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Saving Fish and Fishers

Toward Sustainable and Equitable Governance of the Global Fishing Sector

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Acronyms and Abbreviations

ACE	Annual catch entitlement
APEC	Asia Pacific Economic Cooperation
BSE	Bovine spongiform encephalopathy
CAS	Country assistance strategy
CCAMLR	Commission for the Conservation of Antarctic Marine Living Resources
CCRF	Code of Conduct for Responsible Fisheries
CDD	Community-Driven Development
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
Codex	Codex Alimentarius Commission
Comanagement	Collaborative management
COREMAP II	Coral Reef Rehabilitation and Management Program Phase II
CPUE	Catch per unit effort
DFID	Department for International Development, United Kingdom
EAF	Ecosystem Approach to Fisheries
EEZ	Exclusive Economic Zone
EFP	Extraordinary Fishing Permits
ESSD	Environmentally and Socially Sustainable Development Network of the World Bank
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FJS	Fisheries Judicial System
FMS	Fisheries Management System
FOB	Free on board
FRR	Financial Rate of Return
GEF	Global Environment Facility
GPS	Global Positioning System
GRT	Gross Registered Tons
GTZ	Deutsche Gesellschaft für Technische Zusammenarbeit; German Technical Cooperation
HACCP	Hazard Analysis Critical Control Points
IBRD	International Bank for Reconstruction and Development
ICLARM	International Center for Living Aquatic Resources Management; WorldFish Center
IDA	International Development Association
IEQs	Individual effort quotas
IFAD	International Fund for Agricultural Development
IFC	International Finance Corporation
IFPRI	International Food Policy Research Institute
IPCC	Intergovernmental Panel on Climate Change
IPOA	International Plan of Action
ITQs	Individual transferable quotas
IUCN	International Union for the Conservation of Nature

IUU	Illegal, unreported, and unregulated
LOS	Law of the Sea
MCS	Monitoring, Control, and Surveillance
MDGs	Millennium Development Goals
MPA	Marine Protected Area
MSC	Marine Stewardship Council
MSY	Maximum Sustainable Yield
NGO	Nongovernmental organization
OECD	Organisation for Economic Co-operation and Development
OED	Operation Evaluation Department of the World Bank
ppb	Parts per billion
PRSC	Poverty Reduction Support Credit
PRSPs	Poverty reduction strategy papers
PSAL	Programmatic Structural Adjustment Loan
R&D	Research and Development
RFOs	Regional fisheries organizations
SEAFDEC	Southeast Asian Fisheries Development Center
SIFAR	Support Unit for International Fisheries and Aquaculture Research
SIL	Specific Investment Loan
SWAp	Sector-Wide Approach programs
TAC	Total allowable catch
TACC	Total Allowable Commercial Catch
TURF	Territorial use rights in fishing
UK	United Kingdom
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
US	United States
VCU	Vessel capacity unit
VMS	Vessel monitoring system
WSSD	World Summit on Sustainable Development
WTO	World Trade Organization
WUAs	Water users associations
WWF	Worldwide Fund for Nature (formerly World Wildlife Fund)

Foreword

This World Bank Fisheries Sector[1] Approach Paper has been written in recognition of the mounting challenges that the World Bank and the developing world face in meeting the fishery sector-related Millennium Development Goals and the outcomes of the 2002 World Summit on Sustainable Development. It augments the Bank's Rural Strategy, *Reaching the Rural Poor*, which advocates a holistic approach to rural poverty reduction, and support for equitable growth. This paper also builds on the World Bank's Environmental Strategy, *Making Sustainable Commitments*, a major pillar of which is the protection of the regional and global commons, in addition to the improvement in the quality of life and the quality of growth of the World Bank's clients. However, this Approach Paper treats the needs of the sector in greater depth, focusing in particular on the improvement of the livelihoods of the millions of poor fishers, and the sustainability of the inland and marine regional and global commons, which define the quality of life of their users.

The fisheries sector has many features in common with the environmental and agricultural sectors. Like in agriculture and the environment, there are many market failures, which are often exacerbated by even more distorting subsidies. Some issues are especially acute in the fisheries sector, particularly its currently overstressed resource base, and the complexity of establishing appropriate ownership and access rights under conditions of greatly mobile resources, spread over large, difficult-to-control areas. Finally, they all share the importance they have for the livelihood and quality of life of millions of the most marginal people in the world.

These attributes and issues clearly call for approaches that combine policy adjustments and investments in the public domain. This document, therefore, analyzes the issues confronting the fishery sector, provides the tools and good practices currently available in the world to manage these resources sustainably, and provides recommendations on possible future World Bank and other donor involvement in the sector. This document focuses on the state of the world's capture fisheries, and while the emphasis is on marine fisheries, the arguments also apply to the great lake and river fisheries of the world. The emphasis is on the paths to improve capture fisheries management and resource and income sustainability. The rapid and parallel growth of the farming of fish through aquaculture is also charted as a contributory part of this equation for the future.

The integration of the fisheries sector into regional and country-specific development programs and policy planning documents, such as national poverty reduction strategy papers (PRSPs) and the World Bank's country assistance strategies (CASs), will be crucial to increase World Bank and other donor involvement in the sector. Initial practical experience in developing a policy dialogue with national governments and other stakeholders, obtained through a parallel initiative, the Global Trust Fund for Sustainable Fisheries, will be provided in this document.

This Approach Paper benefited from contributions of many individuals and institutions. Cees de Haan was responsible for the overall coordination of the paper, and the final drafting of the document. The three main authors are John Virdin, Peter Gardiner, and Gert van Santen. They were greatly helped by the many inputs provided by the WorldFish Center, particularly regarding the description of the tools for sustainable fisheries management. SIFAR (Support Unit for International Fisheries and Aquatic Research)

[1] Throughout this Approach Paper, "fisheries" is used to mean the fisheries and aquaculture and allied subsectors, such as those for stock-enhanced fisheries.

provided much-appreciated case study material, with successful examples of sustainable management of fisheries resources. Bill Edison, Kieran Kelleher, Ron Zweig, and Frank Sperling provided important building blocks on issues of legislation, future trends, aquaculture, and the impact of Global Climate Change, respectively. Matthew Gianni (independent consultant), Ulf Wijkstrom (FAO), and Meryl Williams (WorldFish Center) provided valuable comments as peer reviewers of the initial Concept Note and this document. Simon Heck (WorldFish Center), Christopher Delgado (IFPRI), and Tom Grasso (WWF) provided most valuable comments as the panelists in the workshop to discuss the paper. The document also benefited greatly from the inputs of the Fisheries Advisory Committee (in particular Marea Hatziolos, David Freestone, and Francois le Gall) and members of the Agricultural and Rural Sector Board and the Environmentally and Socially Sustainable Development Network of the World Bank (ESSD) management team, particularly Ian Johnson, the Vice President of ESSD, of the World Bank. Diane Stamm provided the final editing inputs.

Executive Summary

Man has taken fish from nature for millennia, and millions still rely on fishing and fish for their income and nutritional quality of their diet. However, without a concerted effort of the global community to improve fisheries management, the world is under imminent threat of a collapse of some of its main fisheries, endangering the livelihoods of these millions, reducing foreign exchange earnings of several developing countries, and ravaging the health of the oceans. Public and international awareness has been raised by an ever increasing stream of evidence that many of the world's fisheries are overfished, catches are declining, and fishers' livelihoods are degrading along with the natural ecosystems they exploit. This Approach Paper directly follows on the recommendations of:

- the World Summit on Sustainable Development;
- the World Bank's Rural Strategy, *Reaching the Rural Poor*; and
- the Environment Strategy *Making Sustainable Commitments*, the major pillars of which are poverty reduction, equitable economic growth, and the protection of regional and global commons, which are also the major objectives of *Saving Fish and Fishers.*

THE NATURE OF THE FISHING CRISIS

The evidence of overfishing is steadily and forcefully accumulating, even as global fish-catching capacity in many countries continues to increase. While global fish production from capture fisheries[2] during the 1950s and 1960s grew at a rate of 6 percent annually, catches of the most sought after marine fish species have actually been in decline since 1988. Moreover, the current level of declining capture fisheries production has been achieved only by fishing harder and by targeting smaller and less-valuable species, as the large fish species have disappeared and fishers continue to "fish down the food chain." Evidence is accumulating from all levels. For example, biomass of the global ocean's valuable and predatory fish (such as cod, tuna, grouper, and shark) is estimated to be down by 90 percent of preindustrial levels 50 years ago. In Asia, coastal fisheries' biomass is now down by a similar margin, to 8 to 12 percent of pre-fishing levels. Catch per hour of the same surveillance ship, with the same gear in the Gulf of Thailand, declined from 250 kilograms to about 18 kilograms per hour between 1961 and 1999. Furthermore, the ecosystems that support these fish stocks are being increasingly degraded; for example, 88 percent of the coral reefs in Southeast Asia is estimated to be at risk from human damage, particularly overfishing, aggravated by coral mining and global warming.

The result is a declining net income in the sector. Since the 1950s, the total number of people fishing and fish farming worldwide has at least quadrupled (compared with a 35 percent increase in the economically active population in agriculture), and average fishing power increased an estimated 270 percent between 1965 and 1995. However, with dwindling resources, the corollary of this massive expansion of fishing effort has been a rapid decline of net income. For example, the Food and Agriculture Organization of the United Nations (FAO) estimated that for 1994–97, annual gross income from the world's fishing fleets and port infrastructure of US$70 billion to US$80 billion was far exceeded by their real operating costs

[2] The fishing sector can be divided into two categories—capture fisheries and aquaculture. Capture fisheries are fisheries where fish are captured through the use of gear. In aquaculture, fish are farmed or raised.

(including subsidies, losses, and depreciation) of US$120 billion. In particular, the 30 million small-scale fishers have seen their income decline in many parts of the world. Decreasing catches have also reduced critical foreign exchange earnings from fish exports and fisheries agreements, on which several of the poorest developing countries rely.

Finally, overfishing is threatening the nutritional status of major population groups, particularly of the 400 million people from the poorest African and South Asian countries, for whom fish products constitute at least 50 percent of their essential animal protein and mineral intake, although the rapid growth in aquaculture has offset losses from the decline in capture fisheries.

THE CAUSES

More than any other cause, poor sector governance has enabled the creeping practice of overfishing to continue and negatively affect fisheries in ever larger coastal marine areas. Fisheries administrations have for decades aimed at expanding fishing capacity, or they have used ill-designed and poorly executed measures to limit catches of threatened species. Only relatively recently have some countries acknowledged that management of the sector is fundamentally a political and economic process, requiring changes in institutional, legal, and regulatory frameworks, and a more participatory role of the private sector, and have created entirely new approaches to managing the sector.

The impact of the lack of effective sector governance has often been exacerbated by inappropriate policies, such as continuing subsidy levels supporting the fisheries sector—mostly in industrialized countries—estimated at US$12 billion to US$20 billion per year. Industrial countries have increasingly directed these subsidy-supported fishing fleets to operate in developing countries, often in direct competition with local fisheries. For example, during 1993–97, the European Union (EU) fishing fleet caught over 600,000 tons per year, or 11 percent of their catch, in distant waters, and in 1998 Japan, Korea, Taiwan, and the United States caught about 1.8 million tons of tuna in the 200-mile Exclusive Economic Zones (EEZs) of the Pacific Island Countries. However, for developing countries, income from fisheries rights fees is low as a share of the total catch, because of their weak negotiating position caused by poor governance in the sector, leading to inappropriate preparation and unclear sector objectives.

Rapidly growing demand for fish, fuelled by population and income growth and health concerns, has increased many fish prices. Fish is one of the few agricultural commodities that has shown a strong increase in real prices, notably during the past 10 years. This has maintained incentives for investment in fishing vessels, despite falling catches.

However, excessive fishing has not been the only culprit. The population living within 100 kilometers of the coast has grown to 2.2 billion people (39 percent of the global population), leading to pollution and degradation of major marine ecosystems. Pollution effects and declining water levels have been even more significant in inland water bodies.

PROVEN GOOD PRACTICE

As more and more fisheries have declined or collapsed over the last decade, developing and industrialized countries have demonstrated an increasing willingness to improve fisheries management. The recent experiences of countries such as Iceland, Namibia, New Zealand, Norway, the Pacific Islands, and the Philippines; the current situation under way in Ghana and Senegal; and the long-term experience of Japan, which successfully changed their approach to managing their fishing sectors, provides developing countries willing to follow their lead with a valuable set of proven practices and methods described below. This new set of proven practices is the basis for the proposed enhanced role of the international

donor community, including the World Bank, in sustainable fisheries management. The main good practices elements and the proposed entry points are described below.

Improved Governance. The good practice governance models implemented by the above-mentioned countries are in the context of an ecosystems approach. They are thus addressing the biotic, abiotic, and human components of ecosystems and their interactions in a holistic fashion. The ecosystems approach is clearly articulated in the Code of Conduct for Responsible Fisheries, adopted in 1995 by the FAO member states. Experience so far highlights the importance of a strong decisionmaking, legal, and enforcement framework, which clearly defines the participants, their resources, and their access rights and obligations. This is possible only if an effective system of decentralization and other stakeholder involvement (collaborative management, or comanagement) is established. Moreover, good governance requires the establishment, in a transparent and participatory fashion, of the most appropriate balance between short- and long-term objectives, between small-scale and industrial sectors, and between maximization of income from license fees and long-term sustainability. Good governance also requires support for the developing world in the negotiations, implementation, and control of the fisheries agreements, ensuring that the interests of their domestic industries are adequately protected. The World Bank has considerable experience in supporting improved governance and accountability from other sectors. Therefore, it could participate using instruments such as programmatic lending (budgetary support in the form of Poverty Reduction Support Credits [PRSC] and Programmatic Structural Adjustment Loans [PSAL]) and investment lending (Specific Investment Loans [SILs]) for some of the required investments to strengthen the control functions, such as monitoring systems and surveillance vessels.

Once improved governance of the fisheries has been established, countries may avail themselves of a menu of proven good practices—often used in combination and often using approaches similar to those used in forestry, water, and community development—which can be used to help implement sector reforms, including:

- *Strengthening comanagement.* Established as a part of the restructuring of governance, the sharing of responsibilities between the fishers and government would need continuing attention. This is particularly important in tropical developing countries with large numbers of fishers using multiple gears to target multiple species. Comanagement systems require significant extension, education, and awareness (of all fisheries stakeholders, including government), and technical assistance activities to empower communities and stakeholders to participate in the governance of sustainable fisheries. There is now a good body of experience available of successful, locally implemented comanagement schemes, for example, in India, Indonesia, Samoa, and the Shetland Islands. Such schemes are based on the principles of Community-Driven Development (CDD), in which many donor agencies and nongovernmental organizations (NGOs) now have a good deal of experience.

- *Establishment of Marine Protected Areas (MPAs).* Setting aside environmentally critical fish habitats for full protection is effective in rejuvenating depleted fish stocks, particularly in multispecies, small-scale fisheries, as shown in World Bank projects in Indonesia and the Philippines, and in the Caribbean. As in comanagement, donors could expand support for the establishment of such reserves through CDD programs, and through the programs of the Global Environment Facility (GEF). The GEF/World Bank Coral Reef Targeted Research and Capacity Building Project proposes to inform decisions related to siting and design of MPAs, and would directly support achievement of World Summit on Sustainable Development (WSSD) targets to establish representative networks of effective MPAs.

- *Changing exploitation patterns.* Changes in patterns of exploitation are aimed at avoiding the catches of immature fish through gear regulations (mesh size); setting the legal fish size, eventually in

combination with temporary closed areas; seasonal closures; and other gear restrictions. Such regulatory gear can also be used to avoid bycatches (discards) on nontarget species.

- *Restocking and stock enhancement programs.* Releasing reared juveniles into open waters has proven to be very effective for some species, including the restocking of fish in irrigation water bodies, as successfully proven in Bangladesh and India. This could be mainly funded through bilateral donors.
- *Fishing capacity reduction.* Decommissioning fishing vessels or buying back of licenses is probably the most direct method of reducing industrial fishing capacity—to increase the relative share of fish resources available to small-scale fishers. There is experience with buyback schemes from Organisation for Economic Co-operation and Development (OECD) countries, and some from China and Malaysia, the latter dealing with older vessels, and payment through funding of alternative livelihoods. In view of the high level of funding required, and the policy nature of those schemes, the World Bank and other major international financial institutions could support buyback of surplus vessels through broad sector instruments such as Sector-Wide Approach programs (SWAps) or PRSCs.
- *Aquaculture.* Helping to meet the global demand for fish and reducing the pressure on capture fisheries, fish farming has expanded dramatically (now 35 percent of total global production), although the rapid expansion has not been without environmental and social problems. The World Bank has supported several aquaculture programs, mostly in East Asia, covering the entire production chain, and could continue to support aquaculture through SILs or in partnership with bilateral donors and the International Finance Corporation (IFC). Key areas of public funding are the establishment of the appropriate investment climate, environmental and social safeguards, and support for research and development, particularly in increasing efficiency.
- *Certification and food safety programs for fish products.* Such tools have the potential to promote sector sustainability and poverty reduction. Certification programs, certifying fisheries compliance with environmental criteria, such as the quality of the management system, stock condition, and ecosystem impact, have begun to generate an impact in temperate climates, and are now increasingly focusing on selected tropical fisheries. Compliance with food safety standards also becomes critical for international market access, and good experiences have been obtained with small-scale fisher groups, such as in West Africa. This would be mainly the domain of other donors and the private sector.
- *Promotion of alternative livelihoods.* Creating economic alternatives to fishing for small-scale fishers and fishing communities faced with resource degradation, overcapacity, and the need for effort reduction will be essential to reducing human pressure on overexploited resources. Alternative livelihood development is based on community-driven programs, and ideally offers a wide range of options to surplus fishers. Successful experiences with alternative livelihoods exist in World Bank projects in China, where most alternative employment was found in aquaculture, and in Indonesia, where most success was achieved outside the sector. Alternative livelihoods to fishing can best be promoted through CDD and microfinance programs, in which there is now solid international experience accumulating.

Clearly, while there is a worsening crisis that particularly affects fisheries in tropical areas where sector governance is currently weakest, not all is lost. If action is taken soon to reduce overfishing, using the methods and approaches that have proven effective in a number of developing and industrial countries, most of the threatened ecosystems can—at least partly—recover, and effective sector governance can reverse the declines in income and other economic impacts discussed above.

INTERNATIONAL SUPPORT FOR SUSTAINABLE FISHERIES

In line with most other international support for fisheries, most World Bank support is directed to coastal management, some inland fisheries, and smallholder aquaculture operations, predominantly in Africa and East Asia. FAO plays a critical role in setting standards (such as the Code of Conduct for Responsible Fisheries [CCRF]) and the provision of technical assistance. Many NGOs are actively involved in smallholder fisheries and coastal management. However, international support for structural reform in the marine and inland capture fisheries is limited. For example, from the total project value of the 2003 World Bank's Fisheries Portfolio of about US$420 million, only about US$10 million was directed toward marine capture fisheries. One of the reasons for this paltry support is the disappointing performance of fisheries projects. This is, in part, because of the erroneous approaches of the past, which in the 1980s focused mostly on increasing productivity while resources were already declining, or in the 1990s on one species or type of fisheries, without the required attention to the overall ecosystem and its governance. Such ratings appear, therefore, to have limited relevance for the future, and this paper argues for approaches that would have more in common with international support for forestry, irrigation, and water management, for which there is now solid experience.

An enhanced role of the international community, including the World Bank, is therefore proposed, following a structured approach, with the preparation of a long-term vision with stakeholder participation, and the preparation and implementation of an action plan. The program would have the following three thrusts:

- At the **corporate level**, the emphasis would be on the development of a vehicle for stakeholder consultation and the global awareness creation. The effect of the OECD subsidies and the dominant position of these countries in the negotiations on licenses with developing countries would be the core theme. Support in strengthening the negotiating capacities of developing countries would be the main direct avenue to reduce the current dominant position of the OECD fisher nations.
- In **industrial fisheries**, the focus is expected to be on meeting WSSD sustainability objectives. In those developing countries with overfishing, the support is planned to include institutional restructuring (including the introduction of transparent systems of allocating equitable use rights), effort reduction, and the strengthening of monitoring and control systems. This could be funded through combinations of programmatic and investment lending from the World Bank and other international finance institutions, and grant resources from others (GEF, bilaterals).
- In **small-scale, labor-intensive fisheries**, the focus is planned to be on the WSSD and Millennium Development Goals (MDGs) poverty reduction objectives. It is expected to comprise the support for the organization of fishers, the allocation of use rights, alternative employment and income-generating opportunities where needed, and the establishment of MPAs. This could attract a variety of sources of funds.

Rationale for External Funding

The ***rationale*** for greater involvement of the international development community follows directly from the WSSD and MDG documents, because there is (a) the imperative to reduce poverty among 30 million small-scale fishers and their dependents, now faced with declining income; (b) the urgent need to address the looming ecological crisis; and (c) clear international and national requests for stepped-up involvement. This involvement will require all potential partners to combine their ***comparative advantages.*** Additionally, organizations such as FAO, the WorldFish Center, and the United Nations Environment Programme (UNEP) will need to combine their international expertise with the grassroots contacts of national and international organizations such as the Worldwide Fund for Nature (WWF) and

the International Union for the Conservation of Nature (IUCN). The addition of the World Bank to this existing network of capabilities would be essential. The World Bank would contribute its convening power to draw global attention to the plight of fisheries; its significant experience in participatory and decentralized development, sector analysis, and strategy development; its capacity to work across sectors; and its experience in the introduction and funding of governance and structural reforms. These capabilities are not found in any other international institution, and it can well be argued that the WSSD targets will not be met without the proposed broadening of the World Bank's role.

The Impact

What could be the measurable impact of a proactive international approach toward the fishing sector? Looking at current and future trends, including those in other sectors that have launched major international initiatives (forestry), such an approach could result, over the next 10 years, in major fisheries reform programs in about 20 countries or regions, predominantly in Asia and Africa (for example, India and Indonesia). These programs would, in the first instance, be designed to halt and prevent the ongoing decline of millions of tons of fish biomass. Depending on the specific countries interested, some five to 15 percent of Asian fishers and 20 to 40 percent of African fishers (three million to five million fishers and shore-based workers) would no longer experience declining incomes, or would have access to training and credit to support alternative livelihoods. Similarly, export earnings from fish would stabilize at current or higher levels. Beyond the 10-year horizon, fish catches may actually increase, as biomass substantially expands, and sector income expands as the industry adjusts to a stable, predictable output scenario.

1. The State of Global Fisheries and Their Driving Forces

Man has taken fish from nature for millennia, but unless more sustainable management systems are put in place, the world's marine fisheries resources are in serious danger of collapsing. For those living on coasts, lakes, and rivers in years past, these common resources provided a traditional source of food. For many of today's fishers, this is still true. But fishing, like other industries based on natural resources, has changed. The trade in fisheries products became global, more so than any other food industry, so that millions are now dependent on the sector, not only as a source of food and livelihood, but also for employment and national export earnings. Moreover, fishing has taken divergent paths even within the same countries, with separation between industrialized and small-scale fishing activities.

First industrialized in the early 19th century when English fishers started operating steam trawlers, fishing evolved after World War II to include freezer trawlers, radar, and acoustic fish finders. The sector rapidly expanded, and throughout the 1950s and 1960s this huge increase in the global fishing effort led to an increase in catches so rapid that their trend exceeded human population growth, encouraging an entire generation of managers and politicians to believe that launching more boats would automatically lead to higher catches. As a result, over the last several decades, industrial fleets became too big and wasteful, while small-scale fisheries became too numerous and unregulated to sustainably exploit the fisheries resources of the seas. Weak governance, leading to open access and poorly defined property rights, allowed this expansion, and competition and conflict have marred management. With ever weakening public institutions in many parts of the world, management regulations were poorly enforced, and monitoring and control systems decayed.

