
Toward Sustainable Management of World Fisheries and Aquaculture

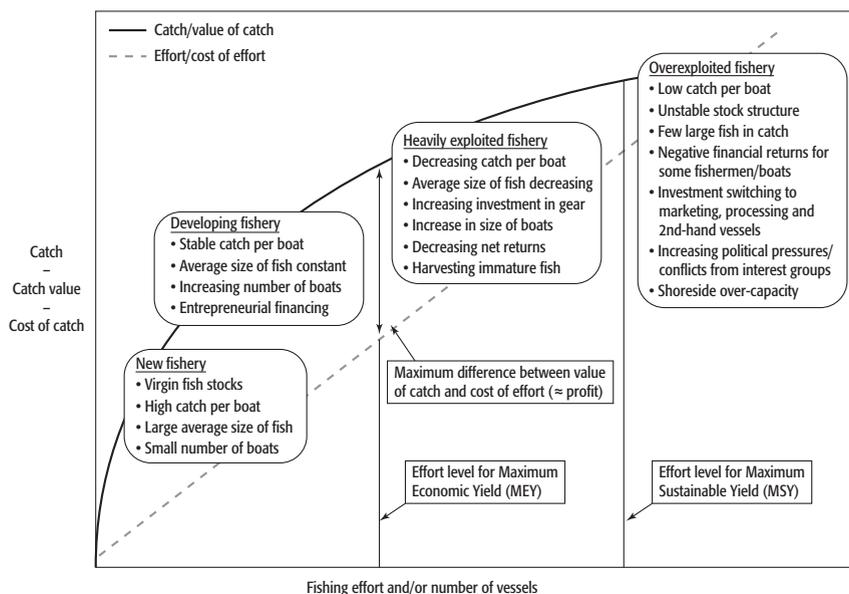
KIERAN KELLEHER AND MICHAEL L. WEBER

The continuing depletion of the world's marine fisheries is a key indicator of a critical decline in ocean health and a global issue of increasing concern. Fish is an important food for billions of people and provides a livelihood for an estimated 200 million people worldwide. The living marine resources of the planet are also an important part of the Earth's diversity of life, providing a range of ecological services and support recreation, scientific research, and tourism. Yet in the last half century the growth of human populations and economies, the spread of new technologies such as fishing nets made from synthetic materials, and the motorization of fishing fleets have contributed to the decline of many fisheries, jeopardizing ecological and economic sustainability for coastal communities around the world.

The task of making fisheries sustainable has local, regional, and global dimensions. Fish and fishers move from sheltered bays and estuaries to the open ocean, and from one ocean to another. Small-scale fishers from Senegal and Ghana fish in the waters of many other countries in West Africa and in the Gulf of Guinea; European and Asian industrial tuna fleets operate throughout the Atlantic, Indian, and Pacific Oceans. The rapid expansion in the global fish trade means that fish products from even the most remote fisheries are gradually entering world trade.

The depletion of fish stocks and loss of critical marine habitats due to overfishing can be traced to the inherent nature of wild fisheries as a common property to which all have access (see figure 15.1). For example, in

FIGURE 15.1 Growth of an Ungoverned Open Access Fishery



Source: Kelleher (1996).

many small-scale fisheries there are no restrictions on who may fish; as a result, a growing number of fishers, having few alternative economic options available, compete for limited fish resources. Since individual fishers have no incentive to restrict their fishing so as to preserve the common resource, an effective form of governance is needed, either to provide such an incentive, or to enforce restrictions to ensure the sustainable use of the resource.

The problem is the same at the international level. Nations may act like individual fishers, each seeking its own individual benefit. Thus, without effective international regulation, fisheries accessible to more than one country, including those on the high seas, may suffer this “tragedy of the commons.” Yet efforts to provide such regulation have been beset with problems. Many existing international instruments designed to regulate high-seas and transboundary fishing are weak. Subsidized international fisheries access agreements may benefit fishers from industrial countries at the expense of fishers from developing countries. Regional fisheries management organizations have limited powers of enforcement, and their

consensus decisions often reflect an ineffective compromise at the lowest common denominator. The existing Law of the Sea Convention and its subsidiary instruments have important gaps, and effective enforcement of measures for responsible high seas fishing has proved elusive. Vessels flying flags of convenience transgress national and international law with impunity, and subsidies provide inequitable support to maintain overcapacity in industrial fleets.

At the heart of the matter lies a lack of political commitment to resolve a difficult problem, one that requires long-term national, regional, and international efforts to build awareness and consensus. The short-term political costs of fisheries reform may be high, yet the techniques and applications required to reduce risks and secure the potential long-term benefits often require investment and testing as well as sensitivity to the social costs of change.

