promote a framework for the sustainable management of fisheries. This framework revolves around the central importance of managing fisheries as an integral part of the ecosystem, rather than just as a collection of fish stocks to be exploited without regard to the system which nurtures them. This has come to be known as the "ecosystem approach" to fisheries management. Ecosystems consist of a dynamic complex of organisms—fish, mammals, vegetation, coral, and other bottom-dwelling organisms—and the physical environment in which they live, interacting as a functional unit (Millennium Ecosystem Assessment 2003). Current understanding recognizes that maximum production of fish stocks cannot occur where marine or freshwater ecosystems have been degraded, since these environments affect the reproduction and survival rates of fish.

Applying the "ecosystem approach" to fishing activities means, for example, reducing the impact of fishing activities on aquatic ecosystems by limiting disturbance of the sea-bottom community by bottom-trawling equipment. It also entails trying to maintain the ecological relationships between the species being harvested and other inhabitants of the ecosystem, trying not to disturb the relative balance of species by overharvesting a given stock. Protecting the coastal and inland water environments from other human-induced threats, such as pollution and infrastructure development, is another key element of the ecosystem approach.

Using an ecosystem approach also has a socioeconomic dimension. It starts from the assumption that fisheries management should not only sustain the fishery resource itself, but should contribute to the sustainable development of communities and nations, including food security and economic growth. It therefore realizes that managing fisheries must do more than just satisfy the commercial fishing industry, but must accommodate the wide array of economic and social benefits that people derive from marine and freshwater ecosystems, such as recreation, local livelihoods, cultural identity, and so on. The practical effect of this is that it widens the group of users that have a legitimate say in how fisheries should be managed (FAO 2003b). Setting up appropriate institutional structures and legal frameworks that will allow wider stakeholder participation in resource management is essential for the successful implementation of more concrete management strategies.[2]

Of course, translating the ecosystem approach into concrete management policies is not easy. There is no "one-size-fits-all" management approach suitable to all nations and fish stocks. However, there are a variety of strategies that, when combined, can clearly contribute to more sustainable fishing practices. These include such steps as improving licensing and monitoring regimes; developing refined fishing gears that reduce damaging impacts and unintended catches; establishing marine protected areas that act as refuges for recovery of fish stocks; supporting better stock assessments that yield more accurate catch quotas; pursuing stricter enforcement of fishing regulations and tighter international cooperation to improve compliance with international fishing treaties; and putting in place economic policies that give fishers incentives to reduce fleet sizes and that reward responsible fishing practices. All of these strategies are currently being applied in various nations and with various stocks, but the details of the applications and their coordination are what count. Chapter 11 discusses these management approaches—what has worked and what has not.

Lastly, there are external factors that influence how well any of these natural resource management efforts can succeed, from political stability and corruption, to poverty and economic development priorities, especially in developing countries. However, detailed coverage of these broader issues is outside the scope of this report.

[2] This report focuses on those strategies that are specific to fisheries resources, rather than fully exploring the broader theoretical and practical approaches to common property resource allocation and management. There are numerous published sources that cover issues such as common property resource and fisheries, terrestrial wildlife, and water resources, to name a few (Berkes et al. 2001; Hulme and Murphree 2001; Le Moigne et al. 1992).