THE CRISIS IN FISHERIES

As is becoming clear, the natural resource limits of the oceans, coastal regions, and many inland water bodies have been reached, and declining fish stocks and ecological change are widely reported. FAO estimates that 25 percent of the world's major fisheries are overfished, and 40 percent are fully fished. Recent assessments (Pauly and others 1998, 2002; Myers and Worm 2003) show reductions in the size and value of fish caught, and a spectacular decimation of key target species of fish, such as the large predators. In Asia, coastal fisheries biomass is down to eight to 12 percent of pre-fishing levels (ICLARM 2001). In Thailand, catch per hour of the same surveillance ship with the same gear in the Gulf of Thailand has declined from 250 kilograms per hour in 1961 to about 18 kilograms per hour in 1999 (Willmann, Boonchuwong, and Piumsombun 2001). Other examples could be cited (box 1.1). Fishing and other anthropogenic disturbances alter and destabilize aquatic ecosystems, and increase their vulnerability to collapse or species shift.[3] Northern temperate fisheries and those in tropical developing countries react differently. While some major temperate water fisheries have suffered relatively rapid collapse (for example, cod, halibut), trends in tropical water multispecies demersal fisheries have been different. Under heavy fishing pressure, these tropical fisheries gradually decline, with a shift in species composition in

[3] Anthropogenic means resulting from the influence of human beings on nature.

favor of species lower on the trophic (nutritional) scale. This, in turn, results in depleted stocks of less-desirable (and lower-value) species.[4]

Box 1.1. Marine fisheries—at the limit or in decline

Demersal Fisheries

- Several important demersal, or bottom, fisheries are suffering ecosystem change as a result of depletion of the high-value target fish at the top of the food chain—crustaceans or small fish replace large fish.
- In many areas such as the Gulf of Thailand, and coastal areas of Senegal and Vietnam, the total quantity of fish harvested has increased, but because the catch is largely composed of small, low-value species, the total catch value has declined, or is far below optimal.
- The Newfoundland cod fisheries have virtually ceased to exist, and the Irish Sea cod fisheries may collapse.

Pelagic Fisheries

- The state of small pelagic (oceanic) fish resources (anchovies, sardines, mackerel, and others) is heavily dependent on climatic conditions such as the El Niño phenomenon. The cyclical nature of small pelagic production influences markets for fishmeal and the prices of fish feeds and cultured species.
- Stocks of tuna are under increasing pressure in all oceans, and all major commercial species, except skipjack, are considered fully exploited.
- The larger, more valuable tuna, such as blue fin, are overexploited, and regional tuna management organizations have expressed concern over the stocks of major "canning" species, such as yellow fin.

Invertebrate Fisheries

- Shrimp, the most important globally traded fish product, shows less sign of depletion due to exploitation of less accessible stocks, and ecosystem changes that may favor crustaceans. Nevertheless, declining catch rates in many shrimp fisheries signifies intense exploitation.
- Shrimp trawl fisheries also account for the greatest proportion of discards, indicating scope for more rational resource use, and significant ecosystems impacts from bottom trawling.
- In common with small pelagics, cephalopod (for example, squid) stocks tend to fluctuate in response to environmental conditions.

Source: Authors (edited from FAO, 2002b)

This crisis is not directly evident from the statistics, though. Global capture fish production, according to FAO statistics, increased by 1.1 percent per year during 1985–99, and according to the recent projections of Delgado and others (2003), can probably increase by 0.5 percent per year until 2020. However, these supply statistics need to be viewed with caution. First, there are convincing indications that reported Chinese fishery statistics might have been overestimated. If that is the case, global catch trends have stagnated over the last decade, and might even have declined (Watson and Pauly 2001). According to a statistical model constructed to predict catches, China's reported fish catches, which account for more than 15 percent of the global catch, could have been exaggerated by twice the actual amount. Moreover, aggregate figures mask what one authoritative analysis has termed the "paradox of abundance and decline," (World Humanity Action Trust 2000) because the figures do not adequately portray the severity of overfishing in the coastal and inland waters of developing countries. Nor does it convey the changes that are taking place in the quality of the supply. In the future, the consequences of the declining state of fisheries resources, which we can identify today, will be disproportionately experienced by developing countries and their poor communities.

[4] Demersal means living near, deposited on, or sinking to the bottom of the sea.

Ocean health, critical habitats, and endangered species

The currently unsustainable systems of fishing throughout the world are a serious threat to the health of the oceans. While the dynamics of marine ecosystems are still poorly understood, the depletion of one species might have severe impacts on others. For example, the overfishing of the large predator fish species (including tuna, shark, and cod) can cause significant increases of the species somewhat lower in the food chain (such as smaller pelagics). In cases where many higher-level fish species have been removed, there can be serious repercussions on the lower end of the food chain, leading to overgrowth of crustaceans, squid, or pest species such as jellyfish. Other forces exacerbate these negative impacts of overfishing. Seabeds are being stripped of their flora and fauna by bottom trawling using large nets scraped along the ocean floor, with effects on the bottom flora and fauna comparable to "clear-cutting a forest to hunt deer."

Coral reefs are threatened by the growth of coastal populations, unsustainable fishing methods, offshore oil extraction and mining, industrial pollution, and tourism. In 2002, the Reefs at Risk Report for South East Asia estimated that 88 percent of the reefs of that region are at risk from human damage (Burke, Selig, and Spalding 2002). Time series data from the Dutch Antilles show that coral recruitment[5] is one-tenth of that 10 years ago, thought to be due to ecosystem change and algal overgrowth of the corals. Approximately 16 percent of the world's corals were destroyed by temperature-induced coral bleaching following the last El Niño; particularly affected were Eastern Africa, the Indian Ocean, and the Western Pacific regions (Wilkinson 2002).

The survival of numerous species, including marine mammals, turtles, seabirds, and invertebrates, is menaced by fishing, habitat loss, and pollution. Although the size of the oceans presents particular problems with defining extinction with certitude, eight fish species are listed in the most threatened category of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), and 28 species are listed as likely to be threatened if trade is not brought under control (CITES 2003). Among these species are sturgeon (*Acipenser* spp.) and the regionally important Caribbean queen conch (*Strombus gigas*). Commercially important species that may soon be added to the CITES listings are the coral reef Napoleon wrasse (*Chelinus undulatus*), the Patagonian toothfish (*Dissotichus eleginoides*), the Antartic toothfish (D. *mawsonii*), the basking shark (*Cethorinus maximus*), and the whale shark (*Rhincodon typus*). The CITES listing has also drawn attention to non-fish species targeted or taken as bycatch in fisheries, such as whales and sea turtles. Finally, the combined effects of overfishing and poor land use practices have led to freshwater fishes being the most highly threatened group of animals, with 20 percent either extinct, threatened, or vulnerable.

THE CAUSES

Governance

Weak governance is the main underlying cause of overfishing. The common access nature of the fishery resources (with often conflicting notions about whether wild fish stocks are the property of the nation, the community, or the individual fisher); technical and enforcement difficulties in controlling the levels of catch; and the migratory character of the fish resources and the resulting supranational institutional requirements for effective control all provide great challenges to the governance structure, which many international, regional, and national institutions have not been able to meet.

[5] Recruitment means the measure of new individuals (recruits) arriving in a population.

At the international level

Distant-Water Fishing. Fishers have always explored and exploited fish stocks beyond their own coastal zone. During the 16th century, Portuguese and Brittany fishers fished for cod off Newfoundland; American whalers regularly circumnavigated the globe during the 19th century in search of sperm whales. Distant-water fishing really blossomed during the second half of the 20th century, when some large fishing nations developed global operating strategies for their fishing fleets. Over time, some countries have reduced their distant-water activities from their former peak levels (Former Soviet Union countries and Japan), although the remaining activities are still far from negligible. For example, the European Union (EU) obtained some 600,000 tons annually of its fish supplies (or 11 percent) from distant-water fishing activities during 1993–97, valued at EURO 660 million. In 1998, Korean, Japan, Taiwan, and the United States caught about 1.8 million tons of tuna valued at US$1.3 billion, within the 200-mile Exclusive Economic Zone (EEZ) of the Pacific Island Countries. Regional and distant-water fishing by vessels from developing countries is still expanding, and fishing fleets of "flag of convenience" states are reportedly increasingly involved in illegal distant-water fishing.

Formal access of foreign vessels to fishing grounds within the EEZ of fish-rich nations is normally regulated under fishing agreements. As shown below, some developing countries are now critically dependent upon financial compensation payments for their entire public budget. Negotiating a "fair" compensation level has become a highly technical operation, because future catches and their landed value are unpredictable, detailed operational cost of the vessels are not available, and the costs of lost benefits in local employment are uncertain. In general, there seems to be little relationship between the value of the catch and the fee level, which points directly to the poor negotiating skills of the developing countries. Negotiating teams from developing countries are often poorly prepared, not able to valuate the non-fishery costs and benefits of foreign values, and lack the capacity to monitor the catches of foreign vessels. In addition, many of fishing agreements are heavily subsidized by industrial countries (for example, the EU pays 83 percent of the license fee, the vessels themselves only 17 percent). This set of conditions leads to most fish-rich developing nations being underpaid and overfished by the foreign fleets.

Box 1.2. International agreements

The *Code of Conduct for Responsible Fisheries* (CCRF) promulgated by FAO provides an internationally accepted set of principles and guidelines for governance and best practices in fisheries development and management. Other instruments, including the *Agreement for the Implementation of the Provisions of the Convention Relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks*, the *Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas*, and four International Plans of Action (IPOAs) on management of fishing capacity, on conservation and management of sharks, on reducing the incidental catch of seabirds, and on illegal, unreported, and unregulated (IUU) fishing, are complemented by a number of multilateral declarations.

Source: Authors

International Agreements. Several international agreements have been promulgated subsequent to the *Law of the Sea Convention* (LOS) and the Rio Declaration (see box 1.2). Despite considerable progress, (such as collaborative efforts to implement the Code of Conduct for Responsible Fisheries [CCRF] for the Asian region made by the Southeast Asian Fisheries Development Center [SEAFDEC] and FAO), commitments made in these instruments have not been fulfilled. While the instruments identify most of the actions required to restore and maintain the health of the world's fisheries, the lack of resources required to reduce fishing capacity, the many interests involved, and the lack of political will at the national level to implement tough fleet reduction programs, have severely hampered their effectiveness (see box 1.3). A recent call (FAO 2003a) for an evaluation of the impact of the CCRF may assist in prioritizing these actions and facilitating implementation of the difficult policy decisions involved.

At the regional level

Over 35 multilateral or regional fisheries organizations (RFOs) have been established, with differing functions ranging from consultative and advisory to those with full powers for management, decisionmaking, and enforcement. There is the opportunity for RFOs to bridge the divide among international instruments and more local levels of fisheries management, particularly with respect to shared stocks or issues of joint concern to countries of particular regions. Consultations help resolve disputes and identify joint actions, and provide a means of extending improved management methods and knowledge from one nation to a region. The performance of RFOs has, however, been uneven, with difficulties encountered particularly by those addressing wide geographical regions and multispecies fisheries in developing countries. Fishery bodies with discrete species mandates, like some of the tuna commissions, or the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR), an intergovernmental convention for the Antarctic, have been successful in introducing new methods or approaches. For other "management RFOs" the decisionmaking process is often a cumbersome compromise relying on peer pressure as the primary means of enforcement. The purely "consultative RFOs," rarely have the power or resources to implement plans and programs. Scientific advisory bodies have to rely on inaccurate, politically manipulated national fisheries catch statistics, because they often lack the capacity to mount their own assessment programs. The economic dimension of scientific advice often remains unsought, is ignored, or is merely used to strengthen national arguments in international bartering of stocks and quotas. Strengthening and streamlining RFOs is a key component of improving global fisheries management.

Box 1.3. Intranational management of fisheries in the EU

The failure of the earlier Common Fisheries Policy of the EU to manage European fisheries on a sustainable basis illustrates the difficulties posed by international fisheries management, even when substantial scientific and financial resources are available. The collapse of cod fishery is an example. In the North Sea, cod fishery, jointly managed by the EU and Norway, spawning stock biomass hit a historic low in 2001, prompting emergency measures that included closing large parts of the North Sea to cod fishing for up to 12 weeks, and reducing the total allowable catch by 50 percent from the previous year (European Environment Agency 2003). Nations act like fishers, placing national interest before the common good, and often, conflicting interests or inadequate cooperation between member states prevail.

Source: European Environment Agency. http://themes.eea.eu.int/Sectors_and_activities/fishery/indicators/cod/tab_content_ILR.

Committees also sometimes manage transboundary freshwater lakes and rivers, but the emphasis is on water allocation and power generation, and often not on fisheries and habitat issues.

At the national level

The introduction of improved fisheries governance structures is often marred by conflict of interest. The most common is that between Ministries of Finance, which prefer to maximize revenues from licenses and foreign exchange earnings, and Ministries (more often Departments) of Fisheries, which seek to manage yields and stocks and introduce more sustainable limits to the level of catches. Political considerations can influence the setting of total allowable catches (TACs) above the precautionary limit set by fisheries scientists. In worst-case scenarios, unachievable fisheries targets are imposed on the Department of Fisheries for implementation on the basis of target revenues anticipated by a planning commission, or a Treasury impressed by the high value of internationally traded fish. Finally, the issuing authority for licenses to build fishing vessels is often not vested in the fisheries authority, but in port authorities, as in Thailand (Willmann, Boonchuwong, and Piumsombun 2002).

Box 1.4. Experiences in Kenya: the failures of nonparticipatory fisheries management planning

Even where governments and managers attempt to implement measures geared toward sustainable fisheries resource use, when stakeholders are not part of the planning process, these measures have often failed. For example, by the mid-1990s in Kenya, the Kenya Wildlife Service had set aside several coastal fishing areas as marine parks where fishing was prohibited. However, this was done through a planning process that did not consult the fishers or local communities that had traditionally used these areas. As a result, tensions in local fishing communities mounted to the point of armed assaults on marine park rangers, arson at beachfront park structures, and illegal fishing. The Kenyan Government quickly realized the mistakes of such a planning process, and replaced the Director of the Kenya Wildlife Service, and implemented a new community outreach program to involve the stakeholders in the planning process.

Source: Glaesel and Simonitsch (2001).

Moreover, within the sector, the institutional framework and the physical, human, and financial assets available for fisheries management and monitoring, control, and surveillance (MCS) are often inadequate. Sanctions for illegal fishing are an insufficient deterrent, particularly when detection and prosecution rates are low. Fishery authorities are administrators rather than managers, and management decisions are frequently more political or administrative than technical. Fishery planning and management processes are often divorced from the stakeholder constituency (see Box I.4), and are designed and implemented without due consideration for broader ecological and socioeconomic interactions, in particular those among labor, capital, and social support. Lack of stakeholder dialogue and low levels of education in many fisher communities contribute to conflict, and to failure to reach stable long-term solutions to the allocation of fish resources.

Finally, while scientific advice is a critical input to understanding the complicated marine ecosystems dynamics, it is often of marginal use for management decisions, because research programs are not directly relevant to the fishery management decisions, or are severely outdated. Logbooks often remain unprocessed (that is, unanalyzed by authorities), surveys done long ago are cited, but the current state of a fishery is unknown. Much research is a historical exercise incapable of describing the current situation in the fishery, much less projecting its future, given the short life cycle of many species, changes in species composition, in predator-prey relationships, in environmental conditions, and behavior of fishers.

At the fisheries level

While broad national fishery policies and plans are important, they have to be translated into specific fishery-by-fishery management plans. This is often not done, and if prepared, the boundaries of the individual fisheries are often poorly defined. A clear vision for the future of a given fishery, a realistic and measurable management objective, and a roadmap for moving the fishery toward an agreed objective, are rare. The United States and Australia have comprehensive fishery management plans, while the EU has

been obliged to introduce "recovery" plans for depleted stocks. Namibia has taken the opportunity of its declaration of its independence to assert control over its important fisheries and to develop a national management plan.

Management mechanisms tend to be centralized; for example, statistical and scientific information is aggregated and analyzed at a national level with poor feedback, communication, and delegation of management functions to the local level. Institutional arrangements for the creation and enforcement of local fishery bylaws are frequently deficient.

As a result of weak governance, conflicts are a feature of many fisheries, largely caused by competition and differences in scale of use (for example, between national and foreign fleets, between small-scale and industrial fishers, and between coastal fishing and aquaculture enterprises). Questions of access, allocation, poverty alleviation, and equity are often elements of such conflicts. In the face of threatened livelihoods, such conflict would likely intensify, and, without political, legal, or organizational support, would work to the detriment of the smaller player.

Subsidies

Subsidies to the fisheries sector have been an important driving force in creating the current overcapacity and, subsequently, overfishing. A 1998 study by the World Bank (Milazzo 1998) estimated an aggregate level of US$14 billion to US$20 billion in annual subsidies to the sector, which was recently confirmed by a Worldwide Fund for Nature (WWF) survey of official reports from Asia Pacific Economic Cooperation (APEC), the Organisation for Economic Co-operation and Development (OECD), and the World Trade Organization (WTO) members totaling US$13 billion in annual subsidies (WWF 2001). Of this US$13 billion, WWF categorized almost half as "capital and infrastructure support" and another 35 percent as "fisheries management, research, effort reduction and conservation programs." In that sense, roughly half of the reported subsidies potentially lead to overcapacity and overcapitalization, and for that reason have often been distinguished as "bad" subsidies.

In addition, a growing number of governments are increasingly subsidizing fisheries management and capacity-reduction programs (for example, buybacks), which have been termed "good subsidies." Moreover, from a trade perspective, subsidies on buyback schemes and management regimes increase the competitive advantage of national industries, and would therefore be against the WTO agreements, although no definitive conclusion has been reached on that issue yet. Nevertheless, the EU, in a current submission to the WTO Negotiating Group on Rules, proposes that future reform of the EU Common Fisheries Policy should include measures for restructuring of the fleet through capacity withdrawal, and the phasing out of public aid for fleet renewal.[6] It was earlier estimated that the world's fishing capacity would have to be reduced by 25 percent for revenues to cover operating costs, and by 53 percent for revenues to cover total costs (Garcia and Newton 1995). It is clear that fisheries have not paid the full management fees associated with fishing, nor have they internalized the environmental costs. Net economic returns to subsidies are made difficult to assess because of interactions among fleets, linkages with processing, and the difficulties in quantifying the ecological and social impacts of fishing.

(c) Demand and Supply Imbalances

Growing populations, increasing incomes and urbanization, and health concerns about other sources of animal products will continue to fuel a strong increase in domestic demand for fish in the developing

[6] Submission of the European Communities to the Negotiating Group on Rules—Fisheries Subsidies, April 2003. Available at http://europa.eu.int/comm/trade/goods/agri/sub_fisheries.pdf.

world, outstripping the supply from capture fisheries, and thus putting more pressure on the already overfished marine and inland resources.

Demand

Globally, per capita demand for fish products for human consumption increased from 10.5 kilograms (kg) per year to almost 16 kg over the last three decades. The recent International Food Policy Research Institute [IFPRI]/WorldFish Center study on global fish demand (Delgado and others 2003) predicts that the total demand for fish products will increase from 91.3 million tons in 1997 to 127.8 million tons in 2020, which equals an annual growth of 1.47 percent, and a per capita annual consumption increase from 15.7 kg to 17.1 kg in 2020. FAO estimates that global fish consumption will increase to 19 kg to 21 kg per capita in 2020, even higher than Delgado and others (2003).

Thus, significant regional differences emerge. As shown in Table 1.1, these increases in consumption will likely be concentrated in Southeast Asia, Latin America, the Caribbean and China, while consumption is likely to decrease or remain relatively constant in Africa, the Near East, Oceania, and Russia.

Table 1.1. Current and Projected Per Capita and Total Consumption in 1997 and 2020

Region	Per Capita Consumption 1997 (kg)	*Per Capita Consumption 2020 (kg)*	*Total Consumption 1997 (million metric tons*	Total Consumption 2020 (million metric tons)
China	26.5	35.9	33.2	52.5
Latin America	7.8	8.6	3.8	5.6
North Africa and West Asia	6.2	6.4	2.1	3.2
Southeast Asia	23.0	25.8	11.3	16.7
India	4.7	5.8	4.6	7.4
Other Southeast Asia	6.0	6.1	2.0	3.2
Sub-Saharan Africa	6.7	6.6	3.7	6.4
United States	19.7	19.7	5.4	6.3
Japan	62.6	60.2	7.9	7.4
European Union (15)	23.6	23.7	8.8	8.8
Eastern Europe and former USSR	10.6	11.6	4.4	4.8
Other industrial countries	14.7	14.0	1.6	1.9
World	**15.7**	**17.1**	**91.3**	**127.7**

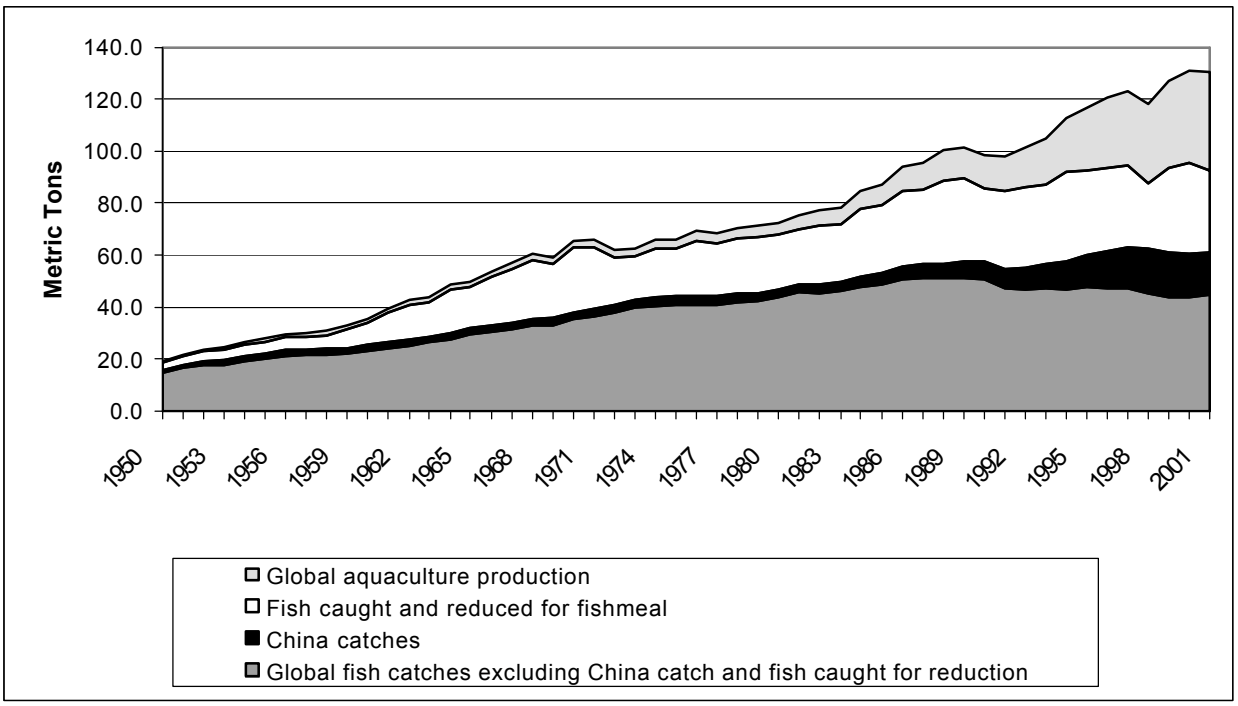
Source*:* Delgado and others (2003).

In general, developing countries will continue to export high-value products and import low-value products, particularly small pelagics. However, as their incomes increase, consumers in developing countries will also generally pay more per calorie of food fish, replacing lower-value species with higher-value products (Delgado and others 2003). For example, consumers in East and Southeast Asia will diversify their diets and slightly increase the share of high-value fish in their food basket. Southeast Asia is anticipated to increase its total food consumption by 1.7 percent per year. In contrast, in Southeast Asia the consumption of low-value fish (2.1 percent per year) is anticipated to increase faster than total food fish (1.9 percent per year) (ibid.). Net imports into Africa (for low-value products) are projected to increase.

Supply

Based on recent trends and the most realistic stock assessments, little increase in supply from capture fisheries, beyond the current level of 80 million to 90 million tons, can be expected. Indeed, when the contributions of fish caught and reduced for fishmeal (a majority of which are small pelagics, such as anchovy, with highly variable abundances depending on climate), and the production from China, (because of its probable overestimation), are subtracted from the world total, capture fisheries have actually been in decline since 1988 (figure 1.1.). Even this level of production has been maintained only by fishing harder and by targeting smaller and less-valuable species as the large fish have disappeared and fishers continue to "fish down the food chain." Intensifying the fishing effort would only hasten the degradation of the resource base. FAO (2002a) has estimated global production of capture fisheries could reach 100 million tons in 2030, which is partially based on the introduction of more sustainable fishery methods and a shift toward the use of lower-value species, and even zooplankton for human food.