The Global Importance of Fisheries

For some 2.6 billion people around the world, fish provides at least 20 percent of average per capita intake of animal protein. Fish is a particularly important part of the diet in developing countries, where total protein intake level may be low. In Bangladesh, Cambodia, the Republic of Congo, Equatorial Guinea, and Sri Lanka, and in some small island states, fish may account for 50 percent of total animal protein. (For comparison, the average share in industrial countries is only 8 percent.) Declines in fishery resources caused by overfishing or a significant increase in the price of food fish can thus seriously affect the nutritional status of major population groups.

In 2002 about 76 percent of estimated world fish production was used for direct human consumption; much of the remainder was used in the manufacture of fishmeal and oil. These products are generally manufactured from small pelagic fish (fish that live in surface waters). These species, such as anchovies and sardines, made up 37 percent of total marine catches in 2002.

Worldwide, 38 million people are full-time fishers or fish farmers, and fishing, aquaculture, and related activities such as fish processing employ roughly 150 million people in developing countries. The Food and Agriculture Organization of the United Nations (FAO) estimates that, since 1990, the number of full-time fishers has been growing at an average rate of 2½ percent a year; the total increase since 1950 is about 400 percent. Most of this growth has been in small-scale fisheries in the developing world, particularly Africa and

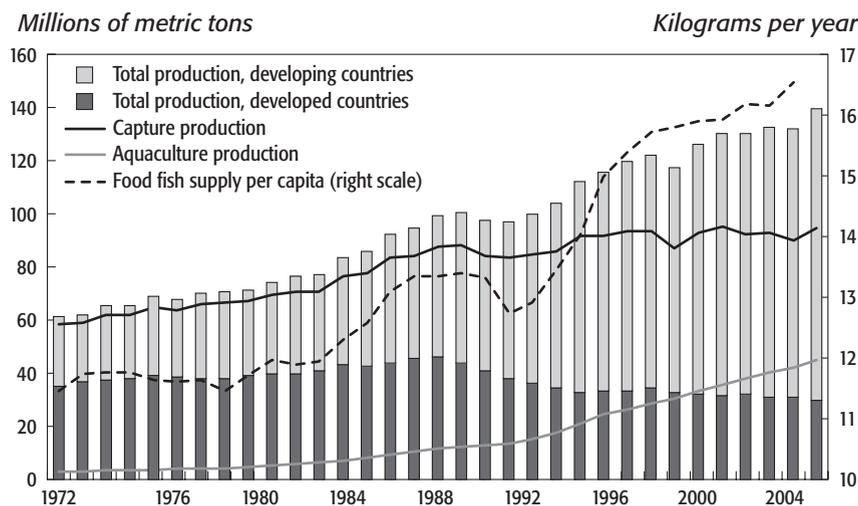
Asia, where poverty among coastal communities is often high and fishing is often the livelihood of last resort. In 2004 the global fishing fleet comprised roughly 1.3 million decked fishing vessels and 2.8 million open, or undecked, fishing vessels, of which 65 percent were without engines.

Trends

The FAO, which monitors trends in the world's fisheries, reports that total world production of fish products by freshwater and marine fisheries and by aquaculture increased steadily from 19 million metric tons in 1950 to 100 million tons in 1989 and nearly 140 million tons in 2004 (figure 15.2). Since 1985, developing countries have accounted for more than half of this production.

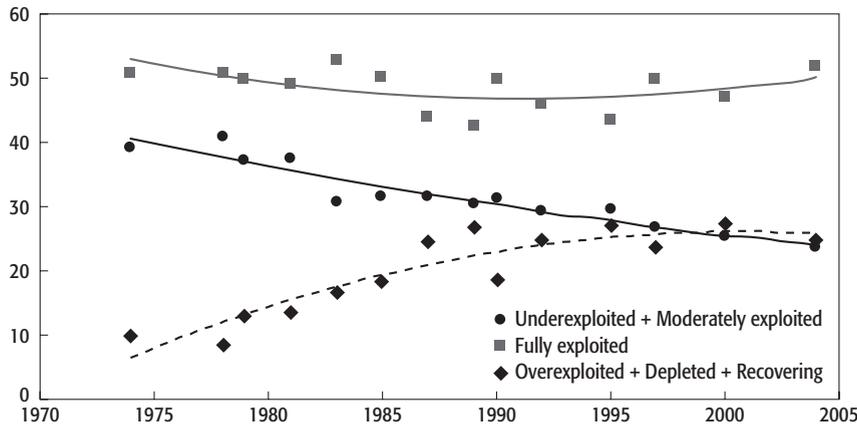
Marine fisheries catches increased to about 80 million tons by the end of the 1980s and have since then remained at about that level, accounting for about 60 percent of global production in 2003. However, the relatively stable level of catches in recent years obscures some problematic changes in the world's fisheries. In many areas, catch levels have been maintained only through increasing effort and investment in more and better-equipped

FIGURE 15.2 Production from Capture Fisheries and Aquaculture by Developed and Developing countries, and Food Fish Supply per Capita, 1972–2004^a



a. Excludes aquatic plants.
Source: FAO Fishstat.