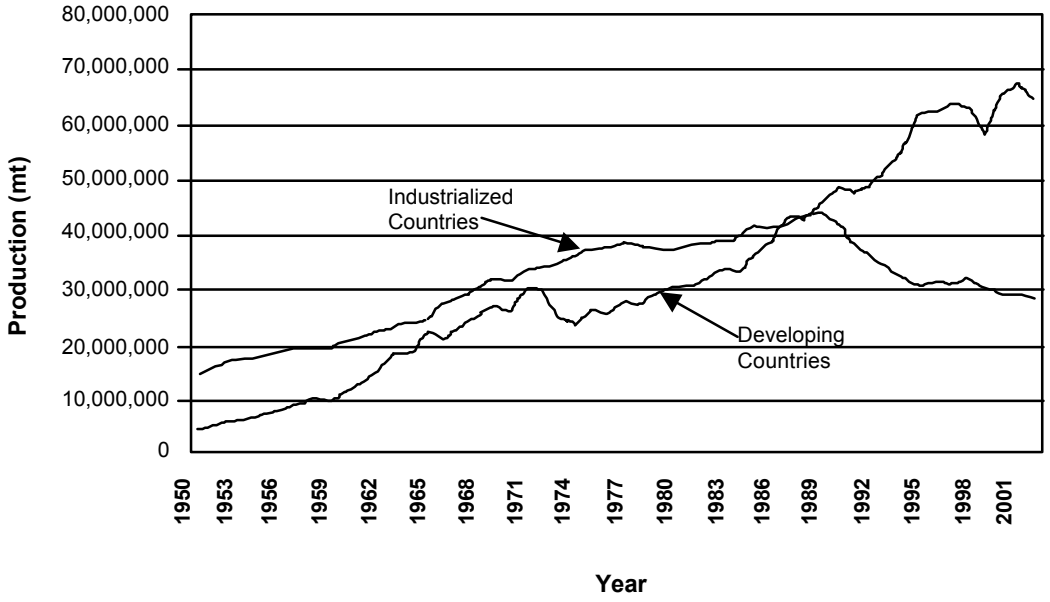
Figure 1.1. Trend in global fisheries production since 1950



Note: Highlighting the contribution of aquaculture, fish caught and reduced for fishmeal (e.g., anchovetta, *Engraulis ringens*), and China's Reported Fish Catches Source: FAO (2002).

Over the last two decades, the two main sources of growth have been capture fisheries in the developing world and aquaculture, particularly as industrial fishing efforts in industrial countries have shifted to developing countries in the wake of declining catches. Much of the world's capture fisheries production now originates from developing countries (see figure 1.2). Production in developing countries has grown at an annual average growth rate of 1.42 percent over the period. In contrast, annual growth rates of production were higher in industrial countries (2.83 percent) until 1988 after which they have declined sharply (-2.72 percent during 1989–2001).

Figure 1.2. World fish production from capture fisheries, industrial and developing countries (1950–2001)



Source: FAO (2003b).

The same trends of production and overexploitation are seen in inland water capture fisheries. Total production from inland capture fisheries in 2001 was 8.8 million tons (FAO 2002b)[7] (with China contributing one-quarter of the total). The top-10 producing countries (China, India, Bangladesh, Uganda, Indonesia, the Russian Federation, Tanzania, Egypt, Cambodia, and Kenya) account for 64 percent of world inland water production. Most of the global total came from the catches of Asia and Africa (about 64 percent and 25 percent, respectively), which is indicative of the use of the Great Lake and river floodplains of these regions, which contribute important sources of animal proteins to subsistence communities.[8]

Consumer preferences will also affect the pressure on capture fisheries, and the equity of access of the different stakeholders. There is a growing demand for fresh fish, which accounts for 54 percent of global food fish consumption, with frozen fish (currently at 26 percent), canned fish (currently at 11 percent), and cured fish (currently at 10 percent) the remaining segments. This demand for fresh fish favors direct processing and packaging on board vessels or in large processing plants in the main fish ports. Such factory vessels increase fishing pressure, while their economies of scale carry the danger of the small-scale fisheries being crowded out, particularly as they often cannot meet the stricter sanitary requirements demanded by the international trade in fresh fish products. Conversely, there is also a trend toward the transfer of processing operations to countries with low labor costs, which favors employment generation in the developing world.

[7] These figures may be an underestimate because many countries experience significant difficulties in collecting statistics on inland water fisheries. Among the main reasons for this are the scattered characteristics of these fisheries, their unrecorded contribution to subsistence, and lack of related fisheries industries. For example, the Mekong River Commission has revised production estimates for the Lower Mekong Basin based on both reported commercial and assessed subsistence use up to 2 million tons annually, an order of magnitude larger than estimated in the 1990s.

[8] In contrast, in developed countries these inland water resources are increasingly given over to nonfood commercial uses, such as sports fishing.

The main source of growth has been, and will continue to be, the aquaculture sector. At a growth rate of 13 percent per year over the last 20 years in the developing countries, this sector has grown dramatically. Major aquaculture developments in some countries (for example, Norway, China, and the Philippines) have been successful in increasing supply and holding down global or local prices of specific commodities (salmon, carp, and tilapia, respectively). This is expected to remain the same for the next decades. Under a scenario using the present baseline and trends for the capture fisheries sector, global production of food fish is projected to rise by 1.5 percent annually through 2020 (Delgado and others 2003). Two-thirds of this growth is provided by aquaculture, whose share of total food fish production rises to 41 percent. Most growth will occur in developing countries, which will account for 79 percent of food fish production in 2020.

The effect of this spectacular growth in aquaculture on fishing pressure for fishmeal then becomes an important question. The quantity of fish landed and reduced to fishmeal has grown since 1970, but this growth has stalled since the mid-1980s (table 1.2). Peru and Chile are responsible for an average of 44 percent of fishmeal supply, but the supply from these countries has shown major fluctuations according to the effect of the El Niño climate effects. These countries have therefore been the major price maker in the global market.

Table 1.2. Use of Fishmeal, 1973–97 (actual) and 2020 (projected),

millions of metric tons

Region	1973	1985	1997	2020
China	0.11	0.55	1.57	2.09
European Union (15)	1.10	1.19	1.07	1.15
Japan	0.83	1.05	0.73	0.71
United States	0.33	0.46	0.27	0.30
Rest of the World	2.14	2.84	2.49	3.67
Total Developing World	0.88	1.82	3.15	4.64
Total Industrial World	3.63	4.27	2.98	3.28
Total	4.51	6.09	6.13	7.92

Source: Delgado and others (2003).

The percentage of fishmeal consumed by aquaculture has risen dramatically over the last decade (from 10 percent of fishmeal in 1988 to an estimated 35 percent in 2000), reflecting the growth of aquaculture itself (Delgado and others 2003). This was made possible by the substitution of fishmeal by other sources of protein in livestock feed.

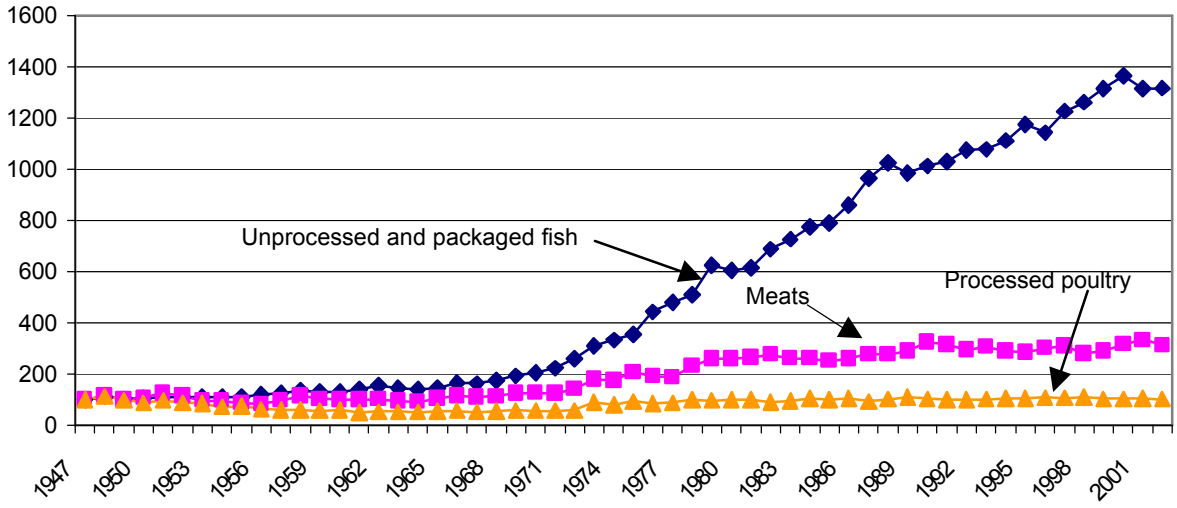
The future prospects for fishmeal are unclear. On one hand, there is the strong growing demand for livestock products,[9] which is being met mainly by pigs and poultry based on fishmeal-containing feeds. In addition, there is the increasing demand for food fish, which will have to be satisfied in large part by the subsector of aquaculture, which requires a much higher percentage of fishmeal in their diet. Already one-third of the world's production of fishmeal is fed back to high-value carnivorous fish, and this share is expected to increase. The projected scenario is one of increasing prices, so that these inputs become more expensive than plant-derived substitutes, even taking their higher quality into account. Alternative scenarios, in which either a percentage of these requirements is derived from new technology (for example, single-cell protein sources), or public confidence in the use of fishmeal is affected (for example, by environmental issues), could affect the utility of fishmeal supplies and the costs of aquaculture production.

[9] Described as "the Livestock Revolution" in Delgado and others (2001).

Rising Prices

The imbalance of supply and demand is causing a strong increase in the prices of most food fish species and fishmeal. As can be seen in figures 1.3 and 1.4, fish and seafood products are therefore one of the few agricultural commodities that have shown a real increase in price over the last decades. Price rises could well lead to increased (fish) food insecurity in poor urban populations.

Figure 1.3 Prices of fresh and processed fish compared to meats and poultry



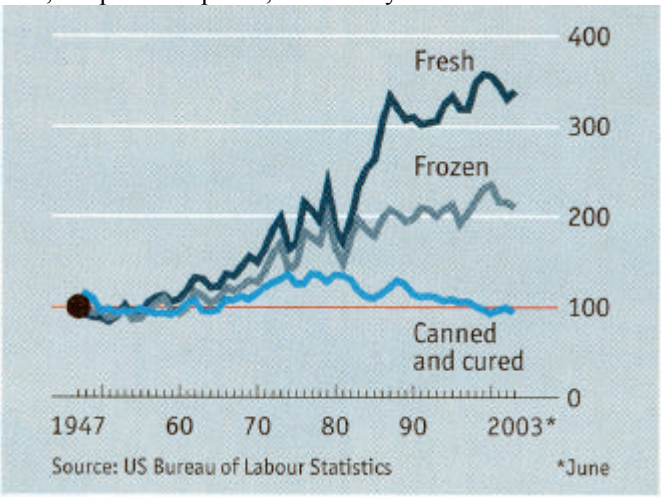
Source: U.S. Bureau of Labor Statistics. U.S. Producer Prices, deflated by U.S. Producer Price Index, 1947 = 100.

This trend is expected to continue. According to Delgado and others (2003), real fish prices are estimated to rise by 4 to 16 percent by 2020, while meat prices will fall 3 percent. Fishmeal and fish oil prices would rise 18 percent and use of these commodities would increasingly be concentrated in aquaculture of (generally high-value) carnivorous species. A sensitivity analysis, based on a pessimistic view of capture fisheries, leads to escalating food fish prices (increasing 69 percent for high-value finfish) and soaring fishmeal prices (increasing 134 percent). However, an optimistic view of increased investment in aquaculture lowers the real prices of low-value food fish (by 12 percent), but raises fishmeal prices by "only" 42 percent.

In summary, overall trends are clear: there is a strong growing global demand for fish products, in particular for the higher-quality species, which cannot be met by the stagnating production of capture inland and marine fisheries. This, in turn, drives up the prices, which increases the fishing pressure even further. In addition, there is a shift toward fresh fish, which might have negative equity implications for small-scale fishers, although more high-value export opportunities may be generated in the developing world.

Figure 1.4 Prices as fresh as the fish

Fish, US producer prices, deflated by US PPI 1947=100



Source: "The Promise of a blue revolution." Economist Vol. 368, No. 8336 August 9, 2003. Reprinted with permission.

Structural changes of the capture fisheries sector

In tropical and subtropical fisheries, many fishing units using different fishing gear types and with different scale operations could be targeting the same fish stocks and hence competing for a share of the catch (see box 1.5). Moreover, while the physical structure and dispersed nature of coral reef fisheries may limit their exploitation to small-scale fishers in many tropical developing countries, in many others, overfishing of one species by the industrial sector might threaten the yield of other species in the food chain. Moreover, there are strong economies of scale in production and in processing and selling, which crowd out small producers. Therefore, the sustainability problems of capture fisheries subsectors can be solved only by a holistic approach, recognizing the sharing of resources among different scales of fishing and their interactions. For example, bycatch from shrimp trawlers along the coastline often includes some of the same species that are targeted by local small-scale fishers for food fish, while at the same time the trawl gears can damage coastal habitats that support small-scale fisheries. In these cases, efforts to govern the small-scale fisheries would have to include the industrial shrimp fisheries as well. Some countries, such as Eritrea, have prohibited industrial trawling within a specified distance from coral reefs, to protect the reefs from the impacts of trawl gears and the health of the small-scale coral reef fisheries.

Inland-water fisheries in developing countries are associated with heterogeneous bodies of still or flowing waters. The water bodies encompass large and small lakes, rivers, and their floodplains, or water trapped in manmade structures such as reservoirs, tanks, and trap ponds. Fishing is also characterized by the use of multiple gears, seasonality (particularly in flood plains), and variable linkages with livelihoods like farming. Opportunities for exploitation of inland waters are governed in large part by geospatial arrangements within water basins, upstream/downstream links, and competition among fishing and other land and water uses, particularly irrigation for agriculture, power generation, and navigation.

Box 1.5. Structure of marine fisheries

Fishing is carried out in a vast range of styles and scales. At one end of the spectrum there are the small-scale or artisanal fishers, which in some cases are low-capital, single-person operations, such as those using cast nets and small traps, carried out from the shore without even the use of a boat or dinghy, from small nonmechanized canoes or rafts, or from small motorized dinghies and boats crewed by one to three fishers. Small-scale fishers often target the larger demersals, although small-scale fisheries are so diverse and encompass such a wide range of users and fisheries that it is difficult to characterize them. However, small-scale fisheries are the predominant type of fishery in developing countries, such as in Thailand, where over 90 percent of the fishing households participate in these types of fisheries, and in Indonesia, where these fisheries are responsible for almost 95 percent of the total marine production (FAO Country Profiles 2003).

At the other end of the spectrum, there is the *industrial sector*, with large team operations that may be highly mechanized, such as marine purse seiners and trawlers. They tend to target the wide-ranging, oceanic, large pelagic species, using surface longlines, and purse seines; or the demersal or bottom-dwelling species that live on coastal shelves and slopes, using trawls, gill nets, and bottom-set longlines; or the schooling small pelagics, such as clupeoids and mackerels of highly productive marine ecosystems affected by upwelling currents and river outflows, using purse seines; or pelagic trawls, shrimp on coastal shelves affected by tropical river outflows, using trawls, and riverine and coastal migrating fish, using fish-herding traps and bag nets.

In between these extremes are small, medium, and large operations using fixed or passive fishing gear such as gill nets, and active gear such as trawlers and trolled lines.

Source: Berkes et al., 2001

Technological advances

While in numerical terms the global fishing fleet (1.3 million decked and 2.8 million undecked vessels) has remained relatively stable since its major expansion in the 1980s, maximum catching capacity as characterized by the size and power of the vessels, the selectivity of their gear, and the navigation technology and skill of skippers, has greatly increased. Thus, it has been estimated that there has been a 270 percent increase in average fishing power between 1965 and 1995, essentially a 9 percent average annual growth rate (FAO 2002c; Garcia and Newton 1995). Bigger vessels also use more nondiscriminating gear, leading to an increase in the share of the nontarget catch, the so-called "bycatch," which is discarded or used in the reduction industry. For example, some trawler vessels often catch more "bycatch" than their target species.

Declining technology costs also mean that more small-scale fishers are now using Global Positioning System (GPS) technology, echo sounders, outboard motors, and monofilament nets, which can greatly enhance the efficiency of fishing operations, leading to concerns that technology will enable "the last fish in the sea to be caught." For example, a proliferation of technologies like outboard motors in the Pacific Island countries has allowed small-scale fishers to travel further to exploit remote fishing grounds previously accessible only to local communities, whose traditional resource management measures have increasingly broken down in the face of growing external fishing pressures. In such cases, where small-scale fishing communities are geographically isolated, with poor market access or limited access to capital and services, new technologies have allowed more fishers to access these fishing grounds, or resulted in a larger proportion of the total catch being taken by a few fishers with new technologies, increasing inequities in local resource use.

Narrow scientific focus

"Sustainable" yield has been the key goal of fisheries management efforts over the last few decades, and the subject of extensive research. During most of the last century, this sustainability concept was applied—often in its most extreme form, seeking the Maximum Sustainable Yield (MSY)—to single fish stocks, particularly in temperate climate areas. Not surprisingly, governance of a sector that focused efforts on managing an individual fish stock as if it lived in a vacuum, unaffected by changes in the ecosystem, mostly failed, and for the following reasons:

- Other aspects of the natural, human, and management system were left out of the equation.
- The MSY approach largely ignored the risks of natural and human disasters.
- The single objective proved insufficient to provide a sustainable solution, particularly in the complex, multispecies tropical marine systems fished by small-scale fishers throughout the developing world.

Moreover, most research has focused in the past on the biology of fish and—more recently—the relationships governing marine systems. Only some industrial countries have well-functioning economic institutes analyzing fishing operations. Few research programs in the developing world provide sufficient knowledge necessary for timely management, and most management decisions all around the world are made in a vacuum of insufficient timely and relevant information and analysis, with particular shortages in the developing world. Planning of research to tailor outcomes to management requirements has been a failure in all but a handful of countries. Transforming the "culture" of scientific independence prevailing in many research institutes and linking research funding to producing timely "outputs" has to be a critical component of any attempt to improve sector governance discussed in the next sections.

Population growth and water scarcity and pollution

Increasing human populations and their clustering around sea and lake coasts and the productive floodplains of the great rivers are another root cause of overfishing and degradation of aquatic ecosystems in developing countries. The population living within 100 kilometers of the coast has grown to 2.2 billion people (39 percent of the global population), leading to pollution and degradation of major marine ecosystems. Pollution effects and declining water levels have been even more significant in inland water bodies. The high price of fish relative to other primary agricultural commodities has acted as a spur to overextraction. Population pressure and loss of terrestrial commons drive the poor, the landless, and those without alternative employment to exploit aquatic resources to which access is often open and free. The inherent nature of open-access fishery resources leads to overexploitation as economic opportunities attract more fishers. Even when profits decline, individual fishers continue to increase their fishing effort in an attempt to harvest a greater share of the limited resource shared with competitors.

Population growth particularly affects inland capture fisheries. Overexploited inland capture fisheries or those suffering from environmental degradation are found in many of the major inland fish producers such as Bangladesh, China, and India, the countries of the lower Mekong Basin, and the countries bordering Lake Victoria. Population growth also affects the sustainability of water bodies. Water is being extracted from lakes and rivers to meet urban demand and irrigation; for example, the Aral Sea has seen a major contraction. Dams disrupt migratory pathways and cause high mortalities of juvenile fish; for example, dams on the Volga and other rivers contribute to the decline of the sturgeon stocks, and dams curtail water inflow from almost all rivers entering the Mediterranean. Deforestation for fuel, agricultural land, and other uses causes increased runoff and erosion by rivers, leading to sedimentation downstream, particularly in reservoirs and estuaries. Pollution is a significant contributor to the direct mortality of fish, and pollutants constrain reproductive success and render fish more susceptible to disease. Fish from some

water bodies pose a health risk because of accumulated toxins. Pollution and drainage of wetlands destroy essential fish habitat.

Population growth and industrialization also affect habitats crucial to the sustainability of fish stocks. Wetlands and estuaries are being impacted by urban sprawl, industrialization, and drainage schemes. Mangrove swamps are being converted and sea grasses lost. For instance, in the Philippines, aquaculture ponds cover about 2,539 square kilometers, mostly located in the coastal zone in what were originally mangrove areas. Pollutants, sediments, and toxic contaminants from terrestrial sources continue to enter the oceans in large quantities despite international commitments to reduce discharges. While the impacts are difficult to quantify, there is ample evidence of the effects of pollutants. Whole rivers have been poisoned by industrial mishaps, and increasingly frequent algal blooms in coastal areas deplete oxygen and are associated with shellfish poisoning. For example, over 300 red tide[10] events were recorded during the 1990s along China's coastal areas, affecting cage culture and cultivated mollusks. In the East China Sea harmful algal blooms increased in 2000, covering up to 12,446 square kilometers (Lu 2001).

Climate change

Any discussion of the driving forces affecting the sustainability of the world's fisheries must take into account the current and projected impacts of global warming and subsequent climatic changes on the ecosystems that support these fisheries. According to the Intergovernmental Panel on Climate Change (IPCC 2001), throughout the coming century, global warming will result in large-scale impacts on the oceans that include increasing sea levels and sea surface temperatures, changes in ocean circulation, and potentially more frequent and intense climate variations. Already, the frequency of intense natural phenomena, like El Niño events, has increased in recent decades, but whether this is a fingerprint of global warming-induced climatic changes or natural variation is still a matter of scientific debate. All of these changes can significantly impact the structure of marine ecosystems, and the abundance and distribution of commercially important fish stocks.

For example, the World Bank (2000) noted that projections of increasing average sea surface temperatures and year-to-year climate variability in the Western Pacific Ocean (including large zonal displacements in the warm pool and more frequent El Niño-like conditions) would affect the distribution, abundance, and catchability of the tuna fisheries in the region. While distant-water fishing fleets would likely be able to shift their effort and fishing patterns in response to such changes, domestic fleets of Pacific Island Countries would be highly vulnerable to fluctuations of tuna fisheries in their Exclusive Economic Zones. In some cases, global warming is already believed to be responsible for climatic changes impacting marine ecosystems. Recent, intense El Niño events and temporary increases in sea surface temperatures are believed to be responsible for large "bleaching" events on coral reefs. Corals flourish between quite restricted temperature limits and expel symbiotic algae in response to a stress such as increasing temperatures, causing the corals to pale in color (that is, bleach), and in many cases leading to coral mortality. Such events have threatened the health of coral reef ecosystems in the coastal waters of many developing countries (for example, throughout the Indian Ocean), and potentially the fisheries that these ecosystems support. Rates of recovery from bleaching have been variable around the world for reasons that are not completely understood, but which may relate to ancillary stressors of these systems.

Unlike many of the other driving forces affecting the sustainability of the world's fisheries, the exact nature and magnitude of the impacts of projected climatic changes on marine ecosystems (such as increased fluctuations in abundance and spatial distribution of tuna, and increased threats to coral reef ecosystems) is not yet known. However, there is a growing recognition among experts that these changes

[10] Red tide is the term applied to toxic algal blooms caused by several genera of dinoflagellates that turn the sea red and are frequently associated with deteriorating water quality.

may interact with the biophysical stresses on ecosystems caused by fishing, rendering fish stocks more vulnerable to change. For this reason, the possible impacts of climatic changes on fisheries will need to be taken into account in fisheries management planning. It will likely require more precautionary approaches to harvest limits, and understanding of the state of ecosystems. Increased flexibility may be required in the implementation of regional fishing agreements and management arrangements due to changing distributions of fish stocks such as tuna.

IMPACTS

The effect of these driving forces has been severe over fishing throughout the world, and have led to the fisheries crisis described above. They will directly affect the key goals of the World Bank's Rural and Environmental Strategies of poverty reduction and sustainability.

Income effect

The massive expansion of fishing has caused a rapid decline of net income. At the global level, FAO estimated that during 1994–97 the gross annual income from the world's fishing fleets and port infrastructure amounted to US$70 billion to US$80 billion, which was far below their real operating and capital costs of US$120 billion. The difference was made up by substandard incomes and wages, subsidies, and unaccounted depreciation and infrastructure costs. Many industrial vessels catch hardly enough to meet their operating costs.