FIGURE 15.3 State of Exploitation of Global Fish Stocks, 1974–2004
Percent of total



Source: FAO (2005).

vessels with increasingly efficient gear. Analysis of global fisheries data shows that the mean size of individual fish caught has declined, previously discarded fish are being retained, and in many cases the net value of the catch has also decreased.

Today a quarter of the world's marine fish stocks are being fished at an unsustainable level (figure 15.3). Half of all stocks are fully exploited, with no scope for further increases in catches. Seven of the top ten marine fisheries are fully exploited or overexploited. It is unknown whether these overexploited stocks can recover in the face of continued fishing and other pressures such as pollution, disease, climate change, and habitat loss. Besides the impoverishment of the Earth's natural heritage, damage to marine ecosystems can have long-term impacts on coastal communities.

Overfishing already has led to fewer jobs, higher fish prices, and reduced income for coastal, regional, and national economies in both developing and developed countries. The impacts are particularly troublesome in the developing world, where fishing has played a particularly significant role in providing food and income to many of the poorest people.

More generally, fishing can dramatically affect the rich diversity of life in the oceans and the ecosystems of which they are a part. Fishing activities that use certain kinds of gear, or that use them improperly, may do serious harm to populations of marine wildlife other than those the fishers are seeking.

According to the FAO, 7.3 million tons of fish and shellfish are caught and then discarded because there is no market for them, or at times to comply with quota or size regulations. Some types of fishing gear, such as trawls, can also damage important fish habitats, such as reefs and seagrass beds. In March 2005 the Millennium Ecosystem Assessment, the first global assessment of the state of the world's ecological health, identified fisheries as one of five global systems in critical condition.

Trade

Not only are many species of fish themselves highly migratory, passing easily across national borders, but fish (including fish raised by aquaculture) is the most heavily traded food commodity worldwide and the fastest-growing "agricultural" commodity on international markets. In 2003 the top five fish-importing countries by value—Japan, the United States, Spain, France, and Italy—accounted for nearly 54 percent of the total value of global imports of fish products. Between 1985 and 2003 the export value of fish and fishery products (including from aquaculture) rose from \$14.5 billion to \$63.5 billion. In 2003 the top five fish-exporting countries—China, Thailand, Norway, the United States, and Canada—accounted for one-third of the global export value of fish products.

Exports from developing countries rose from \$6.7 billion to \$30.3 billion between 1985 and 2003 and net foreign exchange earnings of developing countries from exports of fish products amounted to \$17.4 billion—more than the value of their combined net exports of rice, coffee, sugar, and tea. This represents an enormous shift since 1985, when developing countries were net importers of fish products. Fish products now represent more than 10 percent of the total merchandise exports of at least 20 countries, most of them developing. Although the expanding global fish trade creates opportunities for developing countries, it can also foster overfishing and can place fish beyond the purchasing power of the poor.

Climate change affecting ocean temperature and chemistry may have a profound effect on both inland and coastal fisheries. With rising temperatures, the amount of oxygen in the water may decline, while salinity levels and sea levels may rise. Loss of coral reefs and wetlands may reduce critical habitat and alter the availability of food for some fish species. These changes will have a disproportionate impact on the lakes and coastal areas of some developing countries, which lack the resources to adapt to or mitigate these changes. Among these countries are many small island developing states, which have contributed little to the greenhouse gas emissions to which global

warming is largely attributed. Fisheries on the high seas are likely to be less affected by global warming, although it may alter the distribution of some species, such as tuna, that are of critical economic importance to many developing countries.

The Forces and Dynamics Affecting Global Fisheries

Four major forces have contributed to the decline of marine and inland fisheries: lack of effective governance, growing demand for seafood, more-effective fishing technologies, and subsidies to fishing operations.

Governance

In most societies fish are traditionally a common resource to which all have free access. Unlike crops and livestock, fish resources are freely mobile and hidden beneath the waves, making them difficult to measure or control. This complicates the identification of ownership and tenure, which are the usual basis for assigning responsibilities for stewardship of natural resources. Numerous other factors complicate fisheries governance: the interaction between industrial and small-scale fishing; climatic factors that influence the abundance and distribution of fish; the fact that the by-catch of one fishery may be the target species of another; and the poor selectivity of many types of fishing gear.

Additional management challenges are presented by the geographical distribution and movement of fish populations between different jurisdictions—between federal and state waters, between countries' exclusive economic zones (EEZs—waters within 200 nautical miles of a country's coast, where it may claim exclusive rights to fish), or to and from the high seas. Solutions are typically an outcome of protracted negotiations among fishers, governments, and other stakeholders and are often superseded by the volatile nature of the fisheries themselves. Even with an agreed management system in place, difficulties in enforcing regulations remain. In many countries fishers consider penalties for illegal fishing as simply a cost of doing business, because the benefits of breaking the law far outweigh the risk of detection and punishment. Meanwhile developing countries lack cost-effective means of deterring the incursions of foreign vessels into their EEZs, which typically extend 200 miles offshore.