Box 1.6: Small-scale fisheries in rural Thailand

"If I were a fishermen in rural coastal Thailand, I would probably make about half of the income of the average Thai citizen. I would be from one of the almost 50,000 households in Thailand fishing with a vessel less than 10 tons. I would live in one of the 2,500 rural fishing villages around the country, 80 percent of which are located beyond municipalities and lack basic infrastructure such as roads and electricity. Many people have left fishing for other job opportunities, and if I could do anything else I would."

Source: World Bank (2002).

A decline in fishery resources also seriously endangers the livelihoods of some very poor population groups. Fisheries resources are essential to the lives and livelihoods of about 51 million people, including some of the world's poorest people (ICLARM 1999) who are directly involved in the harvesting and processing of fish and other aquatic products—98 percent of whom are from developing countries. Around 30 million people are employed (FAO 2002b) as full-time fishers, of whom 95 percent are from developing countries. Assuming an average household size of five people, then 250 million people in developing countries are directly dependent on the fishing sector for food and income. Pushed by a lack of alternative employment, this number is still growing. FAO estimates that globally the number of full-time fishers has been growing at an average rate of two percent per year since 1990, and with the decline in the number of fishers in the OECD countries, this growth has been mainly in small-scale fisheries in the developing world. However, this increased number of fishers has to scratch their livelihood often from a decimated resource base (see box 1.6), as shown by the collapse of the catch-per-unit- effort in Thailand. Additionally, fish production employs some 150 million people in developing countries in associated sectors such as marketing, boat building, gear making, and bait (ICLARM 1999). FAO further estimated that at least 20 percent of the world's full-time fishers (6 million people) earn less than US$1 per day, and that roughly 90 percent of the world's fishers are from Asia and Africa.[11]

[11] More specifically, FAO reports that 85 percent of the world's fishers and aquaculture workers are in Asia, and seven percent are in Africa.

Furthermore, for many poor families, fishing is a critical part of risk reduction. In addition to fishing, many fish workers are also engaged in farming, farm labor, and other rural activities that provide at least part of their livelihoods. Conversely, rural and urban people may rely part time on fisheries resources, if they can access them. Indeed, access to fisheries resources or exclusion from their use may determine vulnerability to poverty (Bene 2003) in chronically or sporadically depressed rural environments, for example, as a result of climate, economic, or other crises. Thus, the resources can act partly as a social safety net, partly as a production base. The extreme marginal nature of the poorer fishers makes them a difficult group to target for development assistance.

Nutritional effect

The decline in fishery resources, or a significant increase in the price of food fish, would seriously affect the nutritional status of major population groups, including some of the most vulnerable ones. Fish is an important source of animal protein, but the vitamins and micronutrients it supplies are also vital for nutrition. Food fish is relatively more important as food in developing than in industrial countries; in developing countries, fish provides nearly 20 percent of the animal protein, compared to 12 percent in industrial countries.[12] Indeed, the overall animal protein divide between the industrial and developing world is starkly illustrated by fish consumption. In 2000, in absolute consumption per person, people in developing countries consumed only 3.7 grams of fish protein per day compared to 6.6 grams per person in industrial countries. This points to both an animal protein divide and a divide in the relative importance of fish in the more meager diets of those in developing countries. It is particularly important in East Asia and in Africa, where, for example, it supplies more than 50 percent of the animal protein intake in the diet of the 400 million people living in the some of the poorest countries of the world (Bangladesh, Cambodia, Equatorial Guinea, Ghana, Guinea, Indonesia, The Gambia, the Republic of the Congo, Sierra Leone, and Togo). This figure is equal to all four terrestrial animal protein commodity groups combined (beef and veal, sheep, pig, and poultry) for these countries (Williams 1996).

Macroeconomic impact

A declining global fish resource will affect the economic performance of a significant number of coastal developing countries. While they may not all contribute large proportions of global fish production, their fisheries sector is an important contributor to economic growth or state finances. For example, the fisheries sector provides half the funding for the regular budget of Guinea-Bissau, and for some, it is a major component of the economy.

Table 1.3 shows that the sector represents more than five percent of the national economy and GDP of at least 12 countries (Berkes and others 2001; Matthews and Hammond 1999). The majority (64 percent) of global fish production originates from only 12 countries, seven of which are developing countries (figure 1.5).

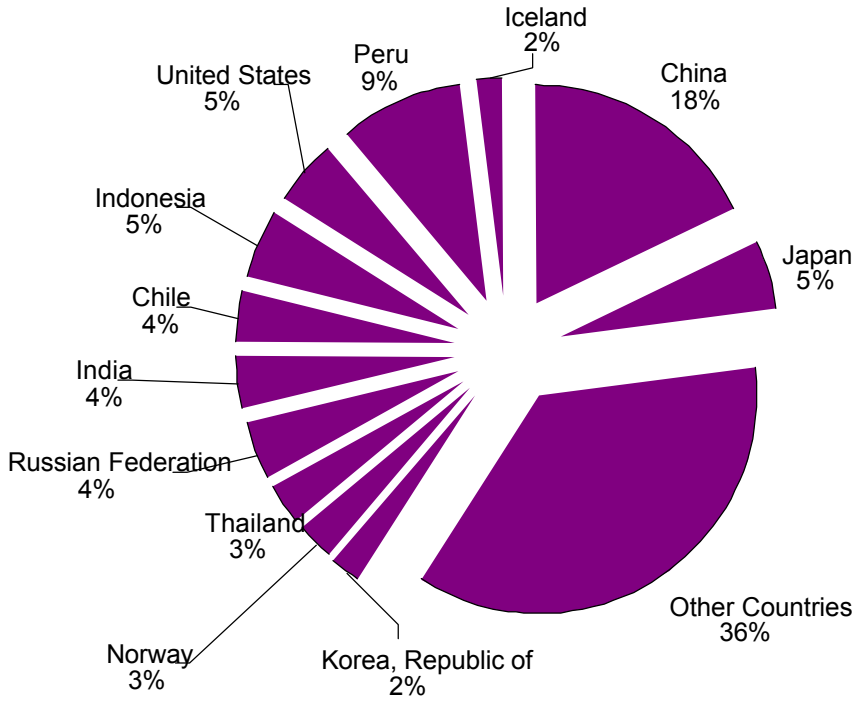
[12] From FAOSTAT nutrition database, http://www.fao.org.

Table 1.3. Contribution of fisheries to the GDP, selected countries

Country	Fisheries as Percent of GDP	Country	Fisheries as Percent of GDP
Bangladesh (1996/97)	7	Marshall Islands (1998)	9
Cambodia (1995)	4	Myanmar (2000)	5
China (1999)	3	Namibia (1999)	7.5
Fiji (1998)	5	Samoa (1999)	6.6
Ghana (1996)	7	Senegal (1996)	7
Kiribati (1998)	13	Solomon Islands (1999)	12.8
Laos (current est.)	4	Vietnam (1996)	6
Maldives (1996)	13		

Note: Countries in which fisheries contribute more than 5 percent of GDP are included. However, China, the largest producer, is included as a comparison. In Cambodia and Laos, the fisheries production results entirely, or in large part, from inland water capture fisheries.
Source: FAO Country Profiles..

Figure 1.5. Leading capture fisheries producers in 2001



Note: More than 2 million ton/year. Source: FAO (2003).

Global trade and foreign exchange

Declining capture fishery resources, if not replaced by aquaculture, will greatly affect the trade and foreign exchange position of the developing world. Fish is the most heavily traded food commodity and

the fastest-growing agricultural trade commodity on international markets. The export value of fisheries products (including aquaculture products) was US$55.2 billion in 2000, continuing the last decade's sustained four percent annual growth rate. In value, industrial countries imported 80 percent of the world total of US$60 billion of fish and other aquatic product imports in 2000. Trade in fish products tends to flow from the less-developed countries to the more-developed countries. Net exports, and hence crucial foreign exchange earnings of all fish products from developing countries, increased from US$3.7 billion in 1980 to US$10 billion in 1990, and to US$18 billion in 2000. This was greater than the net exports of other agricultural commodities such as rice, coffee, sugar, and tea combined. Thailand is the leading fish exporter in value terms, with US$4.4 billion in 2000, followed by China, with US$3.7 billion. In addition to these large producers, fish products also constitute a major portion of exports for a number of countries, with coastal countries in Africa, South America, and the islands of Oceania exhibiting a significant trade surplus in fish products. For example, in 2000, fish products represented about one-third of the total export of Senegal. The increased trade in aquatic products has made many developing countries more vulnerable to the imposition of sanitary and other standards of the industrial world. Short-term trade blocks by industrial countries, some justified, others imposed by the industrial countries to protect their own industries, have cost developing countries dearly. Examples in recent years include the European Union block on shrimp imports from India and Bangladesh, and the U.S. refusal to allow farmed native catfish from Vietnam to be sold as "catfish" on the U.S. market.

THE INTERNATIONAL REACTION

The threat of the collapse of the major global marine ecosystems has recently created a strong public reaction. The implications for the macro economy and trade of several developing countries, the livelihoods of poor coastal communities, and nutrition of the urban poor need to be addressed by the development community. Following on the awareness created by FAO since the mid-1990s, the World Summit on Sustainable Development (WSSD) took the long-term sustainability of the global fish resources very seriously and called on the international community to take very specific actions to meet specific targets, including the establishment of representative networks of marine protected areas by 2012, and the maintenance and restoration of the world's fish stocks to sustainable levels by 2015 (see table 1.4).

This action plan to address the current fisheries crisis was reiterated by the G8 countries in their May 2003 Ministerial meetings in Evian, France. Acknowledging that while "global sustainable development and poverty reduction requires healthier and more sustainably managed oceans and seas…there is growing pressure on the marine environment…[and] the decline in marine biodiversity and the depletion of fish stocks are of increasing concern," the G8 countries promised to maintain the productivity and biodiversity of important and vulnerable marine and coastal areas, including on the high seas. Moreover, they stated that the "establishment of ecosystem networks of marine protected areas by 2012 in their own waters and other regions is a priority under the action plan" (Environment News Service 2003). In addition, more recent findings on the collapse of the large predator stocks, in particular cod and tuna, heightened awareness and sparked a new round of interest in the general public, reflected in the recent cover stories of *U.S. News & World Report*, *Newsweek International*, the *New York Times*, and *The Economist*.

Table 1.4: Summarized goals of the WSSD on fisheries and aquatic resources

Year	Goals	WSSD Paragraph Reference
No time frame	Assist developing countries in coordinating policies and programs at the regional and subregional level aimed at the conservation and sustainable management of fishery resources.	29(g)
No time frame	Strengthen donor coordination and partnerships among international financial institutions, bilateral agencies, and other relevant stakeholders to enable developing countries to develop their national, regional, and subregional capacities for infrastructure and integrated management and the sustainable use of fisheries.	30(g)
2004	Deter and eliminate illegal, unreported, and unregulated fishing through implementation of the international plan of action. Establish a regular process under the United Nations for global reporting and assessment of the marine environment. Implement the Global Program of Action for the Protection of the Marine Environment.	30(d) 34 (b) 52 (e)
2005	Assist in implementing FAO international plan of action for the management of fishing capacity.	30(d)
2006	Achieve substantial progress (by the next Global Plan of Action Conference) to protect the marine environment from land-based activities.	32 (d)
2012	Develop and facilitate the use of diverse approaches and tools, including the ecosystem approach, the elimination of destructive fishing practices, the establishment of marine protected areas consistent with international law and based on scientific information, including representative networks… and time/area closures for the protection of nursery grounds: proper coastal land use, watershed planning and the integration of marine and coastal areas management into key sectors.	31 (c)
Not later than 2015	Maintain or restore (fisheries) stocks to levels that can support the maximum sustainable yield with the aim of achieving these goals for depleted stocks on an urgent basis.	30 (a)

Source*:* WSSD (2002).

Besides meeting the specific fisheries targets set by the WSSD (table 1.4), the accomplishment of the Millennium Development Goals (MDGs) will be enhanced by the inclusion of the fisheries sector, which is critically important for many of the poor. The sector has too often been overlooked in plans to sustain rural development. The World Bank, with its capacity to combine policy dialogue at the highest level with specific investments, is well placed to work with international agencies and analytically with governments in key fishing nations to assist a four-pronged attack on the issues of the global sector, including:

- Supporting the establishment of market-based incentives and elimination of open-access regimes;
- Contributing to long-term sustainability through the capture of resource rents through user fees or royalties;

- Supporting increased services provision to marginalized rural fishing communities, and directly assisting these communities to sustainably manage their fisheries and establish marine reserves and protected areas; and
- Strengthening the institutions dealing with the governance of the sector in the developing world, and raising awareness at the level of the OECD countries on the need for reform of their systems.

The World Bank's new rural and environmental development strategies recognize the importance of addressing these issues and the global fishing crisis, linking rural development to effective sustainable resource management, and particularly, toward enhancing sustainable fisheries management. This paper will offer an approach for how the international development community, and in particular the World Bank, could assist coastal developing countries to meet the fisheries targets set by the WSSD. The challenge is to maintain economic growth and development, but to avoid the overfishing and ecological problems of today, and to establish institutions, values, and practices that will safeguard the fish resources for tomorrow. Improved governance of fisheries at the local, national, and international level is a prerequisite for sustainable use of fish resources.

2. Redressing the Governance Framework for Sustainable Fisheries Management

GOVERNANCE AND SUSTAINABLE MANAGEMENT OF FISHERIES

As described in chapter one, fisheries throughout the world are facing a crisis, and the root cause of this crisis is poor governance.[13] This chapter outlines the basic fisheries governance structures (policies and institutions) that should be in place in order to ensure the sustainable use of the fisheries resources and the ecosystems that support them, to meet the fisheries targets set by the World Summit on Sustainable Development (WSSD). The principles of fisheries governance outlined in this section are based on the experiences and lessons learned in countries that have successfully achieved a level of sustainability in their fisheries. Thus, this chapter describes the goals for governance and the management of fisheries, including the institutions and aspects of the supporting legal system that are required. Cooperative and collaborative management (comanagement) approaches, and the adoption of user rights in the management of fisheries, are also included as critical components of good governance. Possible entry points for external funding are identified, but, because this paper focuses particularly on World Bank staff and their colleague decisionmakers of developing countries, some emphasis is given to the identification of World Bank financial instruments.

The goals of fisheries management

There is abundant evidence that in the absence of management to regulate access, fisheries become ecologically, economically, and socially unsustainable. Sound governance and management of fisheries resources and their supporting marine ecosystems are therefore required. The Code of Conduct for Responsible Fisheries (CCRF), adopted at the 28th Session of the FAO Conference (October 31, 1995), provides probably the clearest articulation of the goals for sustainable fisheries management. The CCRF states that nations and users of marine resources should conserve aquatic ecosystems, and that the right to fish carries with it the obligation to do so in a responsible manner, ensuring the conservation and management of living marine resources. In addition, the CCRF stresses the importance of applying the precautionary principle to the management of fisheries, in order to incorporate the fundamental goal of resiliency—that is, the ability of fish stocks to absorb and bounce back from perturbations to the environment caused by natural events or by human actions.

According to the CCRF, countries that wish to govern their fisheries resources sustainably need to adhere to the following principles:

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[13] In general, this document defines "governance" as the act, process, or power of governing carried out by the government (political unit) of a state—largely through administration and control of law and public policy. In contrast, "management" is the act, manner, or practice of managing, supervising, or controlling an entity (such as a fishery) to ensure its continued productivity and accomplishment of other objectives. However, in relation to fisheries there is a good deal of overlap and interplay between these areas—as noted in such terms as "local governance" and "national management policy." For that reason we have adopted some flexibility in the use of these terms, and we have not sought to alter the common usage of others.

- Avoid or correct excess fishing capacity, by introducing an economic incentive system for the sector that results in responsible fisheries;
- Take into account the interests of fishers, including those engaged in subsistence, small-scale and artisanal fisheries;
- Protect the biodiversity of aquatic habitats and ecosystems, and allow depleted stocks to recover;
- Assess, and where needed correct, adverse environmental impacts on the resources from human activities; and
- Minimize pollution, waste, discards, catch by lost or abandoned gear, and catch of nontarget species, both fish and non-fish species, through measures including, to the extent practicable, the development and use of selective, environmentally safe, and cost-effective fishing gear and techniques.

The CCRF and other international instruments provide valuable frameworks on which specific national strategies and approaches can be predicated. However, turning international plans of action into workable national strategies will require assistance and support in many cases, in order to implement sound governance of the sector. Fisheries governance in countries must aim to create multiple outcomes based on the goal of ensuring that the fisheries resources, and their supporting ecosystems, are used in a sustainable manner to safeguard future use, and provide employment and maximum economic rents for the country (see box 2.1). This is the basic premise of sustainability in fisheries, and should be the focus of efforts to improve sector governance in developing countries.

Box 2.1. Three outcomes of sustainability

Ecological sustainability—maintaining the resource base, enhancing the resilience and health of the ecosystem, including biodiversity;

Economic sustainability—enhancing the long-term "macro" socioeconomic welfare, including sustainable generation and distribution of net benefits, including resource rents; and

Community sustainability—emphasizing the "micro" objective of sustaining communities, enhancing financial and sociocultural well-being and community cohesiveness.

Theoretical and modeling initiatives are paving the way for the optimization of outcomes among multiple fisheries objectives.

Source: Charles (2001); and Ecopath (see www.ecopath.org).

(b) The Shifting Focus of Fisheries Management—The Ecosystem Approach

During the last decades, fisheries management plans have generally been targeted at one or a few commercial or food species. However, in both large- and small-scale fisheries, fishing activities usually affect other components of the ecosystem in which harvesting is occurring (for example, through bycatch of nontarget species, food chain effects, changes in biodiversity, and degradation of habitats). Thus, sustainable fisheries management and development approaches require consideration and management of the entire marine ecosystem that supports the fisheries, and not just the target species. The need for a wider consideration of environmental and ecosystem issues in fisheries has been recognized by the international community, and the principles for an Ecosystem Approach to Fisheries (EAF) have been documented by many forums, including the FAO's Committee on Fisheries, and recently in a statement by over 50 international participants at a meeting hosted by the WorldFish Center in Penang (FAO 2002d; WorldFish Center 2004).

The approach, although rooted in the biological concerns of fishing, has much wider implications for the future governance of the fisheries sector within national planning. According to the FAO (2002d): "An Ecosystem Approach to Fisheries strives to balance diverse societal objectives, by taking into account knowledge and uncertainties about biotic, abiotic and human components of ecosystems and their

interactions and applying an integrated approach to fisheries within ecologically meaningful boundaries" (FAO 2002d). The consideration of a broader range of ecosystem goods and services necessarily implies the need to address a wider range of trade-offs between different uses and user groups. Consequently, there is a requirement for a broader stakeholder base, broader participation, and improved linkages of fisheries with coastal and ocean planning and integrated coastal zone management activities.

Similarly, the benefits deriving from successful implementation of an EAF are not only fish harvests. They have been identified as:

- Greater economic and social benefits, including fisheries that produce higher catches at lower costs;
- Fewer conflicts among competing users;
- Fewer disruptive surprises, which might occur otherwise because ecosystem changes are not foreseen and/or are not taken into account, or become more likely as ecosystems are increasingly perturbed by fishing; and,
- Continuing social acceptance of fisheries as a responsible use of marine ecosystems.

The challenges to adopt and implement the ecosystem approach in small-scale fisheries are substantial. Currently, management indicators are still generally focused on target species (for example, biomass, and recruitment) rather than on an ecosystem scale, and consensus on practical applications of this approach is still emerging. Nevertheless, the EAF provides an approach within which to pursue sustainable fisheries management in the future—a framework that takes into account the dependence of small scale and artisanal fishing communities on fishing for their life, livelihoods, and food security.

IMPLEMENTATION ISSUES

While for the more complex multispecies tropical fisheries the ecosystem approach is clearly the preferred one, such an approach is complex. At the overall sector level, it requires the input of several ministries (environment, health, industry) and their agreement on the appropriate division of responsibilities, which is always difficult to achieve. In addition, the focus on multispecies greatly increases the complexity of priority setting, and decisionmaking. Finally, in the absence of a clear understanding of the dynamics of the different fish populations, the scientific basis for rational decisionmaking is often lacking. Participatory approaches that bring to bear the experience and knowledge of all stakeholders could help alleviate this scientific gap.

External funding entry points

At the international level, the international donor community and nongovernmental organizations (NGOs) may focus on assisting developing countries in the preparation for fisheries agreement negotiations, training team members in effective negotiating skills, analyzing potential alternative negotiating strategies, and providing background information and key conditions of similar agreements. In its role of global convener, the World Bank may take the lead in informing consumers, decisionmakers, members of parliament, and administrators of current distortions in subsidies, skewed negotiations, and the role fisheries agreements can play in sustainable fisheries development. In the long term, the Bank should assist countries in managing their fishing sector to reduce the need for foreign fishing to highly specialized operations, and to introduce management systems for industrial fisheries that would enable decisionmakers to easily quantify the total costs and benefits between issuing fishing licenses to foreign or domestic fishers.

At the national level, the main challenge involved in the introduction of the EAF is to work across sectors. Supporting the introduction of such a multisectoral platform with an expansion of stakeholder groups and sectoral linkages would therefore be the World Bank's main entry point. Specifically, it could work with other donors in providing the technical assistance, and through programmatic lending, such as the Poverty Reduction Strategy Credits (PRSCs) for the low-income countries or Programmatic Structural Adjustment Loans (PSALs) for the middle-income countries, in supporting the development of enhanced transparency and accountability in the decisionmaking.

Governance and the political process of managing fisheries

Creating effective fisheries sector governance that can achieve the goals outlined earlier is a complex process. This complexity is partly the result of its political character—governance allocates or destroys wealth—and partly the result of the institutional and legal arrangements that are required, which often upset existing institutions. Moreover, the multiple objectives, the need to consider both short-term and long-term outcomes, and the desires of small-scale and industrial fisheries all have to be accommodated.

For example, in Senegal about 50,000 to 70,000 small-scale fishers target the same high-value fisheries resources for the export markets as the industrial (and often foreign) vessels. Poor governance in the past has allowed a growing number of both small-scale and industrial vessels to enter the fishery. Because the resources are dwindling, fishing effort also has to be reduced and difficult decisions made about resource allocations among the different stakeholder groups.

Also, a likely implication of new governance policy is that it will result in (re)allocation of current and future sector benefits compared to the current management regime. Political opposition to changes in the governance system is likely to be particularly strong when resources are overexploited and the pie to be divided is shrinking. Thus, in order to assist developing countries to introduce more effective governance, governments, with the aid of donors, will need to create a mechanism for multiple stakeholders to reach consensus on the allocation of the benefits and costs of sustainable fisheries resource management.

Box 2.2. Sector rent in fisheries

The *rent* from a fishery is an economic concept: it is the excess profit—over and above a reasonable rate of return to capital—that fishers would earn when exploiting a fish resource during the early stages of development, when stocks are relatively plentiful. This *rent* can potentially be very large (2 to 4 times operating costs) in selected small-scale and industrial fisheries. In most—poorly regulated—fisheries the rent is quickly dissipated by overinvestment in excess fishing capacity and infrastructure, or in the case of small-scale fisheries, for social, cultural, or external reasons, as traditional management structures breakdown.

In a well-managed fishery the rent can either be "capitalized" by the small-scale and industrial private sectors—in the form of increasing values for fishing "rights" they own—or they can be extracted by the public sector for the benefit of the entire nation. Creating rent—in an overexploited fishery—requires a temporary reduction or even complete ban on fishing, until fish resources have sufficiently recovered. Moreover, it will require, limits on future fishing capacity, probably well below earlier levels.

Source: Authors

Planning a *long-term strategy and vision for the sector* has shown to be a successful mechanism for reaching such stakeholder consensus within partner countries. The vision articulates what constitutes an effective, equitable, and sound level of resource exploitation. It seeks practical production, income, and employment targets that would balance the interests of various stakeholder groups and satisfy the objectives for ecological, economic, and community sustainability. Decisions about targets that can meet these three objectives (box 2.1) need to be based on reasonable scientific projections and consensus among all stakeholders. However, many of the key sector governance questions cannot be solved through scientific research alone, but will require political decisions.

A long-term strategy for the governance of the fisheries sector needs to answer the following critical questions (see also Boxes 3.3 and 2.4):

- Who would participate in the fishery (for example, what are the future roles of small-scale and industrial fisheries)?
- What fishery resources can be used in what manner, and at what level of exploitation?
- Where can specific participants fish, and what are the future allocations between small-scale and industrial fisheries?
- What public support, if any, should be provided to enable the rebuilding of fish resources?
- What share of sector rent (see Box II.2) should be collected by the public sector, under what type of tax regime, and which institutions should benefit from this tax income?
- What role, if any, should be played by foreign interests in the sector, and how much should they pay for access to local fish resources?
- What financial support should the private sector provide, and how much influence should it have over management of such public services as research; monitoring, control, and surveillance (MCS); quality control; local ports; markets; and auctions?

Box 2.3. World Bank assistance to Guinea-Bissau to plan a fisheries sector strategy

Recently, the Global Forum and Trust Fund for Sustainable Fisheries sponsored World Bank assistance to Guinea-Bissau to prepare a long-term vision for the fisheries sector, as the basis for reforms and donor assistance. The Bank and the Government first examined existing information on the state of the resources and the ecosystems that support them, in order to determine how many demersal fish resources would be available for industrial and export fisheries, how many estuarine and coastal pelagic species might be available for the small-scale fisheries, and so forth. Based on the health of the resources and the estimated levels of sustainable exploitation, the strategy articulated how these resources should be allocated among different stakeholders in order to achieve goals of domestic value added and employment, sector rent, how many estuarine and coastal pelagic species might be available for the small-scale fisheries, and the availability of other major commercial species. Most important, the strategy detailed options for the governance reforms necessary to make such allocations and ensure that the rules for sustainable resource use were being followed. This was a difficult process that required political decisions about who could fish where, and how the multiple objectives of sustainability would be met.

Source: Authors

Box 2.4. Checklist of sustainable fisheries governance policies

In implementing sustainable fisheries governance and meeting the goals described above, the following checklist of policies and their implementation capacity would need to be in place:

- The level of fishing permitted is commensurate with the state of fisheries resources.
- No vessel is allowed to fish unless authorized to do so, and in a manner consistent with international law for the high seas or in conformity with national legislation within areas of national jurisdiction.
- Where excess fishing capacity exists, mechanisms are established to reduce capacity to levels commensurate with the sustainable use of fisheries resources.
- The performance of all existing fishing gear, methods, and practices is examined and measures are taken to ensure that those that are not consistent with responsible fishing are phased out and replaced with approved alternatives.
- Fishing is regulated to avoid conflict among fishers using different vessels, gear, and fishing methods.
- When deciding on the use, conservation, and management of fisheries resources, due recognition is given to traditional practices, needs, and interests of indigenous people and local fishing communities that are highly dependent on fishery resources for their livelihood.
- In the evaluation of alternative conservation and management measures, their cost-effectiveness and social impact are considered and continuously monitored and eventually revised, where and when needed.
- Appropriate measures are taken to minimize waste, discards, catch by lost or abandoned gear, catch of nontarget fish and non-fish species, and negative impacts on associated or dependent species, particularly endangered species.
- Measures are introduced regarding depleted resources and those resources threatened with depletion that facilitate the sustained recovery of such stocks, including restoration of habitats critical to the well-being of those resources.

Source: FAO, 1995

Effective Fisheries Sector Governance

There are a number of components of an effective governance strategy for fisheries. These are the institutional framework and the instruments of control. Most components are available to industrial and developing countries in some form (although with different emphases), although few countries demonstrate the proper functioning of all measures.

The Institutional Framework For Sustainable Governance Of Fisheries covers:

- The *Fisheries Management System*, including (a) the basic regulatory framework and fisheries law; (b) the specific institutions for the management of fisheries (Ministry of Fisheries, sector councils, an independent agency that can manage a system of industrial fishing rights and MCS, and regional and local bodies responsible for small-scale fisheries); and (c) provisions for fisheries research that can drive management decisions.
- *Monitoring, control, and surveillance* (MCS) to observe the fishing industry's activities and to enforce its adherence to the rules of the fisheries management system.
- The *Fisheries Judicial System* to process alleged violations of fisheries management rules and issue sanctions to those deemed to have violated the rules. The Fisheries Judicial System complements the MCS activities in enforcing the fisheries management rules.

- An *institutional framework*, which allows close collaboration with stakeholders in management decisionmaking and implementation, particularly in small-scale fisheries.
- A *system of allocation of user rights* that allows the allocation of access rights, which provides the incentives for sustainable resource use, such as the implementation of a quota management system, without endangering equity.
- *Control and development instruments* and tools for implementation of an institutional framework that will provide for a sustainable, equitable use of the fisheries resources.[14]
- *Establishment of Marine Protected Areas* (MPAs), to rejuvenate depleted stocks and protect the fishery supporting ecosystems;
- *Managing exploitation patterns,* through regulation of fishing operations, such as closed seasons, closed areas, size regulations, gear regulations, and trawl-free zones;
- *Restocking*, to directly rehabilitate depleted fish stocks;
- *Fishing vessel effort-reduction programs,* such as buybacks and decommissioning;
- *Promoting aquaculture*, to augment supply and hence reduce the demand for capture fisheries;
- *Food safety and ecolabeling*, to involve consumers and the private sector in pushing for sustainable fisheries governance; and
- *Promotion of alternative livelihoods to fishing*, to diversify coastal economies and provide stakeholders with alternatives to participating in an overexploited fishery.

External Funding Entry Points

The World Bank, in cooperation with its international partners, could assist developing countries in carrying out the analytical work needed to identify desirable options for sustainable management and development of the fishery sector. This would enable national policymakers to choose and revise where necessary the future governance structure of their fishery sector. The high level of expertise of the World Bank in economic analysis, and knowledge about the individual economies of the developing countries, would support such activities. The World Bank, with assistance of the Government of Japan, has already established the Global Trust Fund for Sustainable Fisheries, under which Sector Strategy Notes are being prepared for a small number of countries (Eritrea, Guinea-Bissau/Senegal, Kazakhstan, Peru, Vietnam). These Notes have been very well received inside and outside the Bank, and some are being followed up with investment studies, demonstrating the comparative advantage the World Bank has in this area.

[14] While many of these instruments focus on "output" controls as the ideal, that is, controls on the catch output of the fishery, "input" controls, for example, controls on gears used, number of vessels, and days fished, can be more cost-effective, and may be more practical in many situations. Generally, a mix of both input and output controls is most appropriate, depending on local conditions in the fishery, although output controls might be a more ideal goal for ensuring sustainability of resources.

3. The Institutional Framework for Governance of Sustainable Fisheries

All fisheries, whether they are explicitly governed or not, are embedded in an overall framework of social institutions. This institutional framework essentially constitutes the fisheries governance regime, providing a set of social prescriptions and procedures that control the fishing activity. In some countries or communities, the fisheries governance regime is quite intricate, involving several formal organizations and activities. In others it is constituted more informally based on a few social customs. Irrespective of their complexity, however, all fisheries governance regimes generally comprise the following five basic components:

- The Fisheries Management System
- The Monitoring, Control, and Surveillance system (MCS)
- The Fisheries Judicial System
- Decentralized decisionmaking and collaborative management (comanagement)
- Definition of the access rights.

In the past, the lack, or breakdown, of any one of these five components of fisheries governance has contributed to the current overexploitation of the resources in many countries. For that reason, this chapter briefly describes the appropriate institutional framework or fisheries governance regime that developing countries would need to achieve.

THE FISHERIES MANAGEMENT SYSTEM

The Fisheries Management System specifies the regulatory framework for the fishing sector. It consists of the rules that fishing activities must obey, such as gear and area restrictions, fishing licenses, and catch quotas (see Box 3.1). In many countries, most fisheries rules are based on explicit legislation. In others, they are primarily based on social custom and prescriptions.

However, in several developing countries the basic regulatory framework for fisheries management is not in place to prevent overexploitation of the fisheries resources, let alone to meet the multiple objectives of sustainability in fisheries. In many more developing countries, this framework is in place, but the capacity to implement and enforce it is weak or nonexistent. Thus, in assisting countries to plan a long-term strategy for the sector, the basic regulatory framework and law for sustainable fisheries, and its enforcement capacity, need to be in place before focusing on issues of implementation. This could be an important entry point for the World Bank, through technical assistance and twinning arrangements with countries that have successfully implemented sustainable Fisheries Management Systems.

Box 3.1. Basic regulatory framework and law for fisheries management

Ideally, the goal of sustainability and the types of polices listed in chapter two would be stated very clearly in a basic fisheries law, or otherwise in an overarching environmental law, which would make provision for the following:

- *The preparation of fisheries policies and conservation and management plans*, usually on an annual basis, as a mechanism for setting fisheries policies from time to time.
- *Administrative responsibilities*, such as the power to issue authorizations; set fees; collect fisheries data; issue, cancel, vary, or withdraw authorizations; and maintenance of a record of fishing vessels.
- *Determination of the total allowable catch (TAC) or individual user rights* for particular species within national waters from time to time, usually for each year, including the capacity to revise these if necessary.
- *Scientific research*, that is, clear procedures for undertaking marine scientific research in national waters.
- *Provision for the possibility of declaration of marine parks, marine reserves, or prohibited fishing areas.*
- *Specification of the type of authorization system that will be used to allocate access to the fisheries.*
- *System for authorizing national vessels to fish on the high seas*, regulating and recording which fishing vessels are authorized to fish on the high seas.

Source: Authors

Institutions of the Fisheries Management System (FMS)

The availability of effective institutions to implement the FMS is probably one of the most critical aspects of sustainable fisheries management.[15] The evaluation of the capacity of existing institutions to implement an effective fisheries law and regulatory framework is therefore an essential element of building a national fishery management strategy (see box 3.2). The following institutions are suggested as critical for the implementation of sustainable fisheries governance:

- A *Ministry or Department of Fisheries*, which can supervise and direct public, mixed, and private activities that together create effective sector governance. To be effective, such a Ministry or Department would act as a policysetting and holding company, and not as an executing agency. For example, the organization of the Ministry in New Zealand has been particularly effective in establishing the FMS and rules for use of the fisheries, setting policies and monitoring the sustainability of the fishery, while outsourcing much of the daily management and MCS activities and streamlining management costs.
- *A Sector Council*, in which all stakeholders are represented, which can provide the premier forum for discussion of stakeholder interests, sector policy, and resources and management strategy. Such sector councils or boards are the most frequently used tool to create consensus on fisheries policy, resources management, and the future of the sector. To be effective, sector councils require: (a) careful representation of all stakeholder groups; (b) clearly defined, accepted, and politically supported terms of reference; (c) superior leadership; and (d) political leadership in the Ministry of Fisheries that combines fairness with a sense of political feasibility. The Council and the Ministry need to play

[15] This chapter focuses particularly on the requirements for improved governance of marine fisheries, although many of the principles are also applicable to inland-water capture fisheries. Significant challenges in the development of improved governance for inland-water capture fisheries include identification of national and local government responsibilities (because inland waters are often administered by ministries and agencies different from marine fisheries), and the specific involvement of stakeholders in other terrestrial sectoral activities that impinge on the quantity and quality of inland waters and associated habitat.

different roles, but should cooperate to be effective. Balancing what decisions can and should be decided by a council, and what should remain the prerogative of public executives, is a critical issue in designing effective governance. Over time, the decisionmaking role of a well-functioning sector council (and also local councils) should increase, allowing stakeholders to participate more and more in the management of the fisheries. For example, the Regulatory Council in Norway has been particularly effective in providing fishers and stakeholders with a voice in the development of management rules and in decisionmaking, by allowing them an advisory capacity to the Ministry.

- Wide sector representation ensures that social issues are heard and valued. However, in practice, council representation is often skewed toward industrial interests, because of their superior organization and political clout. To ensure proper representation of small-scale fishers, traditional fish marketing channels and processors, and technical and financial support for local organizations that represent these groups, are often necessary. Sometimes fishers are represented by different organizations that compete for influence and members, putting them at a disadvantage compared to groups that are represented by a single organization. For example, to satisfy the local management requirements of small-scale fisheries under the Ghana Fisheries project, district fishery boards were created that aim to deal with sector management in clearly defined areas of the coast. Balancing of local and national interests is left to the national council on which each district board is represented.

Box 3.2. Adapting institutional frameworks to prevailing conditions

Two examples of recent World Bank Sector work in fisheries illustrate the need to adapt the institutional set-up to the prevailing social and administrative context of the country. In **Peru**, where the human resources involved in the sector are highly skilled, the issue concerns mainly the place of the Fisheries Department in the overall government structure and the coordination among the different fisheries institutions. Thus, the recommendations focused on ensuring that the departments involved in fisheries management were adequately scaled in the government process, and that efficient coordination mechanisms are in place. In **Guinea-Bissau**, the human resource base is still very weak, and decisions on the sector are made at the level of the Ministry of Finance, which seeks to optimize revenue from license fees (about 50 percent of its budgetary resources) rather than searching for sustainable management of fishery resources. Here the recommendations focus on the establishment of a strong independent agency, with the representation of all stakeholders, including the donors.

Source: Authors.

- An *independent public agency* can manage the entire system of fishing rights and the MCS system of the fisheries. Systems for allocating individual or collective industrial fishing rights or quotas could best be handled by this agency, which would be responsible for all aspects of industrial fishing rights management, and rights and license registration. To the extent possible it should be directly funded from rights transactions, and so provide incentives for the private sector to help manage its fishing activities. Without establishing any more bureaucracy than necessary, MCS activities would ideally be handled by a *public organization* that might be linked to the rights management authority and the Ministry of Fisheries, but might also have links with the navy, the police, and the legal system. For example, in New Zealand the quota management system using fishing rights is based in part on monitoring of catch reports and individual quota limits, shifting the emphasis from patrols and surveillance of fishing activities to catch reporting and the paper trail of fish products. Thus, an independent agency not unlike an auditor that handles much of the MCS activities.
- *Regional and local bodies* responsible for small-scale fisheries development and management in specific areas. All aspects of small-scale fisheries development would be overseen by the Ministry of Fisheries, but would be implemented through regional and/or local government or stakeholder bodies, according to the legal and practical state of devolution of local governance in the country concerned.

For example, the World Bank-funded Coral Reef Rehabilitation and Management Project (COREMAP) Phase II is planning to assist coastal district governments in Indonesia to create a district committee, with representatives from local government, coastal villages, and local nongovernmental organizations (NGOs), to set policies for the small-scale coral reef fisheries in that district. These policies would then be passed as district laws, or *perdas*.

A challenge to the design and implementation of the above is that in many developing countries, relative national and local jurisdictions over fisheries are unclear, or there are ill-defined boundaries among the governance of fisheries on one hand, and agriculture, land, and water resources (especially wetlands), and the environment, on the other. The design and adoption of new national fisheries strategies provides the additional opportunity for clarification of intersectoral and jurisdictional responsibilities in such countries.

THE MONITORING, CONTROL, AND SURVEILLANCE (MCS) SYSTEM

The primary task of an MCS system in a well-governed fisheries sector is to observe the fishing industry's activities and to enforce its adherence to the rules of the FMS. Its secondary but nevertheless very important task is to collect data about the fishery that can be used to improve the fisheries management and judicial systems, and the MCS system itself (for example, patrols, violations, and recording landings, all of which may help refine the efficiency of MCS procedures).

In many fishing nations, MCS activities have evolved over time as management objectives changed. The recent electronic technology revolution has enabled satellite-based vessel surveillance to demonstrate the largest leap in MCS effectiveness; cost-effective technology now exists to potentially observe any movement of all industrial and intermediate technology fishing vessels worldwide. Major improvements have been made in shore-based technology to track fishing vessels and landings, and to apprehend vessels. In developing countries, methods for the appropriate and cost-effective assessment of catches at multiple landings must be promoted to ensure a functional MCS system. Enforcement—requiring quick action taken against offenders—is frequently the least-effective part of the system (see below).

While rapid technological development has reduced the costs of MCS in many cases, effective MCS is still not cheap. It is generally estimated to cost between two and five percent of the total value of the catch in developing countries, declining somewhat in industrial countries to between one and two percent as a result of more efficient institutions and technologies. Stable sources of funding for MCS (perhaps independent of regular public budget procedures), transparent procedures, and constructive contributions from the industry itself (contributing through comanagement arrangements, and the provision of research) can all clearly augment the performance of MCS and the overall fishery. In many island and coastal developing nations, both industrial and small-scale fisheries lack effective MCS to ensure sustainable management of the resources. Strengthening the capacity of developing countries to operate cost-effective MCS is one of the most basic tools donors can use to assist these countries in implementing sound fisheries governance and meeting the fisheries targets set by the World Summit on Sustainable Development (WSSD).

THE FISHERIES JUDICIAL SYSTEM

The *Fisheries Judicial System* (FJS) is usually a part of the general judicial system. However, the imposition of the required discipline in the management of the fishery resource is more or less an informal social process. The function of the FJS is to process alleged violations of fisheries management rules and issue sanctions to those deemed to have violated the rules. The FJS thus complements the monitoring, control, and surveillance activity in enforcing the fisheries management rules.

The preferred characteristics of an FJS that can back up MCS activities would include provisions for observers; clearly drafted powers of inspection and enforcement; clearly defined offenses, provisions for arrest, penalties, and forfeiture of vessel gear and catch; and authority for inspection and the enforcement action taken. In the case of fisheries offenses, the Fisheries Law will need to state very clearly that certain conduct in the fishery (now loosely known as illegal, unreported, and unregulated fishing, IUU) will be treated as offenses. They are (see also table 3.1):

- Fishing without a valid license, in a prohibited area, during a prohibited period, for a stock for which fishing is prohibited, or even having gear unstowed at a time or place where fishing was not authorized for the vessel in question;
- Failure to maintain accurate records of catch and catch-related data, or using false vessel markings;
- Using prohibited fishing gear; and
- Fishing contrary to conservation and management measures established by regional fisheries organizations to which the country in question is a party.

Table 3.1. Examples of good practice of particular aspects of fisheries legislation

Country	Particular Quality Aspect	Key Characteristic
Samoa	Stakeholder participation	Fisheries Law for comanagement of small-scale fisheries, allowing community management plans and rules to be legally recognized as bylaws.
New Zealand	Institutional framework	Fisheries legislation allows Ministry of Fisheries to function largely in regulatory and policy capacity, outsourcing many daily management activities to reduce costs and increase efficiency.
Namibia	Resource user rights regulation	Fisheries law allows for participation of industry through involvement in a Fisheries Advisory Council; fisheries management based on individual quota system.
Indonesia	Marine Park establishment	Law establishing National Marine Parks, and through COREMAP II will draft legislation allowing for communities and districts to establish marine reserves in coral reef fisheries, at the community and district level, with the goal of protecting 30 percent of coral reefs in project districts by 2030.
Pacific Island Countries	Monitoring and control systems	Fishery law leading to agreement to cooperate in a regional satellite-based vessel monitoring system (VMS), with support from several donors, for shared stocks of migratory tuna.

Source: Authors.

Alternative judicial systems

A key issue in the design of Fisheries Judicial Systems in developing countries is their enforceability and the level of proof required. Judicial processes are often criticized as being unduly lengthy, and strict insistence on high standards of proof can lead to too few successful prosecutions to curb illegal fishing. In many instances, the situation has improved by introducing a system of administrative penalties for dealing

with fisheries offenses, which enables the tribunal to apply a lower standard of proof than is possible in a full criminal trial (proof on the civil standard of balance of possibilities rather than on the criminal standard of beyond a reasonable doubt). This system facilitates expedited hearings, and can include the possibility of a negotiated settlement. It has been adopted in the United States and in a number of the island states of the South Pacific. Despite the fact that it involves a possible diminution of their legal rights, it is often popular with fishers because it enables a speedy resolution of their case.

External funding entry points

The World Bank can assist developing countries interested in the development of legal and regulatory frameworks for sustainable fisheries by providing the technical experience and assistance to work closely with their legislators. It has some solid experience in its own staff, and can also rely on its partners (the United Nations Development Programme [UNDP], the Food and Agriculture Organization of the United Nations [FAO], the Worldwide Fund for Nature [WWF], and the International Union for the Conservation of Nature [IUCN]) to work with the World Bank and the developing countries in this area. Moreover, it can provide the funding for the establishment of MCS capacity and the related human resource development, as it has shown in the past (see box 3.3). National advances in MCS capacity can be shared regionally in conjunction with regional fisheries organizations (RFOs), or by working with other organizations, such as the Global Environment Facility (GEF) or the UNDP, to ensure that a regional perspective focuses on sets of countries bordering particular seas or large ecosystems. Under such a partnership, the World Bank would focus on the required policy adjustments and investments at the national level, whereas the other partners would focus on the regional dimension.

Box 3.3. Country and donor experiences funding MCS

In developing countries, MCS activities are typically financed from five sources:

- From the Government's recurrent, or investment budget (treasury).
- Through a fisheries sector fund into which registration fees, license fees, royalties, fines, and revenue from fishing access agreements may be deposited. However, while fishers do pay for MCS through fines, MCS will not pay for itself that way. Experience from the Falkland Islands shows that, provided the MCS operation is efficient and the chances of being caught are high, and fines are set at a level which has a deterrent value, the long-term fines may not amount to more than 5 percent of costs.
- By direct contributions from the fishing industry. Examples include the financing of satellite-based vessel monitoring systems (VMS) installation and operating charges by the fishing vessel operators. In Mozambique, one of the shrimp fishing companies has provided a trawler to patrol the grounds during the closed season. In Namibia, the industry pays a specific fee for observer services. A wide range of reports (logbooks, radio, sales, VMS) that may be required by the fishing authorities is also financed by the industry.
- Through commercial loans and contracts. Mozambique is financing a VMS system using commercial credit arranged by the system supplier.
- From development assistance. The South Pacific (in the area of the Forum Fisheries Agency, a regional fisheries management body of the Pacific Island Countries) provides an example of how MCS costs are shared among developing countries, distant-water fishing nations, and development assistance. Australia provides 400 hours of aerial surveillance per year, New Zealand 270 hours, and France/New Caledonia 30 hours.

As a result, the costs for VMS for the South Pacific regional tuna fishery are shared as follows (US$'000s):

	Pacific Island	Distant-Water	Development

Box 3.3. Country and donor experiences funding MCS

	Countries	Fishing Nations	Assistance
VMS installation (capital investment)		5,000	
Patrol vessels/aircraft (capital investment)			1,200
VMS operation	350	850	
Aerial surveillance			5,000
Seagoing surveillance	3,000		3,000
Observer program	1,000	250	250
Regional register	20	500	
Data collection	600	400	40

Source: Estimates from Van Santen and Muller (2000).

COLLABORATIVE FISHERIES MANAGEMENT (COMANAGEMENT)

With the failure of centralized public sector control in fisheries management, collaborative management, or comanagement, has emerged as one of the most promising approaches to arrive at more sustainable forms of fisheries management.[16] Comanagement is an approach to governance of fisheries and marine ecosystems that is a compromise between the two ends of the governance spectrum: centralized, top-down government control of the resources, or completely decentralized community-based or resource-user-based management and control of the resources—with no role for government. It applies to both industrial and small-scale fisheries, but is particularly useful in tropical coastal small-scale fisheries (box 3.4).

Box 3.4. What drives comanagement?

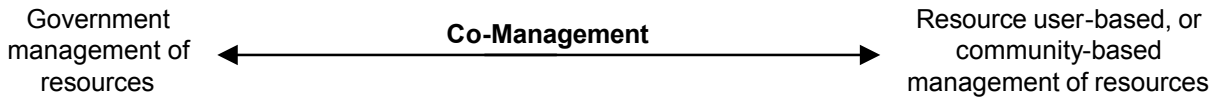
Comanagement and various types of government decentralization often occur at the same time because they both offer greater democracy, empowerment, and local capacity building and development. Experience seems to indicate that comanagement may be driven top-down, from the government level, or bottom-up, from the community level. Top-down decentralization of management will require that communities develop more capacity to take up the management role. Likewise, strong movements in community development and management still require government support or legitimization of the rights and processes of such local level development.

Source: Pomeroy and Berkes (1997).

Comanagement involves a systematic approach toward reaching consensus and legitimizing actions among multiple interests involved in the use and management of fisheries resources. It requires institutionalization of management processes appropriate to the culture and location. Government and the resource users (such as communities, cooperatives, producer associations) share the responsibility for management of the fisheries resources, so that the resource users have influence on the decisions made concerning resource management and allocation. Comanagement arrangements range from those that are largely consultative, to those in which the fishers design, implement, and enforce laws and regulations with advice from the government (Berkes 1994) (figure 3.1).

[16] The sources for this Chapter are Berkes and others (2001); Hersoug (1998); and Virdin (2000a, 2000b).