In many countries the basic regulatory framework for fisheries management is weak or nonfunctional. Efforts to improve fisheries management can also be hindered by disagreements among the different subsectors of a fishery

(for example, between small-scale and industrial fishers targeting the same resource), between fisheries, or between or within governments. For example, attempts to maximize revenue from foreign exchange earnings or from the sale of access privileges to foreign fishing fleets can conflict with efforts to manage fisheries sustainably by setting lower catch limits.

Ineffective governance also undermines the development of sustainable forms of aquaculture, leading to water pollution, destruction of important fish habitats, and declines in wild fish populations. In many countries aquaculture has expanded dramatically without careful planning and consideration of the trade-offs between increased production and sustainability. As a result, valuable habitats such as mangrove swamps have been destroyed in some areas, and wild fish populations have been exposed to disease and parasites.

The Maldives tuna fishery, which contributed about 9 percent of the country's GDP in 2004, provides an example of the risks involved. Maldives exports about two-thirds of its catch, earning \$75.6 million in 2003, or about half the country's exports by value. The fisheries sector accounts for about 20 percent of Maldives' total employment. In recent years the tuna fleet has been modernizing, replacing traditional wooden vessels with larger vessels fitted with more powerful engines. Now concerns are growing about fleet overcapacity, economic overfishing,¹ and possible declines in some fish stocks.

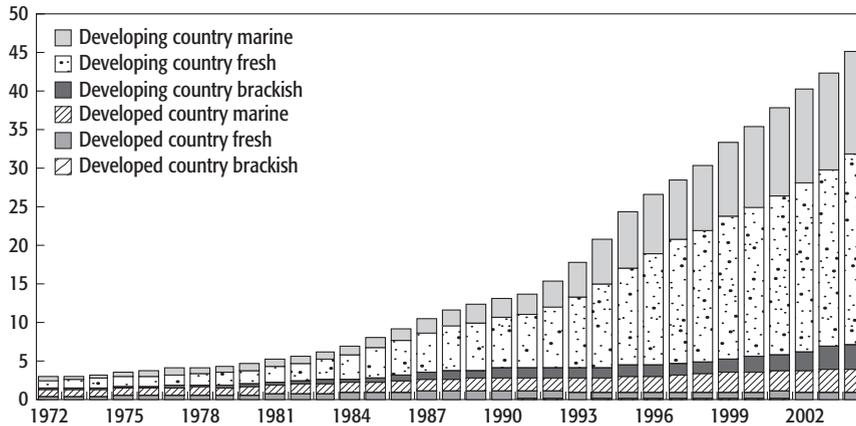
Demand

As the human population grows and countries around the world become more affluent, the demand for fisheries products increases as well. Globally, annual consumption of food fish products per capita has increased from 10.5 kilograms to 16.2 kilograms over the last three decades (Figure 15.2). Most of that increase occurred in China, India, and Southeast Asia. However, excluding China, fish supply per capita was 13.2 kilograms in 2002, the same as it was in 1992. In some countries, such as Ghana, Liberia, and Malawi, the average diet contained less fish protein in the 1990s than it did in the 1970s.

Global demand for fish products is predicted to reach about 20 kilograms per person per year by 2020. Developing countries' share of worldwide fish consumption rose from 45 percent in 1973 to 70 percent in 1997. The growth in aquaculture activities worldwide has also resulted in increasing demand for fish feed. The share of global fishmeal production used by aquaculture rose from 10 percent in 1988 to over 50 percent in 2003.

The projected gap between supply and demand is of particular concern in some regions. For example, the International Food Policy Research Institute and the WorldFish Center project that, by 2020, the gap between supply and

FIGURE 15.4 World Aquaculture Production by Type and Location, 1972–2004
Millions of metric tons



Source: FAO Fishstat.

demand in Africa will still be growing, even if existing harvests of wild-caught fish can be maintained and aquaculture continues to progress at the current rate.

Aquaculture is the most dynamic and rapidly growing sector of the global agricultural economy (figure 15.4), and it remains the leading hope for bridging the widening gap between supply and demand for fish products. However, if pursued without adequate consideration for the wider social and environmental impacts, commercial aquaculture developments may damage aquatic ecosystems and social relationships in coastal communities.

Technology

Although the number of vessels in the global fishing fleet of large (industrial) vessels has remained relatively stable over the last several decades, the catching capacity of much of the fleet has increased enormously, because of ever-larger vessels and increasing sophistication and availability of the technology for locating and catching fish. It has been estimated that average fishing power per vessel has increased by 270 percent since 1965. Little reliable information is available on the global fleet of small vessels, but there is ample evidence that their number has multiplied in many developing countries. In Yemen, for example, it is estimated that the artisanal fleet has increased threefold in the last decade, while the number of fishers has quadrupled.