Figure 3.1. Comanagement arrangements



Source: Virdin, 2000a

Rationale for comanagement

Comanagement is based on the principle that those who are affected by governmental decisions over resources should be heard before such decisions are made. Participation in decisionmaking confers legitimacy and fosters compliance. Compliance with locally agreed plans will allow reduction in the costs of MCS, which centralized agencies were finding excessive. Group decisionmaking also holds out the possibility of reaching longer-term decisions concerning the sustainability of the resource. This principle is being increasingly applied to the management of common resources, such as forest, rangelands, and irrigation water. In fisheries and marine ecosystems, the concept of comanagement was introduced over 10 years ago (see papers in Pomeroy 1994 and Pomeroy and Williams 1994.[17]

Box 3.5. Comanagement in Norway: institutionalized consultations with stakeholders on fisheries resource management decisions

Norway is one of the most important fishing nations in the world—in terms of global catch, it captures roughly 3 million tons of fish almost exclusively from within the 200-mile exclusive economic zone—which provides the second-largest export industry in the country. The large and diversified fishing fleet with, by the end of 2002, over 10,000 registered vessels and roughly 18,000 fishers, is well organized, with more than 50 organizations catering to all types of interests. The fisher's organizations have 9 seats on the 14-seat Regulatory Council, which is chaired by the Director General of the Fisheries Department, and make recommendations to the Ministry of Fisheries on the distribution of annual catch quotas of fish and other regulations. This Council actually makes the policy recommendations (in an advisory capacity only, although the Ministry prefers to adhere to the Council's proposals). The various fishers organizations have always been able to influence major decisions affecting their interests because they are represented in preparatory planning. Thus, Norwegian fisheries management is often termed "centralized comanagement," where the Government has centrally directed consultations with a large organization representing the resource users and stakeholders.

Sources: Hersoug (1998); and the Norwegian Fisheries Directorate.

Thus, in the 1990s, local and national attention turned increasingly to comanagement approaches, and national governments began contemplating national policy shifts and new legislation to support these new approaches. Researchers and NGOs working with community groups documented many cases to define best practices and determine the impacts of such approaches on management efficiency, equitability of

[17] The concept of co-management was formally articulated and widely accepted as a necessary and viable approach to fisheries resource and marine ecosystem management and governance roughly 10 or more years ago. However, individual governments and fisheries (such as Australia, Japan, and New Zealand) have been practicing some form of co-management for many years, but without using the designation.

resource access, and sustainability of the resources. The practitioners and researchers grappled with understanding the influences on management of the different characteristics of the resource systems (for example, coastal enclosed bays, riverine floodplains, and lakes), the local group characteristics, institutional arrangements, the external environment, and various relationships among these major factors (Agrawal 2001). While examples of countries that have successfully implemented comanagement approaches to fisheries management are still emerging (although increasingly widespread [see table 3.2]), there are several instructive experiences in both industrial and small-scale fisheries.

National rules adopted locally were seen as most effective. Ideally, in a comanagement partnership, government with its resources and technical knowledge provides biologically sound rules and management plans based on its ability to collect and analyze large amounts of information (see box 3.6). These rules or principles are made effective by community/stakeholder institutions with the authority to enforce them. However, the types of rules and regulations that are most effectively enforced at the community/stakeholder level are simple and clear rules, and need to be easily communicated and seen as relevant to the resources (World Bank 1999). In addition, where government institutions allowed local communities or stakeholders to act as partners in decisionmaking and sharing in the public revenue, successful comanagement arrangements were established. Many examples of comanagement arrangements are geographically based—i.e., a government institution enters into partnerships with communities to manage adjacent fishing grounds. However, comanagement systems are increasingly accommodating partnerships between government and a wider array of stakeholders based on their use of the ecosystems and fisheries (for example, boat and gear owners), who are often participating in more mobile and larger fisheries.

Box 3.6. The need for comanagement in tropical small-scale fisheries: neither governments nor stakeholders can manage the fisheries alone

In most tropical small-scale fisheries throughout the world, government agencies responsible for fisheries management have little control over, or impact upon, most of the communities of resource users. At the same time, these resource users are losing control of traditional authority for management in the face of growing external pressures (such as foreign or outside fishers). For example, in 1999 the World Bank conducted a survey in 31 coastal fishing communities throughout the Pacific Islands, and found that in many of these communities, fishers and resource users had never had any contact with government fisheries authorities or any knowledge of fishing regulations. At the same time, these communities and resource users consistently reported increasing overfishing by outsiders (such as foreign small-scale fishers or fishers from other regions of the country), and increasingly unsustainable fishing practices, such as the use of dynamite. These small-scale fisheries illustrated a common theme throughout tropical marine ecosystems—that centralized government monitoring, control, and surveillance of the sizeable small-scale fishing effort can become extremely difficult and expensive, and in some cases almost impossible.

Source: World Bank (1999).

Table 3.2. Some key characteristics of comanagement in the countries reviewed

Country	Type of Fishery	Main Comanagement Characteristics	Costs and Cost Sharing	Impact	Issues
Indonesia (World Bank-funded COREMAP project)	Coral reef fisheries	Community-based management, combined with strengthened enforcement.	Foregone fish production estimated at US$28,000 per fishing village in first two years, offset by up to 50 percent increase in yields in following years.	Reduction in illegal fishing practices.	Lead time on local capacity building resulting in initial slow disbursement, implementation of small-scale fisheries management, fragmented and compartmentalized, i.e., MCS activities in some villages but not comanagement activities.
India (Andra Pradesh)	Multi-species, small-scale fisheries.	Community management by the traditional village councils, based on participatory establishment of access restriction.	Very low, because based on traditional peer pressure.	Operational since the 1970s.	Upscaling to wider application.
Samoa (see Box III.8)	Multiple species.	Community-based management, with strong involvement of Fisheries Department on establishment of management plan, including banning of destructive practices, establishment of MPA, and limits on sand mining.	At end-2001, 64 community-based fisheries management plans established and legally recognized, requiring US$80,000 from Fisheries Department per year for ongoing support and the addition of 10 new villages into the program per year.	In recent assessment, 45 percent performed very well, 50 percent moderately well, and 5 percent poorly. Catch per person per hour about 50 percent higher in participating villages.	Skill requirements and lack of recognition of extension staff, and long time required for consensus to be reached. Level of resources required for national level application exceeds local capacity.
Shetland Islands	Sand eel, shellfish, and multiple fisheries.	Civil society-based fishery plans (closed season, vessel size regulations, community-owned pool of quotas) following dissatisfaction with government management.		Stock decline arrested for sand eel and shellfish, but overfishing in demersals continuing.	Sharing of fisheries by outsider (UK) fishers and high costs of enforcement, in spite of local peer pressure and community commitment.

Source: SIFAR, 2003

Implementing comanagement in industrial fisheries

For industrial fisheries, co-management involves processes and methods for including stakeholders and resource users in decisionmaking at every step, and not just in setting quotas or resource management. It would include all aspects of the sector, such as sales regulations, export standards, and licensing procedures. Many national governments share management responsibilities with fishing industry groups organized into producer associations or cooperatives. In these industrial fisheries, government agencies have often implemented co-management approaches by institutionalizing communication and input from these groups into decisionmaking, through methods such as:

Box 3.7. Comanaging the controls: the New Zealand example

In New Zealand, the fishing industry questioned the high costs of the government-supplied MCS and stock assessment services they partially funded. As a result, the Government revised the cost-recovery scheme to allow the industry to fund some of the key fisheries management services, provided these services met certain standards specified by the government. The result of this comanagement arrangement has been that the country now has one of the least-costly management systems in the world, apparently without having compromised the sustainability of the resources. The total management costs are in the range of 3 to 3.5 percent of the total catch value. In comparison, Norway uses approximately ten percent of the ex-vessel value of the catch on fisheries management, Iceland less than five percent, and Newfoundland more than 20 percent (Hersoug 2002). There is a concern that industry is funding many of the management services, which could result in industry having too much say in management and having services performed inadequately or subjectively. However, New Zealand is one of the only countries in the world where the commercial operators pay 60 percent of the administrative costs related to commercial fisheries (Hersoug 2002).

Source: Hersoug, 2002

Creating committees to review proposed fisheries legislation or management rules that include representatives from these producers' associations or cooperatives;

Allowing total allowable catch (TAC) quotas for each fishery to be reviewed by these committees and the representatives of different stakeholders and resource users, who also have a voice into the setting of catch limits and rules; and

Sharing the responsibility with local users for the enforcement in the actual implementation of fisheries resource management (see boxes 3.7 and 3.8).

Implementing comanagement in small-scale fisheries

Tropical coastal and floodplain ecosystems provide some of the greatest challenges to fisheries management due to the increasing number and diversity of small-scale fisheries.[18] Small-scale fisheries dominate in tropical developing countries, and the numbers of small-scale vessels and fishers often greatly exceed those in industrial fisheries. Similarly, small-scale fisheries are often based in rural communities, spread over a large geographic area (such as the coasts of Indonesia, the Philippines, and the Pacific Islands, and along the Mekong and Amazon Rivers and their floodplains), and are often politically marginalized from the centers of fisheries decisionmaking. Furthermore, the fisheries are often multispecies, multigear, and multiscale, operating in ecosystems where hundreds of different species of organisms may be commercially harvested. Such a diversity of fishing enterprises targeting multiple

[18] Tropical coastal ecosystems refers here to tropical marine ecosystems generally at depths of less than 20 meters or less than 12 nautical miles from the shoreline or an island; for example, coral reef ecosystems, lagoons, and estuaries. Tropical river and floodplain ecosystems have some of the same characteristics and complexities as their coastal counterparts.

species generates conflict within and among different user groups, but also creates good opportunities for collective action.

Box 3.8. Comanagement of coastal fisheries in Samoa

To respond to declining coastal resources, the Fisheries Division of Samoa began in 1995 to develop a policy framework that would enable communities and government to share responsibility for the coastal fisheries, with financial support from AusAid. With this policy framework in place, the next year the government began to work with communities to develop Village Fisheries Management Plans, and provide them with any technical assistance they needed to develop such plans. The project was largely demand driven: once the communities requested assistance, extension workers would help them develop Village Fisheries Management Plans. Provided the proposed rules were compatible with national laws, the project also assisted the communities in making them legally binding through the issuance of bylaws. Once approved, the bylaws were disseminated via radio. By 1999, the Fisheries Division had assisted 61 communities in adopting Village Fisheries Management Plans (of which, among other things, 100 percent banned the use of dynamite and bleach, 92 percent established Marine Protected Areas, and 73 percent set mesh size limits).

Government implemented the system gradually, providing extension services to 10 communities a year to create coastal management plans. Extension officers would first meet with the community, and if it was interested and willing to participate, the officers would meet with the entire community to negotiate the entire comanagement process. These negotiations generally consisted of defining what responsibilities needed to be performed in order to manage the resources, and which of those would be carried out by the government, and which by the community. Satisfaction with the program was generally high: an internal review in 2000 found that 86 percent of the villages were implementing management plans at or above average competency. The Samoa Fisheries Extension Program operated at an average annual budget of roughly US$81,000 for ongoing assistance to about 60 communities and extension of the program to 10 new communities per year (World Bank 2000a).

Sources: King and Fa'asili (1998, 1999); Virdin (2000b).

Centralized management, monitoring, control, and surveillance of fishing appears unsuitable to address the complexities of such fisheries and the societies that use them. By engaging users in the management of fisheries resources and the ecosystems that support them, fishers and other resource users are expected to act more responsibly toward the long-term goal of sustainability. Engaging local participants also offers the opportunities to broaden the knowledge base on which management decisions are made, and make management more effective by improving the legitimacy and credibility of the process. Given these resource and institutional characteristics, the decentralized comanagement approach is often widely advocated for small-scale fisheries in developing countries (Hoggarth and others 1999).

Good practice examples in tropical small-scale fisheries

Good practice in comanagement has the following features:

- *A Government policy establishing a comanagement regime* to govern the use of the small-scale fisheries resources. Such a policy clearly would need to spell out government's agreement to share the responsibility for management of the small-scale fisheries with local fishing communities and resource users, and to grant these communities/stakeholders the right to manage the resources, or even transfer actual ownership of the coastal fishing grounds (for example, customary marine tenure). Where the fishing community or community institutions are granted ownership, the adjacent coastal zone becomes the common property of that community, to which they can restrict access to outsiders. The policy would enable communities/stakeholders to formulate rules for the management of the fisheries resources, and provide for their legal recognition by government and local communities/stakeholders and outsiders. In addition, the policy would need to indicate the level of

transfer of the authority for enforcement by, for example, respected local leaders or stakeholder representatives. The process of identifying these rules and regulations by communities/stakeholders needs to be harmonized with, and codified into, national law for widespread applicability. A good example of such a policy is the legislation passed by the Government of Samoa in 1996 establishing an extension program at the Fisheries Division to assist interested villages in creating village fisheries management plans for their associated fisheries, which would be based on technical assistance from the extension program and legally recognized and enforced by the Government.

- *Widespread communication of the comanagement partnership and the new management rules to restrict fishing efforts.* The entire population of small-scale fishers needs to be aware that a comanagement partnership is in place, and that communities/stakeholders can and have formulated rules for access and use of the fisheries resources. Community institutions may be able to perform this function, or outside partners such as extension officers or NGOs may be helpful in raising awareness. Good examples of effective communication strategies can be found in the first phase of the COREMAP Program in Indonesia, where the program established a coral reef public awareness unit at the national government level, to initiate (with the help of local NGOs) media campaigns, and local village education programs, which resulted in increased awareness among the target groups of the importance of healthy coral reef ecosystems in supporting the local fisheries.

In summary, the key features of comanagement approaches in small-scale fisheries are[19]:

- Clearly defined and legally recognized community/stakeholder ownership (or right to manage) of the fisheries resources; that is, power to restrict access, and harmonized with national law.
- Constant attention to the composition of the stakeholder group, to ensure that social equity outcomes are adequately addressed in resource access decisions, and appropriate institutional mechanisms for communities/stakeholders exist to communicate needs to government and to take an active part in the policy process.
- Significant initial education and assistance to communities/stakeholders, and organization to formulate rules of access and use of the fisheries resources. Research agencies including regional universities and technically competent NGOs often have provided critical support to local management efforts.
- Adequate provision of information and technical assistance to assist the stakeholders in adapting policies to specific local rules and regulations, technical assistance (such as monitoring, ecosystem health, trade, and food safety information) to provide the necessary information to allow stakeholders to make sound fisheries resource management decisions.
- Broad publication by government and communities/stakeholders of the rules they have formulated for governing the use of the fisheries.
- Adequate monitoring and enforcement rules in aquatic systems, receiving government assistance where necessary for enforcement of rules governing the use of the small-scale fisheries (such as conflicts with medium-scale and industrial fisheries).

[19] While the specific roles and responsibilities may differ, these aspects of co-management approaches in small-scale fisheries of tropical marine and freshwater ecosystems are generally applicable in some form to many other types of fisheries, such as temperate small-scale fisheries, and larger industrial fisheries.

Implementation issues in comanagement partnerships

Comanagement partnerships in tropical fisheries have often begun as pilot projects in a few sites before or along with a more general policy decision to adopt the approach. Governments have in many cases started experimentally, sometimes persuaded by aid agencies, NGOs, or researchers to try comanagement partnerships in consenting sites. It often takes many years to get to the stage where policies and then laws and regulations change to accommodate the new comanagement partnerships. A review of experiences in comanagement and related governance experiments from five major studies in Asia and Africa has drawn attention to the importance of supportive decentralized and devolved government powers; the many issues related to the scale or level at which resource management should operate; the stakeholder populations and the institutions to be resolved for comanagement to be applied effectively; and the impingement of market forces and changing policy environments on comanagement (Vishwanathan and Ahmed, in preparation). Selected key findings to date include:

- Comanagement should not be viewed as a single strategy to solve all problems of small-scale fisheries management, but rather as a process of resource management, maturing and adjusting to changing conditions over time, and involving aspects of democratization, social empowerment, power sharing, and decentralization.
- Implementing the key features of comanagement partnerships is a process, and the introduction of self-governance takes time. Initial expenditure is therefore mostly on technical assistance, and requires large initial investments of time and resources by the government. However, since this is mostly in salaries for local staff, which are often ineligible for international funding, initial disbursement for donors might be slow, but might pick up later, for example, as subsequent investments in alternative livelihoods.
- Rules developed by self-organized groups differ, often significantly, from current textbooks. As expected, the rules do tend to encourage growth of trust and reciprocity, and are usually based on unique aspects of local resources and culture. While government institutions can facilitate the process of local self-organization, building the social skills of the staff involved is also critical to enable local solutions to be developed.
- Scaling up and effective enforcement on a large scale are still major issues.
- Inclusion of all stakeholders requires more attention. For example, minority and marginal groups, such as fisheries laborers, migrant fishers, and women in the fishing or postharvest sector, are seldom represented in comanagement arrangements, despite constituting a large share of the labor force dependent on the fisheries. In addition, wherever possible, comanagement arrangements should include the private sector.

Conflicts between small-scale and industrial fisheries

Small-scale fishers and industrial fishers often target the same species and fishing grounds. In some cases governments have attempted to divide the use and management of the resources by these different fisheries by partitioning the coastal zone or inland waters according to different scales and classes of fishers. For example, along the wide continental shelf of Guinea-Bissau, regulations state that industrial vessels may not fish within 12 nautical miles of the coast, because this area is reserved for small-scale fisheries. In Peru and the Philippines, the waters inshore of the 7-kilometer line are to be accessed only by municipal fishers (vessels of less than 3 tons). Similarly, in many cases large areas are declared a multiuse Marine Protected Area, and the coastal zone or closest area is zoned for small-scale fisheries. Where clear separation is not possible or politically feasible, different processes for establishing cooperative partnerships are required involving both industrial and small-scale groups in the policy planning process.

Conclusion

Active participation of local fishers and communities in development and sustainable management of the resources is not a new concept; it has been part of development processes since the 1960s. What is different is the increasing commitment of several governments to decentralization and comanagement programs. Current emerging comanagement systems show promise for addressing many of the requirements for sustainability, equity, and efficiency in fisheries management, particularly in tropical small-scale fisheries. Comanagement partnerships address the crucial management issues of who controls the rights to use the fisheries and who obtains the benefits from those resources. The development of these comanagement partnerships is neither automatic nor simple, nor is their survival guaranteed, and issues of costs and scaling up still need further thought.

External funding entry points

Public–private partnerships and local empowerment are at the core of the strategies of many international donor agencies and financial institutions. Developing a policy dialogue with interested countries in revisiting the role of the national and local authorities, and private and public sector partnerships in fisheries management, can be seen as a key service of the international agencies, and in particular the World Bank. Bilateral donors and international agencies can provide the technical assistance for the development of the administrative arrangements (division of responsibilities, flow of funds, governance systems) and act as a convener to bring together the different experiences in this area and, in particular, to help assemble good practice on scaling up the many currently promising experiences at the local level. Using Community-Driven Development funding would be the most appropriate financial instrument.

THE ALLOCATION OF ACCESS AND USER RIGHTS

While there is general agreement that open access to oceans and lakes has generally led to overfishing, ending open-access regimes means that some people will be excluded from fishing. Thus, ending open access has been difficult. Many countries, particularly developing countries, have yet to limit access effectively because of the anticipated social and political costs that must be borne in the transition to better fisheries management in the longer term. In cases where the numbers that can fish have been restricted through licenses, these have, in general, not been defined to prevent the subsequent race to fish, and overfishing of the prescribed harvest limits. Some countries—particularly industrial countries—for which industrial fishing is an important component of national revenues, have attempted to align the goals for fisheries management more closely with the business realities for fishers, and to create incentives for self-regulation and resource conservation. The incentives are provided by the creation of property rights over the resource, for individuals or groups of fishers (FAO 2000a; OECD 1997; NATO 1988; Nehar, Arnason, and Mollett 1989). This section examines user rights in general, the experience of industrial fishing nations with one type of property right, and the characteristics of different fisheries that dictate the choice of rights-based fisheries arrangements.

Rights-based fisheries management

In general, property rights must be clearly defined, enforceable, and provide an appropriate set of incentives for promoting efficient management. Four critical characteristics of property rights have been identified: *security of title, exclusivity, permanence, and transferability*. Property rights with these characteristics create incentives for fishers to identify with the long-term needs for resource conservation and the opportunity to ensure benefits from responsible fishing even if subsequently leaving the fishery. A management system that allocates rights to shares in the fishery can take many forms. It can be

characterized by the nature of entities that hold rights, the type of the right, and rules about transferability. The form of property rights should be compatible with the social, cultural, and economic relationships of the fishery concerned, and with the ecosystem where the resource is found. Thus the form of property rights depends on the particular circumstances of the fishery, including the traditions of the society within which it is embedded. Where traditional rights exist in some developing countries, they are often not sufficient to provide the incentives needed; they do, however, provide the base upon which improved systems can be built. Additional considerations include the level of good scientific advice that can be obtained, and the means for monitoring and control. The right may be to a particular share of the output of the resource, to use a specific amount of fishing effort, or it may be a territorial right (granted to individuals, communities, or companies) to fish a specific area. No one form of property rights is best suited for all fisheries (World Humanity Action Trust 2000).

Box 3.9. A lexicon for rights-based management

- ACE: Annual catch entitlement
- ITQs: Individual transferable quotas
- IEQs: Individual effort quotas
- MCS: Monitoring, Control, and Surveillance
- MSY: Maximum sustainable yield
- TAC: Total allowable catch
- TACC: Total allowable commercial catch
- TURFs: Territorial use rights in fishing

Source: FAO, 2000a

Rights-based management (see box 3.9) can cover the allocation of community development quotas and other group fishing rights, territorial use rights of fishing (TURFs), individual transferable quotas (ITQs), or individual effort quotas (IEQs), taxes, and royalties. A fishing license is essentially a right of access to the fishery, but subsequently fishers compete with each other in open-access fisheries to take as large a portion of the TAC as possible in the time allowed for fishing (see box 3.10). In contrast, the allocation of property rights allows fishers to exercise a measure of control over a portion of the fishery. Because the sea is not practically divisible, these property rights are less complete than, say, enclosing land for farming. An ITQ, for instance, provides an individual fisher or fishing firm the right to harvest a defined proportion (either an absolute amount or, more usually, defined as a percentage) of the TAC in a year or season. The regulatory fishery body continues to define the TAC for the fishery.

Box 3.10. Application of rights-based fishing in multispecies, small-scale fisheries

The Java sea fisheries in Indonesia provide a typical example of a small-scale fishery in developing countries. They are regulated open-access fisheries in which overcapacity (distorted seasonally) and overfishing are evident, and resource stocks are below their maximum sustainable yield (MSY). Excess capacity (making allowance for technical efficiency) of between 86 and 206 percent was estimated for different fleet segments. Numerous fish species are present in the majority of catches, and these are landed at landing sites in different areas. Analysis suggested that the definition of individual transferable quota (ITQ)-type property rights was infeasible in this situation because of (a) a combination of the multispecies nature of the fishery and stock variability of pelagic species, making the setting of total allowable catch (TAC) difficult; (b) the number of fishers and the difficulty in assigning rights without prior monitoring or records of catch histories; and (c) limited infrastructure—including for monitoring and enforcement of compliance, or the development of quota markets. Localizing management in areas served by a home port may be an alternative in such cases.

Source: Squires and others (2003).

An adequate capacity of the regulatory authority to provide the scientific research required for stock analysis and setting of the TAC for individual species, and to establish, at least initially, the monitoring arrangements for whatever type of quota systems is selected (including for bycatch species), is a key precondition for this right-based system to work. The concurrent development of taxation or other

methods to fund these services is also required. There may be legal requirements to acknowledge new rights systems and to establish systems governing the transferability of quotas. This is most likely to be encouraged by a cooperative relationship between the fishing representatives themselves and between fisher's bodies and the fisheries management entity. However, the granting of property rights over what were previously, in most countries, "common property," to a number of fishing firms, organizations, or individuals can be seen as privatization of a national resource, and the process subject to significant social opposition. Difficult issues still arise in cases where rights are to be granted in areas where commercial, recreational, or traditional fishing occur simultaneously.

Several objectives are encompassed by the adoption of a rights-based approach to fisheries management:[20]

- Alignment of conservation and economic incentives, because the property right allocated to the fisher means that he or she has a long-term interest in maintaining the asset value (for example, the ITQ) and the health of the resource for future use.
- Introduction of economic efficiency, because the fisher, without having to endlessly improve the technological efficiency of boats and gear (and the associated cost), but ensured of the right to catch the allotted quota, can consider the most cost-effective means of fishing, timing fishing according to season, migration, or landings according to peak demand.
- Opportunity for sustainable fishing yields, because if the TAC is set with suitable precaution, and fishing ceases as individual quota holders reach their given quota, the fishery's total catch should remain at the targeted, sustainable level. This is not certain, but the incentives are greater for this to happen than under open-access conditions. Rapid increases in capacity are less likely—indeed there will be a tendency for efficient fishers to buy out quota from less-efficient fishers, and so to reduce capacity with time.
- Increased financial returns for users and consumers, because fishers have the opportunity to time the taking of their quota to match processing or market needs, and thus to maximize profit from individual catches.
- Politically acceptable distribution of benefits, because fishers are likely to agree more readily to schemes in which fishers are treated similarly and in which there are reduced incentives for competition to outdo others in the same fishery. However, methods for the initial selection of quota holders and allocation of the TAC shares are substantial political issues.

The example of management through individual transferable quotas (ITQs)

The most comprehensive systems of ITQ management currently are in Iceland, the Netherlands, and New Zealand, with Australia, Canada, Chile, and the United States employing quota management in conjunction with other measures. In Africa, Namibia is an exception in developing countries in using quota-based management, although these quotas are not yet transferable. Some key characteristics of these systems are provided in table 3.3.

The choice of property rights system for management in different types of fisheries

ITQ-based management has been most successful when applied to industrial-country, temperate- water, and single-species fisheries (in which a TAC can easily be defined). Although both demersal and pelagic

[20] Because several industrial fishing nations have successfully adopted versions of a quota management or ITQ system, the following discussion focuses largely on the ITQ system as an example of one type of property rights. As discussed later in the section, other examples will pertain in other types of fisheries.

species have been included under such schemes, the migratory behavior of pelagic species, and the greater sensitivity of their stock dynamics to climatic influences, make this potentially more difficult for pelagic species. For example, in the Global Trust Fund for Sustainable Fisheries-funded Sector Note for Peru, the introduction of ITQs was recommended for the nonmigratory hake, but caution in the application of possible quota systems was recommended for the much more migratory anchovy. The costs involved in the determination and subsequent monitoring of stock biomass, and the monitoring of compliance with regulations (or MSC), forced the focus so far to be on industrial or relatively large-scale demersal fisheries.

The stage for the implementation of a Quota Management System has often been preceded by fleet rationalization (and exclusion or control of foreign vessels). However, buyback schemes (see New Zealand section of table 3.3) may require additional investments beyond the financial capacity of the governments concerned. Although compliance is thought to be higher than with other management methods, dealing with bycatch is more complicated, because TACs have to be developed and recorded for all species in the catch. There have also been suggestions that this method encourages high-grading of the catch at sea (that is, the sorting out of low-value species, or underweight juveniles, to enhance the value of catches contributing to the quota), which is contrary to conservation requirements. Incentive-based management is a preferable form of fisheries management for certain types of fishery, and Chile and Namibia illustrate applications of quota-based management to specific developing country fisheries. In contrast, mature fishing communities in Japan, for instance, have collaborated in effort reduction through pooling or fishing rotation systems (Baba 1997). The application of quota or effort-based management requires learning by fisheries and political institutions on many fronts, so that economic and resource improvements following adoption are likely to be progressive rather than immediate.

However, for other fisheries situations, particularly multispecies tropical fisheries (see box 3.10), and inland waters (box 3.11), ITQs may not be the most appropriate choice of user rights to adopt because output restrictions are much more difficult to implement. Here fisheries management is more likely to succeed with emphasis placed on the restriction of fishing effort, and management by areas rather than single stocks. Systems should be based, where possible, on traditional management by communities, with due emphasis placed on stakeholder fishing methods (because smaller-scale fishing methods have the advantage of employing more selective gears).

Box 3.11. Managing inland water fisheries

Output controls: As with marine fisheries, controls on the quantity and quality of fish landed are also applied in large-lake fisheries where there is a substantial commercial component. They (and size limits) are generally more difficult to apply in other inland fisheries such as rivers, however, because of the high percentage of artisanal fishers and the diffuse nature of the fishery and its markets.

Application of quotas (ITQs) is practicable in lakes where yields are relatively constant and there is a definable core of fishers among whom quotas can be allocated. In river fisheries the concept is harder to apply because of the extensive year-to-year variations in catches and the large number of part-time participants. The quota system works well in recreational fisheries where creel limits are often specified in the license, which defines the number, weight, and species of fish allowed to be removed from the water, usually on a daily basis.

Input controls tend to dominate: Measures for regulation of inland water fisheries include mesh and gear limitations, closed seasons, and closed areas. Control of access and effort is often acceptable in subsistence fisheries—not including migrants—because they often formed parts of traditional fisheries management in which fishing was reserved for particular ethnic or social groups. Access can also be controlled by licenses, state-regulated access, or through communal or individual ownership of smaller water bodies.

Source: Welcomme (2001).

Table 3.3. Characteristics of some successful quota-based management systems

Type of Fishery by Country	Main User Right Characteristics	Costs and Cost Sharing	Impact	Issues
New Zealand				
Numerous commercial species for which TACs derived independently.	ITQs for territorial waters, based on previous catch history, for 10-year period, partly transferable, based on NZ ownership and company size criteria. Government buyback scheme to bring ITQs in line with MSY.	Clearly defined cost-recovery scheme in place, with private sector paying for cost of monitoring, compliance auditing services, and prorated cost of stock assessment for commercial assessment. Government funds compliance of noncommercial sector, and detection and prosecution of fraud.	Significant consolidation of the sector, increase in the value of exports, and substantial increase in the ITQ price, indicating industry expectations of higher future yields.	Traditional fishing rights of the indigenous Maori; bycatch and need for complicated system of multi-species TAC setting, difficult to fit within ecosystems approach.
Iceland				
Cod and other demersal species, small pelagics.	ITQ system for territorial and international waters, combined with area restrictions for spawning grounds. ITQs are transferable and of indefinite duration, monitored through landings.	Net costs for the system (including research) about US$30 million per year, about one-third from the industry.	Total catch now in line with TAC, and greatly increased catch per unit effort. Significant concentration in the sector.	Management of small (6-to-10-ton vessels); and some anticonservation "high-grading," i.e., sorting out of juveniles, to stay within the quota limits.
Namibia				
Virtually a single-stock approach: hake (demersal) fishery is the most valuable.	Development of sound sector vision leading to quota management system, based on non-transferable quota to holders of right of	US$20 million, recovered through full cost recovery plus surplus contribution of US$9 million (1999) through system of quota and license	Stock recovery, additional employment in the industry, but still inefficiency in the processing industry.	Success because of possibility of single-species approach for each fishery, no artisanal sector, and effective control system established.

Table 3.3. Characteristics of some successful quota-based management systems

Type of Fishery by Country	Main User Right Characteristics	Costs and Cost Sharing	Impact	Issues
	exploitation, issued to Namibian companies, combined with license system for other vessels.	fees.		
Chile				
Industrial Patagonian tooth fish fishery in Chilean waters.	Defined as a "developing fishery" under the Fisheries Act of 1991 and managed since 1992 by the establishment of a TAC and Extraordinary Fishing Permits (EFP), which act as ITQs. EFPs are secured by bidding through (one of three different types of) auction and are generally of 10-year duration. Additional regulations include closures, gear restrictions, and limitation of tooth fish taken as bycatch.	Average auction prices have averaged from US$600 per ton to US$2,000 per ton up to 2000 (total Chilean tooth fish exports in 1999 from all fisheries was 11,863 tons at an FOB export value of US$105 million). Eighty percent of the Fisheries Research Fund (US$6.1 million in 1996) was derived from taxing industrial vessels (all fisheries).	Significant reduction in vessel numbers and GRT in this fleet. While catches are reduced from the high in 1994 and are now below the annual TAC, catch per unit effort shows steady decline indicative of a diminishing resource. Despite rules on the amount of quota able to be purchased by stakeholders at auction, there has been substantial consolidation of quota ownership through transfers within eight years (by 2000, 3 companies had 80 percent of the TAC).	Compliance problems are noted, although less than other Chilean demersal and pelagic fisheries which have implemented different ITQ systems subject to ad hoc regulations and poor enforcement. The regulations for the Unidad de Pesca, however, do not account for the migratory and transboundary nature of the resource (fished simultaneously by small-scale fishers in Chilean waters and by several industrial fleets in offshore waters).

Source: Authors

External funding entry points

First, the World Bank and other agencies with broad experience in this area can assist developing countries through analytical work, as already described, in the identification of the most appropriate user rights system under the particular conditions and type of fishery, strength of MCS system, structure of the industry, and other factors. Once the appropriate system is decided upon, and with support from staff with the country case study experience described above, the World Bank and other donors can provide the technical assistance to establish a market-based, tradable user rights system. Where buybacks of quotas by the government regulatory agency are required, this could be funded through the World Bank. Because of high funding levels required for a comprehensive buyback system, and the need for rigid accounting discipline, this component of a sustainable fisheries management system is normally less well suited for bilateral donors. Because experience indicates that public–private sector partnerships are critical for the success of such systems, partnerships with other private agencies interested in sustainable resource management and user rights trading, such as the private sector arm of the World Bank, the International Finance Corporation (IFC), would be essential.

4. Tools for the Sustainable Management of Fisheries Resources

Once the basic institutional and legal framework and an appropriate division of responsibilities and rights is established in the form of operating collaborative management (comanagement) and user rights systems, additional tools can be applied to further enhance marine ecosystems. Fortunately, a number of additional tools are now emerging that can help reduce fishing pressure and restore dwindling fish stocks. This chapter reviews experiences with these, highlighting best practices, the implementation issues involved, and possible external funding entry points. Three general criteria apply:

- While the tools are described individually, they will almost never be successful if introduced as a single intervention. To the contrary, these tools almost always need to be introduced as a package (together with governance reform described in Chapters 2 and 3). For example, a buyback scheme to reduce overcapacity needs to be accompanied by new user rights schemes, and the introduction of Marine Protected Areas often needs to be combined with comanagement and alternative livelihood schemes.
- Private management of the tools should be encouraged. While there is a role for the public sector in creating the enabling environment, the challenge is to create the conditions that make the private sector control itself.
- Fisheries operate with "irreducible uncertainties," that is, errors in estimates of target species population size, catch, fishing effort, and fish mortality that cannot be reduced given differences in annual recruitment, the available resources for management, and data collection. Given such uncertainties, fishery managers need to err on the safe side in setting quotas, and need to set up "insurance" in, for example, setting catch limits and protecting areas of the sea from fishing.

THE USE OF MARINE PROTECTED AREAS AS A TOOL FOR FISHERIES MANAGEMENT

Background

Over the last decades, closed seasons, to provide stocks a respite from fishing and the opportunity to reproduce and grow, have been a component of fisheries management. More recently, the idea of total closures to fishing, variously referred to as fish sanctuaries, fishery reserves, no-take areas, or Marine Protected Areas (MPAs), has again become a key means of introducing conservation and area management into the overall tools available to fisheries management. This section discusses MPAs and equivalent concepts for inland waters.[21]

MPAs enhance the production of offspring that can restock the fishing grounds (box 4.1). Marine reserves are particularly useful in tropical marine ecosystems (which represent a large proportion of the fisheries in developing countries), where conventional management methods (species-by-species restrictions on catch

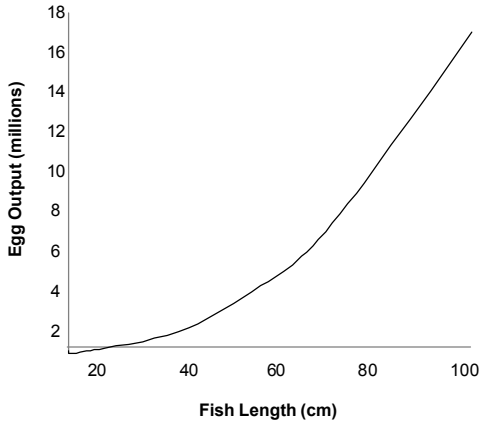
[21] MPAs are any area of intertidal or subtidal terrain, together with its overlying water and associated flora, fauna, historical, or cultural features, which has been reserved by law, or other effective means, to be protected from all fishing, extractive, or harmful uses (Roberts and Hawkins 2001). The source for this Chapter is Roberts and Hawkins (2001).

and effort) are difficult to enforce under conditions complicated by many species, gears, and landings. As the number and biomass of fish within reserves increases, individual fish will start to emigrate out of the reserves and into fishing grounds. Thus, a proportion of the fish that once received protection in reserves does eventually become available for fishers to catch. This contribution to restocking the areas outside the reserves makes them economically beneficial to fishers, and compensates for the short-term loss that they may experience in the early years after reserves are established and fishing grounds are closed.

Box 4.1. Bigger fish produce more offspring

Marine Protected Areas are based on the biological principle that egg production increases exponentially with fish length Protection allows fish in those areas to live longer, and thus produce many more eggs. For example, one 10-kilogram red snapper (*Lutjanus campechanus*) produces over 20 times more eggs at a single spawning than 10, 1-kilogram snappers. Fish that are allowed to live longer and grow to a larger size may also spawn more frequently than smaller fish. Reserves also increase the population densities of marine organisms, which can also increase the number of young spawned, because some species, particularly demersals, can reproduce successfully only at high population densities. In a study of 76 reserves (established for a period as short as 2 years and as long as 20), abundance approximately doubled; biomass increased to 2.5 times the biomass of nearby, fished areas; average body size increased by approximately one-third; and the number of species present per sample also increased by one-third (Halpern 2003).

Egg output vs. body size in tropical groupers



Source: Roberts and Hawkins, 2000

Additionally, MPAs provide a refuge for vulnerable and rare species. Some species (such as stingrays) are vulnerable to capture in fisheries even where they are not commercially targeted (that is, as bycatch), and require protection. They can also act as a buffer in times of catastrophic human and natural disturbances, and during increasing climatic changes and variability resulting from global warming. Intact, fully functioning ecosystems rebound more quickly from catastrophes like storms, coral bleaching events, and oil spills, than ecosystems where organisms are affected by other stresses (Connell 1997).

Implementation issues

The implementation issues for marine reserves largely revolve around the choice of sites to be protected, and the adoption of appropriate negotiating and conflict management mechanisms to obtain an appropriate balance between conservation and fisheries aims of stakeholders. While the attraction of marine reserves lies in their simplicity, lack of stakeholder participation or polarized and unresolved conflicts are most likely to lead to lack of respect for the proposed protection schemes, and to further

damage to the environment and resources. For example, in Kenya, reserves set up for tourism and game fishing did not gain the respect and compliance of poor local fishers. Planning had to be totally revised to bring local communities more effectively into the schemes so that the reserve was respected and had any chance to work (see box 4.2). The example typifies the equity issues to be encompassed in the development of new schemes for the use of aquatic resources (Glaesel and Simonitsch 2001).

Box 4.2. Reserve concepts for inland waters

Conservation of freshwater fish species through parks and reserves requires that protected areas include habitats corresponding to all needs of fish (feeding, breeding, nursery, and shelter habitats) and the connectivity among them. Locally resident ("black") fishes may be easily accommodated in a single channel floodplain reserve, but longer-distance "whitefish" migrations are extremely difficult to provide for within conventional reserve structures. *Conservation reserves* are generally required to be permanent features, and usually depend on total exclusion of fishers from the designated area. The incentive for compliance may come from evidence that setting aside part of the fishing ground has benefit for the fishing communities.

In contrast, *harvest reserves* may be used to protect fish in locations where they are particularly vulnerable to overexploitation, and may not always require being closed for a whole year. Harvest reserves are intended to increase the harvest of fish (that is, to benefit the fishing community), and not just to protect fish for their own sake. They should be managed instead with a flexible combination of regulations adapted to maximize local benefits. A number of small, scattered reserves encompassing critical areas and habitats will be more useful than single large areas. In lakes, some migratory species will need reserved access to tributary rivers for breeding. Like MPAs, harvest reserves are particularly suitable for comanagement approaches because they are conceptually simple, traditional management tools in many places; high visibility makes illegal fishing relatively easy to detect; and they are designed to benefit the local community. They will achieve their objective only if consideration is given to where and when the extra fish produced by the reserve will be caught; for instance, communities are more likely to observe reserves for "black" fish from which they benefit than for "white" fish which may be harvested elsewhere.

Source: Welcomme (2001).

To maximize the benefits, the establishment of MPAs must be supported by proper biogeographic knowledge regarding their placement, to be able exploit optimal recruitment and fisheries interactions. Box 4.3 provides an overview of key technical aspects.

Box 4.3. Key technical aspects of MPAs in coastal areas

Ideally, the reserves would:

- Be sited in areas where species are particularly vulnerable but capable of replenishment (such as nursery areas for juveniles, spawning aggregation sites) and, if possible, where they can provide other useful services, such as tourism, or coastal protection through the maintenance of reefs and mangroves.
- Be of sufficient size to accomplish the biological and fisheries restoration goals.
- Be networked, to enable recruitment from, and seeding of, other reserves.
- Be permanent, to reduce the costs and hardships of the closure of areas at start-up.
- Be reasonably free from natural disaster threats or anthropogenic externalities (such as pollution).

MPAs work in temperate areas as well as tropical waters. They are more suitable for demersal or semi-pelagic species, because migratory species will move through reserves to areas where they can and will likely be subject to fishing pressures.

Source: Authors

Table 4.1 provides key characteristics and experiences with MPAs from the Approach Paper case studies.

Table 4.1. Key Characteristics and experiences with MPAs

Type of Fishery by Country	Main Marine Reserve Characteristics	Costs and Cost Sharing	Impact	Issues
Philippines (Sumilon Island, followed by major expansion in the coastal zones)				
Multiple species/ coral reef.	Community-based management of MPAs, through strengthening municipal jurisdiction and establishment of local Fisher Councils.	Now total of 290 community-based MPAs with total costs of US$230 million, 90 percent from government funding.	Increased catch per unit efforts increased up to 50 percent. Ex post FRR of 28 percent, with management benefits offsetting recurrent expenditure.	Funding for the initial investments, and requirement to scale up local sites in national or large regional, community-based network of MPAs.
Indonesia				
Multiple species/ coral reef.	COREMAP II is planning village-based MPAs (as fish reserves) in coral reef ecosystems as one of the key management interventions in the fishery, through district-level co-management programs.	Currently envisioned to begin with 6 districts and roughly 1,500 villages, with costs of co-management component to establish village-based MPAs for these 6 districts estimated at roughly US$30million to US$50 million.	The Government of Indonesia has set a target that in each district, by 2030, 30 percent of the coral reefs would be protected as MPAs. Impacts are projected for significant increases in biomass and catch per unit effort for coral reef fishers.	Ensuring village-based MPAs are sustainable and enforced, and that Government is able to provide the villages with the support they need.

Source: World Bank, 1998; Authors

Because of their potential, a large number of protected areas have been created. However, while there are successes, there are also some failures:

- Some parks exist only on paper, lacking both local and government protection, and the required community organization and support.[22]
- The persistence or resumption of economic fishing at the margins of MPAs has been documented for a small number of types of reserves and species. Careful planning and monitoring will be required in the adoption of MPA closures as part of restoration strategies in new areas.
- Some coral reef sites (for example, in Jamaica and some other sites in the Caribbean) are so heavily degraded and overfished that there are too few remaining adults of key species to repopulate the area, and little likelihood of recruits coming from nearby areas (Munro 2002).
- Other spots (such as exist throughout East Asia) are so polluted and/or the habitat so degraded that nothing could grow there.

[22] Reefs at Risk Report for South East Asia at: www.reefbase.org.

- As with harvest reserves in fresh waters, marine reserves are most effective, when implemented in networks, as part of larger, multiuse, and managed areas. The total area is delineated and subdivided into zones, based on the ecosystems and the fisheries they support. Some zones might be managed jointly with the communities or resource users (that is, comanaged), while others might be open to all forms of fishing, or closed as MPAs. The establishment of such a network and general management approach is exemplified by the Soufrière Management Area in St. Lucia (see table 4.2) and by the Alaskan Groundfish Fishery in temperate waters (Witherall, Pautzke, and Fluharty 2000).

Table 4.2. Main impacts from selected successful operation of marine protected areas

Country and Site	Main Impact
Spain, Isla Tabarca Marine Reserve	Key species around the reserve were up by 50 to 85 percent over pre-protection levels.
St. Lucia, Soufriere Marine Management Area	Five-year CPUE of large fish traps increased by 46 percent and small traps by 90 percent in fishing grounds around a network of 4 reserves, while the number of fishers and overall effort remained constant.
Egypt, Nabq network of small reserves	CPUE of the trammel net fishery increased by 66 percent in 5 years of protection.
Philippines, Apo Island Reserve	CPUE of the hook-and-line fishery around the reserve has increased tenfold over 20 years of protection. Total yield of the Apo Island fishery is among the highest in the Philippines, and has been stable for the last 15 years.
United States, Sambos Ecological Reserve (Florida Keys)	After 4 years of the reserve being established and in operation, all local fishers experienced an increase in income, with those fishers who were displaced by the reserve gaining an average of 67 percent in income compared to those fishers further away from the reserve who gained an average of 22 percent.

Source: Gell and Roberts (2002).

Economics of marine protected areas

Establishing and managing MPAs is expensive, and most of the world's existing marine reserves are underfunded, thus failing to achieve their objectives. The three key costs involved are (a) initial consultations and lobbying for reserves; (b) start-up costs and compensation; and (c) operating costs (including for research, monitoring, surveillance, ongoing education, and stakeholder consultations).

Initial consultations and start-up costs are often financed by the public sector, generally by the government department responsible for fisheries. Compensation for lost fishing due to the increased competition for resources for the first years might be needed. Forms of compensation can include paying fishers to work with scientists to study the effects of the reserves, and allocation of the revenue generated by the reserves, generally through tourism, to the affected fishers. Public sector compensation would be gradually decreased over the period needed for MPAs to augment stocks in nonprotected areas.

In many coastal areas tourists pay entrance fees to reserves to support operating costs, or general tourism taxes are levied to cover these costs. Reserves may also be funded through environmental trust funds. Such funds are increasingly being used to finance protected areas in general, and could be used to fund MPAs. However such funds are capitalized, whether by loans or grants, such trusts are very useful for generating core funding for operating costs.

The key economic and financial question in the implementation of MPAs concerns the size and rate of the spillover effect into the adjacent fishing grounds. Protection leads to increased population density, which in turn can lead to a net emigration of fish and marine animals from reserves to fishing grounds. Many

studies suggest spillover will be limited mainly to areas close to reserves, perhaps within a few hundred meters of the boundary in some cases, and often after five years of creation, building up for a period of 10 or 20 years. Thus, when reserves are first established, lost fishing grounds may cause initial problems for fishers. As time goes on, benefits from reserves start to increase, and fisheries should begin to improve. How fast fishers see their costs turn to benefits depends on how overfished a fishery was to begin with. The more heavily depleted populations are, the faster fishers will see the improvements in areas outside the reserve. In extreme cases, where overfishing and habitat degradation or ecological transformation have occurred (as is the case in some coral reefs now overgrown by algae in the Caribbean), the no-take MPA may have to be augmented by restocking programs or targeted habitat restoration.

While costs will vary, there is now a good body of evidence of increased catch per unit effort (CPUE) arising from the implementation of reserves, as shown in table 4.2.

Conclusion

In summary, under most conditions, MPAs promote a build-up in biomass of commercially exploitable fish species within their boundaries. In coral reef areas, biomass has been shown to double after three to five years of protection, depending on the extent of resource depletion and ecosystem health prior to establishing the protected area. Provided the scientific underpinning and the stakeholder commitment are adequate, MPAs can be an effective tool to help promote sustainable fisheries governance. This does not mean that implementation of protected areas and protected area networks will suffice for sustainable management of the fisheries of a given area. Fishing activity on the fishing grounds outside protected areas will still need to be managed, and access needs to be restricted. MPAs should become a component of much larger fisheries management regimes. Moreover, establishment of marine protected areas will often require organization of communities and establishment of programs for the support of livelihoods and initial operational costs. Similar considerations apply to the conservation and rehabilitation of inland water species and habitats. If such protected areas are appropriately sited and effectively managed, these tools provide a singular opportunity to address the goals of both biodiversity conservation and sustainable fisheries.