In the past, practical limitations on the size and power of fishing vessels and the technology to detect and catch fish often limited fishing activities to near-shore areas or other shallow waters. The open ocean and the deep sea provided natural refuges for fish. Today, in contrast, global positioning systems (GPS), echo sounders, and monofilament nets all greatly enhance the efficiency of fishing operations. For example, in the Pacific island countries, outboard motors have allowed small-scale fishers to exploit remote fishing grounds previously accessible only to local communities, and canoe fishers equipped with handheld GPS units can now locate seamounts in the open ocean.

Subsidies

Governments often subsidize fishing, along with many other activities, for what are presumed to be socially beneficial reasons. Subsidies are not inherently perverse: although they may distort markets and incentives, they do not necessarily foster environmentally damaging activities. However, it is clear that the billions of dollars in subsidies that governments provide to the fisheries sector do undermine efforts to manage fisheries for ecological and economic sustainability. A number of studies by the World Bank and other international organizations estimate fisheries sector subsidies worldwide at between \$12 billion and \$20 billion a year. Up to half of these subsidies promote excess capacity and overcapitalization in fishing fleets, leading to overexploitation.² The remaining subsidies are directed toward fisheries management, research, conservation, and programs designed to reduce fishing fleets.

Some Controversies Surrounding Fisheries and Aquaculture

The diversity and changing nature of fisheries and the difficulties involved in regulating mobile resources and fishers make fisheries and aquaculture management a challenging task. Some of the controversies that have arisen alongside efforts to make the global fishing industry sustainable are briefly described below.

Allocation of Resources

The allocation of fish resources between small-scale or artisan fisheries and industrial fisheries has been a recurring source of argument and conflict. Table 15.1 reports some selected indicators relating to large- and small-scale fishing; although the data are from 1980, they illustrate the relative

TABLE 15.1 Selected global indicators on large-scale and small-scale fishing

Indicator	Large-scale fishers	Small-scale fishers
Total employment	500,000	12 million
Annual catch of marine fish for human consumption	29 million metric tons	24 million metric tons
Capital cost per person employed on vessel	\$30,000 to \$300,000	\$250 to \$2,500
Fishers employed per \$1 million invested	5 to 30	500 to 4,000
Fish discarded at sea per year ^b	8 million tons ^c	

a. Data are approximate.
b. From recent FAO sources.
c. Figure is for all fishers, of which small-scale fishers account for only a small proportion.
Source: Adapted from Thompson (1980) and FAO sources.

distributional impacts and capital and environmental costs of the two sub-sectors. Large-scale fishers claim, with some justification, that they are over-regulated and complain about the lack of control over small-scale fisheries; the latter, for their part, point to the destruction of artisanal gears and fishing grounds by industrial vessels.

International fisheries access agreements are a special case of the allocation controversy. Under such agreements, one country compensates another for access to its “surplus” fish resources. However, these access payments are normally paid to the national treasury and thus provide little direct benefit to domestic fishers. The manner in which the surplus is determined can also result in controversy: the quotas sold to the foreign fleets are measured as a biological surplus, which does not necessarily correspond with allocations for local fleets if measured in terms of what can be harvested economically by the domestic fleet.

Scientific Advice

Independent scientific advice is vital when decisions are being made about the sustainability of fisheries. However, the results of scientific investigations are subject to considerable uncertainty, resulting in disputes over their interpretation and over the efficiency or equity of proposed management measures. Although controversy still surrounds the details, the collapse of the Canadian cod fishery provides a classic example. Uncertainty over the state of the stocks delayed management measures, and over a decade later the cod fishery has still not recovered. A precautionary approach is now strongly advocated: the absence of adequate scientific information should not be used as a reason for postponing fundamental conservation and management measures.

Deepwater Trawling

Deepwater trawling is a high-cost, high-risk operation and highly destructive of deepwater coral reefs and other habitats, which can take decades to recover. However, declining coastal fish stocks push fishers to exploit the deeper waters, often in areas outside national control. There is widespread support for a global ban on deepwater trawling, particularly on the seamounts of the high seas. Enforcement of such a ban presents numerous jurisdictional problems, however, as reflagging of noncompliant vessels and use of ports with weak controls often allows these activities to continue. More-rigorous controls in ports and by the states under whose flags these trawlers operate are needed.

Impacts on Endangered Species

Fishing affects numerous endangered species including marine mammals, sharks, seabirds, and turtles. This has led to controversy between environmentalists, who seek bans or other limitations on fishing to protect the endangered animals, and the fishers themselves, who naturally view the potential loss to their livelihood as outweighing the benefit of such protections. Trade sanctions to enforce measures that mitigate the impact of fishing on endangered species have resulted in disputes being arbitrated within the World Trade Organization. The best known of these cases is the tunadolphin dispute between the United States and Mexico (and the European Union) and a dispute between the United States and several Asian countries with regard to the use of turtle excluder devices in shrimp trawl nets. In both instances the United States placed restrictions on imports of seafood captured by fishers that were not employing gear or fishing practices that reduced or eliminated the incidental drowning of dolphins or turtles.

The United Nations Fish Stocks Agreement

Fewer than 60 countries are party to the United Nations Fish Stocks Agreement, the primary international instrument governing fishing on the high seas, and this lack of universal participation undermines its effectiveness and global utility. Some countries are dissatisfied with certain provisions of the agreement, but the contracting parties are reluctant to open the agreement for renegotiation. Increased accession to the agreement would greatly assist global efforts to address illegal fishing, limit the use of flags of convenience, and help enforce international management measures.

Aquaculture and the Environment

Finally, controversy surrounds the expansion of some types of aquaculture, principally those for shrimp and for carnivorous fish such as salmon and cod. Shrimp aquaculture has contributed to the destruction of large areas of mangrove forest, which are a very productive habitat for fish and other wildlife, a source of livelihood for subsistence users and serve as a coastal barrier to the effects of typhoons. Many types of aquaculture also rely on large quantities of fishmeal and fish oil produced from wild fish and may contribute to the spread of disease to wild populations and the displacement of wild species. Codes and best practices such as the technical guidelines prepared to apply the FAO's Code of Conduct, and those prepared with World Bank assistance for marine shrimp aquaculture, provide guidance for environmentally sustainable aquaculture.

The Consequences of Failure to Manage Fisheries Sustainably

Resolving the controversies just described is an important task for the international community, because failure to place the exploitation of marine and freshwater fisheries and aquaculture on a truly sustainable foundation will have significant consequences, particularly for coastal and lake communities in developing countries:

- *Economic consequences:* Continued declines in fisheries will result in the sector becoming a net economic burden rather than a benefit, with calls for increasing public support for unprofitable fishing based on a depleting resource. The economic consequences of inaction can be large and long-lasting: for example, some 15 years after the collapse of Canada's Atlantic cod fishery the coastal communities of eastern Canada are still recovering. Similarly unsustainable aquaculture development has jeopardized important fish habitats and wild fisheries and resulted in local economic collapse due to disease and environmental degradation.
- *Social consequences:* The collapse of fisheries in developing countries, by reducing the well-being of dependent communities, will encourage increased emigration with all its attendant social tensions and difficulties. Concentration and intensification of aquaculture may aggravate disparities in income and in economic and political power.
- *Security consequences:* Failure to maintain or increase the availability of fish in the local markets in developing countries may lead to social

unrest. Incursions by fishers into the waters of neighboring states continue to be a source of international incidents. Similarly, the failure of fisheries will increase poverty and dislocation, possibly contributing in some circumstances to failed states.

- *Health consequences:* In developing countries, fish from capture fisheries and sustainable aquaculture can be an important source of protein and micronutrients essential for the good health of the population. Unsustainable fishing and aquaculture development will compromise this supply.
- *Environmental consequences:* Poorly managed fisheries will undermine ocean, coastal, and lake ecosystems, reducing the rich biological diversity of these areas and the many benefits that derive from healthy ecosystems. Similarly, imprudent aquaculture practices will degrade water quality in coasts, lakes, and rivers; damage or destroy critical coastal and freshwater habitats; and threaten wild fisheries.

Steps Already Taken Toward Improved Global Fisheries Management

The mobility of fish and fishers, the difficulties in assessing the state of diverse fish stocks, and the various impacts of overfishing and environmental change pose substantial challenges to fisheries management. Similarly, aquaculture uses public goods including freshwater resources, marine spaces, and common-property wetlands and intertidal areas and can impact on critical habitats, biodiversity, and genetic heritage.

Addressing these issues requires establishing good fisheries governance. Good governance, in turn, means protection of the inshore and coastal fisheries on which poor subsistence fishers and small-scale commercial fishers depend, while clearly defining the important role of industrial fisheries. Good governance also recognizes the important links between aquaculture development, healthy wild fisheries, and the responsible management of water basins, wetlands, and coastal zones. Good governance involves transparent and participatory decision-making that is accountable to both today's stakeholders and future generations.

Explicit policy frameworks that identify clear, realistic goals and how and when they may be reached are an important instrument for realizing sustainable fisheries management. These frameworks, attuned to the needs of each country, include a legal framework and an effective means of applying fishery

regulations, means of engaging stakeholders, provisions for conflict resolution and mediation, arrangements for cooperation and participation, financing of independent scientific advice, extension and outreach institutions, and the use of nongovernmental organizations for monitoring and independent oversight.

Fisheries management also has a vital economic dimension, since economic measures must complement measures targeted on the biological state of the fishery. A profitable fishery can be considered a source of infinite positive cash flow, and thereby an important contributor to an economy.

Several important international conventions provide a framework for management of fisheries at the national and the international levels. These include the following:

- The United Nations Convention on the Law of the Sea, the principal international instrument in this domain
- The U.N. Fish Stocks Agreement, made pursuant to the Law of the Sea Convention, which addresses management of highly migratory species of fish and populations of fish that straddle international boundaries
- The FAO Compliance Agreement, which further defines the international obligations of states with respect to their fishing vessels
- Conventions establishing regional fisheries management organizations, such as the International Convention for the Conservation for Atlantic Tunas, charged with the management of the Atlantic tuna fisheries, and
- A range of non-fisheries agreements and conventions, such as the Convention on Biological Diversity and the Convention on International Trade in Endangered Species, as well as conventions on rivers, lakes, regional seas, pollution, safety at sea, labor standards, and other relevant matters

The international community also has adopted a number of nonbinding instruments, including the following:

- The FAO Code of Conduct for Responsible Fisheries, which sets out principles and international standards of behavior regarding capture fisheries and aquaculture development
- International plans of action on illicit fishing, fleet capacity, and the protection of sharks and seabirds
- Regional instruments integrating the FAO Code of Conduct into regional fisheries policy and practice, such as the South African Development Community Protocol on Fisheries and various policies and regulations of the European Union

- Numerous U.N. General Assembly resolutions, and
- Specific deadlines on five issues agreed on as part of a plan of action at the 2002 World Summit on Sustainable Development (WSSD) in Johannesburg: illegal, unrecorded, and unregistered fishing (often referred to as IUU fishing); fishing capacity; application of an ecosystem approach; restoration of depleted stocks; and establishment of “representative networks” of marine protected areas.

Management of fisheries has become increasingly sophisticated in the last two decades, partly in response to the failure of past approaches to maintain fisheries at sustainable levels. In line with the WSSD Plan of Action, several promising tools can be highlighted:

- *Monitoring and enforcement:* Cost-effective monitoring, control, and surveillance are fundamental to enforcement of fishery regulations. Current technology can track and detect fishing vessels worldwide, including those engaged in illegal, unreported, and unregulated fishing.
- *Buybacks:* In many fisheries it is necessary to reduce the current fishing fleet or fishing capacity in order to achieve sustainable fishing levels. Buybacks are a means of removing fishing vessels from the fleet by decommissioning them (scrapping the vessels or transferring them to other uses), or by compensating fishers for the reduction in the number of fishing licenses.
- *Rights-based management:* Different forms of community or private property rights can be created with respect to fisheries previously considered to be public, open-access resources. Experience shows that property rights systems can improve sustainable use and profitability, but they may also undesirably concentrate wealth. The application of property rights requires analysis of opportunities and challenges on a case-by-case basis and must meet equity objectives, in terms of both access to resources and distribution of benefits.
- *Co-management and decentralized decision-making:* Co-management is an arrangement whereby government and users of a resource share responsibility for its management. This allows fishers to influence the decisions made, while governments can ensure that long-term management objectives are met. Participation in decision-making gains the support of the fishers, confers legitimacy on the regulations, and fosters compliance, which may also reduce the costs of monitoring and surveillance.
- *Ecosystem approach to fisheries:* In previous decades, fisheries management generally focused on the main target species in a fishery.

However, fishing activities also affect species other than the target species and may alter overall ecosystem functions such as predator-prey interactions, species composition, nutrient flows, and habitat quality. Sustainable fisheries management requires consideration and management of the entire marine ecosystem that supports the fishery—not just the target species. The “ecosystem” approach to fisheries is an evolving body of best practice that incorporates ecosystem considerations into fisheries management.

- *Marine protected areas:* A marine protected area (MPA) can offer a range of protection, from complete prohibition against removal of any living creature to seasonal closure or restrictions on the removal of certain designated species. It has been shown that MPAs contribute to sustainable fisheries. The long-term benefits to fishers can outweigh the short-term loss that they may experience when the MPA is first established. MPAs require careful design not only in their spatial configuration, but also with respect to stakeholder involvement and institutional sustainability.
- *Certification programs for fish products:* Certification programs can promote sustainable fishing and poverty reduction by creating market mechanisms that encourage fisheries to be managed in compliance with a suite of criteria, such as stock condition and ecosystem impact. The Marine Stewardship Council is one example of a fisheries certification program. The council links suppliers (fishers) with consumers through a chain of sustainable production by certifying fisheries as sustainable, and recruiting distributors, such as major retail chains, to market sustainable products to discerning consumers, often at premium prices.

The Role of the World Bank in Maintaining Sustainable Fisheries

The fisheries and aquaculture loan portfolio of the World Bank has evolved considerably in recent decades. Before 1980 about 60 percent of all World Bank fisheries loans were for large-scale fisheries development, such as the building of industrial vessels and fishery service facilities. By the 1980s the Bank had reduced its support for increased production from capture fisheries and shifted its emphasis toward aquaculture, resource assessment, and fisheries research. In the 1990s the Bank further reduced its investments in capture fisheries and increased its investments in aquaculture to roughly half of its total direct investment in the sector.

The Bank has responded to the growing concerns of its member countries over the sustainability of increased harvesting of wild fish stocks and the impact on aquatic ecosystems of rapidly expanding aquaculture production. The Bank has acknowledged that, to ensure the sustainability of capture fisheries and aquaculture, long-term investments are required at many political and societal levels: in planning, ecosystems-based resource management, and postharvest operations; in human resources and applied science and extension institutions; and in public-private partnerships. The Bank's current efforts concentrate on improved governance, coastal management, inland fisheries, and smallholder aquaculture operations, mostly in Africa and in South and East Asia.

The Bank will broaden its support for sustainable fisheries at the country, regional, and global levels and has established a new Global Program on Fisheries (PROFISH). In implementing this program the Bank is focusing on policy reforms guided by the FAO Code of Conduct for Responsible Fisheries and is working with global partners, including the FAO, the IUCN—The World Conservation Union, the WorldFish Center, and regional organizations. PROFISH will focus on good governance, sustainable fisheries policies, and promoting effective fisheries strategies. In cooperation with the Global Environment Facility (GEF), the Bank is participating in regional fisheries initiatives, such as the Strategic Partnership for a Sustainable Fisheries Investment Fund in the Large Marine Ecosystems of Sub-Saharan Africa, while also building on the GEF's large marine ecosystem projects.

The rationale for greater involvement by the Bank and the international community in fisheries issues follows directly from the agreements at the World Summit on Sustainable Development and the Millennium Development Goals. These initiatives identified an imperative to reduce poverty among 30 million small-scale fishers and their dependents, many of whom now face declining incomes. These initiatives also speak to the urgent need to address the looming ecological crisis associated with overfishing and degraded aquatic ecosystems.

Working with its client countries and the international donor community, the Bank has the capacity to combine policy dialogue at the highest levels with specific investments. The Bank plans to help mount a global effort to revitalize fisheries by:

- Strengthening the institutions dealing with the governance of fishing in the developing world
- Assisting countries to include a fisheries component in national development and poverty alleviation strategies

- Helping countries develop the legal and regulatory frameworks needed for sustainable fisheries
- Supporting the establishment of market-based incentives for sustainable fishing, and curtailing open access to fisheries through rights-based fishery management regimes
- Raising awareness within industrial countries of the need for reform in areas such as subsidies
- Providing support and training for human capacity building, including development of effective negotiating skills and strategies
- Supporting the further provision of services to marginalized rural fishing communities, and assisting coastal communities in managing their fisheries in a sustainable manner
- Promoting the establishment and implementation of marine reserves and protected areas, and
- Providing technical support for the development of sustainable aquaculture.

The World Bank recognizes that it is time for a proactive, international approach to improving the fisheries sector worldwide. The challenge in moving toward a sustainable fishing industry is to maintain economic growth and development by enhancing productivity and the wealth of fisheries, while avoiding the overfishing and ecological degradation observed today. The Bank is committed to helping establish institutions, values, and practices that will safeguard the future of fish resources and the health and livelihood of communities that depend on these resources for their income, nutrition, and quality of life.

Notes

1. Economic overfishing can occur when the fish catch is sustainable but large enough to drive prices down, so that total income is less than it would be with a smaller catch. Economists describe this as a “dissipation of resource rents.”
2. “Excess capacity” has both short-term and long-term dimensions. In the short term, excess capacity is fishing capacity that exceeds the capacity required to capture and handle the allowable catch. In the long term, it refers to fishing capacity that exceeds the level required to ensure the sustainability of the stock and the fishery at the desired level.

Selected Readings and Cited References

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- World Bank. 2004. "Saving Fish and Fishers: Toward Sustainable and Equitable Governance of the Global Fisheries Sector." Washington.

Selected Web Links on Fisheries Management

Fisheries Department of the FAO
IUCN Marine Program

www.fao.org/fi/default.asp
[www.iucn.org/places/wescana/
programs/marine.html](http://www.iucn.org/places/wescana/programs/marine.html)

Marine Stewardship Council
Millennium Ecosystem Assessment

www.msc.org
[www.millenniumassessment.org/
en/index.aspx](http://www.millenniumassessment.org/en/index.aspx)

United Nations Law of the Sea
World Bank Fisheries and Aquaculture
WorldFish Center

www.un.org/depts/los/index.htm
www.worldbank.org/fish
[www.worldfishcenter.org/cms/
default.aspx](http://www.worldfishcenter.org/cms/default.aspx)