External funding entry points

The establishment of MPAs has been one of the main investment areas of the World Bank and some of the bilateral donors in the fisheries/marine biodiversity sector, but is suitable for a variety of donor agencies. The investment includes the assistance to developing countries with the initial costs of establishing MPAs as part of overall fisheries strategies. This could include technical assistance in establishing the enabling regulatory framework for local empowerment, capacity building, and training for management of MPAs, the skill building in participatory approaches and, eventually, the initial operating costs in the establishment of the reserves. The World Bank can also help explore the practicability of extending novel conservation funding mechanisms from other sectors in which it has experience (like forestry) to aquatic environments (Balmford and Whitten 2003). The comparative advantage of the World Bank, some of the European donors, and several NGOs in the development of reserve management is based on the now quite ample experiences in decentralization, Community-Driven Development (CDD), and farmer organizations.

CHANGING EXPLOITATION PATTERNS

Changes in patterns of exploitation are aimed at avoiding catching immature fish. This can be achieved by gear regulation to ensure selectivity, and by setting the legal fish size that is caught. In combination with

this, other regulatory tools can also be used, such as temporarily closing areas, seasonal closures, and other gear restrictions. Such regulatory gear can also be used to avoid bycatches (discards) of nontarget species. Norway has had such regulations on exploitation patterns for many years. This includes protected areas, flexible closed zones, trawl-free zones, and selection grid in trawls. Norway, which has long experience with a combination of these tools, reversed the collapse of one of its most important fish stocks, the Norwegian spring spawning herring. From a record catch of 1.7 million tons in 1956 from a healthy spawning stock of about 11 million tons, the stock was almost completely destroyed by the end of the 1960s. A total ban was introduced in the early 1980s, but now production is back and sustainably managed at the level of about 1 million tons per year. The Directorate of Fisheries carries out surveillance on conventional fishing vessels, and if the intermixture of juvenile fish or bycatch exceeds certain preset levels, areas are flexibly closed or other gear or trawl restrictions are introduced.

RESTOCKING AND STOCK ENHANCEMENT

Many exploited stocks of aquatic organisms are naturally limited by the supply of juveniles, and many suffer from fishing, which effectively lowers the extent of reproduction and recruitment of new generations of juveniles to the fishery. Consequently, there has been an increased interest in stock-enhancement programs (Munro and Bell 1997).[23] Most stock-enhancement programs involve the release of juveniles reared in hatcheries, or the collection, rearing, and transplantation of wild juveniles. The approach has been explored widely in Japan, with more than 90 marine species reared artificially for the purpose of stock enhancement. Globally, a wide range of species including finfish, crustaceans, and mollusks are the subject of stock enhancement programs. Such programs have been particularly successful for the restoration of recreational fisheries, such as red drum (*Scianops ocellatus*).

Several programs for demersal marine species have documented encouraging rates of survival of released juveniles, and are reported to be economically viable. Indeed, some have reached industrial proportions. Within six years (1969–75), production of the scallop (*Patinopecten yessoensis*) rose from 5,000 tons to 100,000 tons per year in Japan, due entirely to the process of spat collection, culture, and a committed program of sowing seed scallops to build up stock (Ventilla 1982). The methodology has successfully launched industries in other countries with related species (for example, *Pecten novaezelandiae* in New Zealand [Arbuckle and Metzger 2000]). For some other species, high production costs for producing juveniles, or low survival rates, mean that stock enhancement is not currently a viable option.

Stocking of inland waters to produce enhanced fisheries yields of commercial species, particularly as practiced in China and India, has been a major reason for the increased production from that subsector. The simpler ecosystem in reservoirs, in particular in man-made ones, and the greater social and management control of smaller water bodies, makes inland water stocking less complex to manage. It can therefore be an interesting option for increased production and rural poverty reduction.

Implementation issues

The stocking of communal water bodies in developing countries can face major institutional problems and difficulty in achieving equitable outcomes—particularly once profitability has been established. However, technical options are well established, particularly for fresh-water bodies and species, and there is growing experience among the World Bank and its partners in successful projects of this type. As with

[23] Note that two similar processes with different intentions are described: "restocking" aims to restore population size following overfishing or other disturbance; "stock enhancement" provides increases in the number of juveniles to augment subsequent harvests and economic returns.

aquaculture, there are concerns to be addressed regarding the release of cultured or grown out juveniles into the wild. Careless stock enhancement programs could reduce the diversity of a species gene pool, introducing diseases and altering the structure of fish communities. Therefore decisions to use stock enhancement should be based on thorough pilot studies, including analysis of the range of projected economic and social benefits. However, restocking can also be a significant tool in the restoration of depleted populations for conserving biodiversity, where fishing or habitat alteration diminishes the possibility of natural recruitment being effective in reasonable time frames. This was done in the case of giant clams (Tridachnidae) in the Philippines and the Pacific, and is an area of active research for coral reef fisheries (Munro and Bell 1997).

External funding entry points

World Bank experience with restocking programs has been in rehabilitating the fish stocks in reservoirs and lakes, which had been heavily impacted by intensive fishing pressure. Working with local fishing communities, the critical components of such a program included, for example in India: (a) organization of the fishing groups into effective management bodies with strict management measures, (b) provision of long-term fishing rights to the water body in question, (c) introduction of research and training in fingerling-rearing technologies of indigenous species that could effectively use the resources available in the waters to be stocked, and (d) the provision of short-term credit for working capital for the purchase of inputs (for example, fry and feed) and support for the required labor. Such programs are also very suitable for bilateral donors.

METHODS FOR REDUCING FISHING CAPACITY

A number of fishery management methods and practices have been developed to reduce or restrict the capacity of fleets. Those, such as the imposition of a total allowable catch (TAC) for the fishery, vessel catch limits, mesh and size restrictions on gear, license limitation, individual effort quotas, and buybacks, have been termed "incentive blocking control methods." They can all be considered as limitations of fishing capacity, generally dictated by the "command and control" structure of a nation's regulatory fishery agency. They contrast with "incentive adjusting control methods," discussed earlier, which seek to provide individual or group incentives and market mechanisms for meeting output targets, with greater flexibility of operation. Buying back (FAO 1988, 2000b, 2002c; Greboval and Munro 1999; Hatcher 1998; Holland, Gudmundsson, and Gates 1999) surplus vessels represents probably the most direct way of reducing excess capacity and bringing fleet capacity in line with sustainable fishing levels. This section examines the applicability of this tool in addressing overfishing, and assesses the feasibility of its implementation in different fisheries.

Excess capacity and overcapacity

Box 4.4. Defining excess capacity and overcapacity

Capacity: "The maximum amount of fish over a period of time (year, season) that can be produced by a fishing fleet if fully utilized, given the biomass and age structure of the fish stock and the present state of the technology (FAO 2002c).

Excess capacity: Short-term lower production because of a drop in fish stock abundance, or other market factors.

Overcapacity: Long-term phenomenon when the potential output under normal operating conditions is different from the maximum sustainable yield of the resource.

Although these issues are sometimes not distinguished in the fisheries literature, firms can change their production levels in response to market conditions to eliminate excess capacity, but the elimination of overcapacity requires a change in the management.

Source: FAO, 1988

The development of overcapacity in a fishing fleet is the result of open resource access regimes in which competitive fishing practices encourage unregulated vessel construction, and technological improvements in gear and other means to enhance fishing effort and efficiency (box 4.4). These perverse incentives are exacerbated by subsidies to variable or fixed inputs, estimated at US$12 billion to US$20 billion from budgeted, unbudgeted, and cross-sectoral sources (Milazzo 1998). Although it is difficult to disentangle the effects of different forms of subsidies, or to provide global aggregate figures in the absence of key budgetary data, the same report estimates that US$3.0 billion to US$3.5 billion of these subsidies supported domestic fleet improvements, US$0.5 billion to US$1.0 billion was provided to enhance fleet access to foreign waters, and as much as US$6 billion to US$7 billion was provided to all aspects of industry development and operation through subsidized loans, loan guarantees or restructuring, fuel tax exemption, and other preferential tax arrangements.[24] Excess capacity in a free-access fishery leads to depressed yields and the risk of stock collapse. Excess capacity in a regulated fishery (where new entrants are excluded but existing vessels are free to compete for resources) provides strong incentives to circumvent output regulations, and leads to inefficiency in the use of capital and labor (see box 4.5).

Box 4.5. Overcapacity and inefficiency in the anchovy fishery

While the biologically indicated closed season for reproduction theoretically leaves more than 200 fishing days, the duration of authorized fishing in most Peruvian waters had to be reduced to 120 days per year to contain overfishing. The reduction of the fishing season and expansion of fishing capacity form a vicious cycle, locally referred to as an "Olympic" race. At the start of each season ever larger and more powerful vessels seek to outperform smaller, less- powered and equipped vessels in the race to fishing grounds in order to increase their share of the TAC. Fleet and plant overcapacity is tantamount to an efficiency loss as the same quantity of fish could be caught and processed at lower cost. The Ministry of Fisheries in 2001 estimated annual efficiency losses at US$50 million resulting from excess fishing and processing capacity. A similar order of magnitude was estimated by Rizopatrón, according to which a fleet reduction by 50,000 tons hold capacity would save US$6 fishing cost per ton of anchoveta.

Source: World Bank (2003).

Capacity in excess of that required to efficiently take a given TAC is likely to result in catches in excess of the TAC. Overcapacity has been documented in inshore, offshore, and distant-water fleets (which fish outside the Exclusive Economic Zone [EEZ] boundaries under virtually open-access conditions).

[24] Although the tide seems to be turning. Recently, the EC made a submission to the WTO Negotiating Group on Rules for Fisheries Subsidies to ban capacity-enhancing subsidies. Also, the EC measures for restructuring the European fleet will concentrate on decommissioning of fishing vessels and phasing out of public aid for fleet renewal.

Enforcement of fishery regulations is rarely perfect even in industrial country fisheries, but lax control and unclear responsibilities for the issuing of licenses for additional vessel capacity are direct additional causes of overcapacity. There has been substantial analysis of excessive capacity in fisheries at the national, regional, and intergovernmental levels. This has resulted in the development by the FAO of an International Plan of Action for the Management of Fishing Capacity, and many of the provisions for measurement and monitoring of fishing capacity globally also lay the basis for tackling the problems of illegal, unreported, and unregulated fishing. The Plan of Implementation of the World Summit on Sustainable Development (WSSD) urges immediate attention to both these issues.

Buyback schemes and their anticipated benefits

Capacity-reduction schemes through buyback approaches have three objectives:

- Resource management and sustainability objectives, for the conservation of the fishery resource and enhancement of future rents and livelihoods;
- Economic efficiency objectives, for fleet rationalization, enhancement of profitability for the remaining fishers in the face of declines or changes in the stock (reduction in biomass, or age structure) and price; and
- Social adjustment and equity objectives, to assist specific groups in the sector.

The expected benefits from buyback schemes include reduction in the size of the fishing fleet, the reallocation of licenses to different groups, enhanced profitability from existing fishery resources, increased value of invested capital and licenses for those remaining in the fishery, and greater government and industry cooperation through voluntary tendering processes, so limiting litigation through enforced closures and decommissioning. Buyback schemes are often a response to a crisis, acknowledging that long-term profitability and resource conservation objectives will not be met without drastic action.

Effectiveness of reduction in capacity, fleet rationalization, and economic returns

Studies have been made of the relative efficacy of buyback schemes in meeting these targets by analysis of case studies in North America, Australia, and member countries of the European Union (EU). Proxies for fishing capacity targeted by buyback schemes have either been (a) vessels, or (b) licenses—with or without catch history or quotas attached.[25] Different sorts of voluntary bidding processes have been used in most instances to identify capacity for decommissioning.

The form of the process designed for the buyback scheme greatly influences the outcomes of the scheme (table 4.3). In the case of the UK, early evaluations of buyback schemes for vessels alone were not encouraging, and later rounds of buybacks have been conducted in conjunction with more restrictive licensing arrangements. Since 1992, track record fishing performances have been attached to, and transferable with, vessel licenses, rather than to vessels themselves.

[25] Or some other representative parameter such as vessel capacity units (a formula encompassing vessel length, breadth, and engine power; for example, as used for the UK fleet under European Multi-Annual Guidance Program rules.

Table 4.3. Summary of experiences of three countries with buybacks of excess capacity

Type of Fishery	Main Buyback Characteristics	Costs and Cost Sharing	Impact	Issues
Australia				
Prawn (the Northern prawn fishery).	Lengthy consultation, with buyback scheme of 55 to 70 percent of vessels, combined with gear restrictions. Fishery management supported by high quality of research.	US$43 million, 80 percent funded by the industry.	Fleet reductions have not provided a comparable increase in profitability, but have provided continuing flow of rents, and reduction of environmental damage (reduced bycatch, protection of sensitive sea grass- beds).	
New Zealand				
Numerous commercial species for which TACs derived individually.	Buyback of quotas, under voluntary tender system, introduced jointly with ITQ system.	16,000 tons at NZ$42 million (US$25 million), fully funded by the government.	Significant decrease in number of vessels, significant increase in price of quota, indicating higher expected yields in the future.	Fisher rights of indigenous people have been incorporated into industrial component of the QMS, but traditional rights issues remain to be determined.
Malaysia				
Mostly inshore west coast peninsular Malaysia demersal (finfish and prawn) fishery, but approach also included pelagic and traditional gears fishing inshore waters.	Buyback of intermediate (< 40 GRT) trawlers, followed zoning regulations and coupled with license moratorium and alternative livelihood scheme, including the promotion of offshore fishing.	Anticipated expenditure of M$20 million (US$8 million) under 5th Malaysia Plan.	Significant decrease in targeted vessel class. However, large trawler offshore capacity has been created, and overall demersal catches indicate continued overfishing.	Control of remaining overcapacity and IUU fishing in Malaysian waters.

Source: Authors.

Between 1993 (when the UK introduced a decommissioning scheme) and 1996, the scheme decommissioned 578 boats representing 87,500 vessel capacity units (VCUs) and 17,600 Gross Registered Tons (GRT) at a cost of Sterling Pounds 36.4 million. While there was still slight overcapacity compared with GRT targets by 1996, the bidding scheme resulted in the envisioned capacity reduction, but it was unevenly spread over the different fleet segments and geographical areas, with overcapacity remaining in beam trawl, demersal trawl, and seiners and shellfish potting boats.

The effective capacity may decline less than the nominal capacity because of a tendency for efficient (and profitable) boats to remain in the fishery, while less-efficient boats are offered for decommissioning. This is shown by the experiences in the case of Canadian west coast salmon, for example, where a buyback program funded by the federal government for C$80 million (US$60 million), resulted in the purchase of 21 percent (725 licenses) of the gillnet/troll fleet, or only 16.7 percent of its catch history, and 9 percent (48 licenses) of the seining licenses, or 6.5 percent of the catch history. In addition, the skill of captains is commonly acknowledged as a critical component, which can turn unproductive capacity into excess capacity on the transfer of individuals from one boat to another. It is, however, a very difficult area to measure and to legislate for—although some schemes have tried to tie captain's retirement to that of their vessels.

The bidding and selection process for the distribution of buyback funding often induces—sometimes unintentionally—equity problems. Some schemes seek to remove underused or inactive permits (latent capacity), while other schemes instead target the most active fishers through raised compensation and the ranking of bids against catch history. As in the Canadian west coast salmon fishery, license buybacks then provide the opportunity to redistribute licenses, for instance, to indigenous groups. Other schemes can affect different target groups through selective withdrawal of gear types and areas (such as the offshore Japanese long-line tuna fleet).

Buyback programs have virtually always been accompanied by other regulations already in place to control fishing. The attribution of changes in fishery resources to decommissioning is therefore difficult. The consensus of opinion seems to be that demonstrable (positive) effects on the resource directly from capacity reductions through buyback schemes have been slight, although it has often helped to arrest the further deterioration of the resource. One of the indirect political effects has been that capacity reduction through buybacks makes the introduction of tighter fisheries controls more feasible subsequently.

Implementation issues

While buyback schemes focus on enhancing economic efficiency, there are likely to be substantial social, legal, institutional, and cost implications. They are:

- *Social issues*, including the definition of winners and losers; even well-managed programs result in distributional effects. Buyback programs are generally not targeted at other stakeholders (members of the crew, and workers in processing and other fishery support industries). Reduction in fishing capacity typically reduces employment opportunities for these groups, and supplementary programs will have to be created in conjunction with buyback programs. These additional programs include unemployment compensation, early retirement pensions, job training, and grants to develop new businesses.
- *Legal issues*, including the definitions of access, property, and historical rights in different nations and fishing regions, and the ability of fisheries agencies to formulate and enforce capacity-reduction programs in relation to national and local law. The cessation of fishing may be unacceptable to some cultures and enshrined in traditional rights. At the international level, subsidies for environmental conservation goals are generally viewed as "good," while subsidies for the preferential support of national industries are considered "bad." Thus, publicly supported buyback programs are usually thought of as "good" subsidies, despite the fact that in some cases they may increase the efficiency of national fleets and their competitiveness. This ambiguity would be eased by the greater contribution of industry funds to reduction of surplus capacity.
- *Institutional issues*, including institutional knowledge and capacity within the fishing groups, industry leaders, the fisheries management groups, and in government to raise awareness of fisheries issues and to design acceptable programs, appropriately linked to the social, legal, and financial concerns.

- *Costs and prices* to be paid to the beneficiaries of a buyback program. This is often through public tendering, but also valuations on the basis of forgone production have been used. For example, based on foregone financial returns and the market value of the fishing vessels to be commissioned, Willmann, Boonchuwong, and Piumsombun (2001) estimated that the necessary 25 percent reduction in the Thai trawler fleet would require an expenditure of at least US$136 million, indicating the costs of a large-scale buyback program (aside from the costs of improved control to ensure that capacity and catch remain at the reduced levels targeted by the buyback). Alternative methods to motivate attrition from the fishery that have been considered are charging significant annual license fees, and the higher taxation of the capital components rather than taxing the fishery outputs. The latter approaches could also provide government income, rather than using public funds to subsidize the reduction in capacity.
- *Sources of funds*; buyback schemes have largely been funded by central governments, which may be appropriate initially in terms of correcting past policy errors. In Europe, European Union (EU) member countries received substantial EU funds to undertake agreed decommissioning under the Common Agricultural Policy. For instance, the Danish authorities spent ECU113 million (approximately US$124 million at current exchange rates), of which they got back ECU71 million and ECU23 million from the EU and as income tax, respectively. Mixtures of financing that have been used include government grants; annual payments from license fees; and commercial loans, serviced by levies on remaining fishers (for example, in the Australian Northern Prawn Fishery) or against expectations of future license revenues (for example, in the Australian Northern Territories barramundi fishery). The industry has usually been relatively supportive of buyback schemes under such arrangements, although the sums of money required are often too large to buy out all the required capacity, and repeated buyout schemes can induce expectations of bailout by speculators, and the encouragement of a "welfare" mentality. Because buyback schemes are effectively government subsidies for the improved performance of the fishing industry, it is expected that industry-financed buybacks (against expectations of future increased revenues) should increasingly be explored.[26]
- *Moral hazard*, when decommissioning of boats simply leads to their addition to other fisheries and the export of the capacity problem to others.
- *Applying buybacks is more difficult in small-scale and multispecies* fisheries of the tropics. Boats are less specialized and form much more malleable capital, and gear is likely to be a more appropriate measure of capacity. For industrial countries, buybacks of vessels or licenses has been the preferred choice, because capital in industrial fisheries is nonmalleable; that is, specialized freezer vessels and trawl gear are not easily transferable to other, non-fishery uses, and their existence is a disincentive for owners to retire vessels of their own accord.
- *Eligibility of funding* might be an issue for the World Bank because its funding can be used only for productive investments and, while the mid- to long-term benefits certainly contribute to increased production efficiency, the actual investments in vessels to be decommissioned might be questioned. Fleet reduction has been funded in China (box 4.6), although not with direct World Bank funding. Moreover, the World Bank has funded similar effort-reduction programs dealing with greenhouse gas

[26] A precedent for this was set in the early 1980s when fishing vessels remaining in the Japanese long-line tuna fleet paid compensation to the 169 vessels withdrawn to reduce overall capacity. Eighty percent of the compensation came from government loans to the remaining vessel owners, and the remaining 20 percent was paid from private capital (Kuronuma 1997).

emissions under the argument that they contribute to sustainable development and are therefore a productive purpose.

Box 4.6. Aquaculture-capture fisheries in China

China is the dominant force in aquaculture. In 2001, production in China equaled 32.5 million tons or almost 87 percent of worldwide production, and accounted for most of the global increase over the past two decades. During the five-year period between 1996 and 2001, the increase in production in China was about 10 million tons (46 percent) that provided new employment for roughly 2.5 million households. At the same time, the Government of China has also set a target over a five-year period to reduce the number of people involved in marine capture fisheries by 200,000 to reduce the fishing pressure on its coastal waters. While experience elsewhere shows that aquaculture is not necessarily the ideal alternative employment option for fishers, China plans that, of the 200,000 unemployed, 77 percent will be provided employment in aquaculture, 12 percent in seafood processing, and 11 percent in marketing of aquatic products. With limited capacity for production to increase from capture fisheries, the experience from China will be a significant example for other countries in capacity reduction, in providing alternative fish production, and new employment to fishers and others.

Source: FAO (2002b).

Conclusion

Regulation and reduction of fishing capacity is essential to the local and global improvement of fisheries. With perhaps as much as a 50 percent reduction in existing fishing capacity required for reaching sustainable resource productivity (FAO 2002c; Garcia and Newton 1995), the required levels of funding for vessel buybacks would exceed the capacity of any public sector. For example, it was estimated that it would cost approximately US$1 billion to reduce the fleet size to a level that would eliminate overcapacity in five fisheries studied in the United States. However, boats and gear are capital components of capacity, and other critical inputs, particularly effort, similarly require constraints for schemes to meet sustainability goals. Because of the level of funding and control required, buyback systems are most applicable to industrial fisheries, but are less suitable for reduction of capacity in developing country, small-scale fisheries. In general, therefore, buyback schemes are successful if they are implemented in such a manner that: (a) the purchased fishing capacity was effectively destroyed (that is, was not available to reenter other fisheries—creating spillover effects—or was not indirectly replaced by increasing the harvest capacity of the remaining vessels); and (b) they are tied to an incentive-adjusting mechanism, such as a quota system, or the introduction of alternative livelihoods support mechanisms.

External funding entry points

World Bank and other international sources of funding could assist developing countries in establishing transparent, market-based buyback systems that address the moral hazard issue in their industrial fleets. It could help to overcome the funding constraint for decommissioning of vessels. Because of the nature of funding required, and the need for strict and transparent accountancy, the short-term, budget line-focused programmatic lending, such as is available under Poverty Reduction Support Credits (PRSCs) and Programmatic Structural Adjustment Loans (PSALs), is probably most appropriate. These instruments focus in particular on issues of accountability and transparency. In small-scale fisheries, the World Bank and other donors could also provide assistance for the revision of licensing systems to limit gear and vessel capacity, accompanied by exchange programs for old and new gear, for example.

AQUACULTURE: ENHANCING FISH SUPPLY AND MEETING POVERTY OBJECTIVES

Aquaculture can reduce the pressure on marine resources by satisfying the increasing demand for fish products. It is therefore not surprising that the importance of aquaculture continues to increase worldwide. Between 1996 and 2001, production increased from 26.7 million to 37.5 million tons, an increase of seven percent per year, which is an increase from 22 percent to 29 percent of total fish production from all sources, or from about 30 percent to 38 percent of food fish.[27] At the same time, capture fisheries from marine and inland sources showed no appreciable change over the same time period, or remained at about 62 million tons of food fish, thus illustrating that the incremental increase in available fish products to consumers has largely been dependent upon the expansion of aquaculture.

Parts of the aquaculture sector (particularly intensive aquaculture with carnivorous fish species) use inputs from lower-level fish in the form of fishmeal and fish oils to produce feeds for more valuable finfish and crustaceans. The demands on marine resources made by aquaculture and other farm-raised animals are quite significant—as the amount of wild-caught fish reduced to fishmeal and fish oil each year is equivalent to approximately 4 kilograms to 5 kilograms (live weight) per person on the planet (Delgado and others 2003). Aquaculture consumed 35 percent of the world's fishmeal, compared to 29 percent for poultry and 29 percent for pigs (Barlow and Pike 2001). Because aquaculture is much more dependent on fishmeal than terrestrial livestock, it can be expected that the estimated future increase in the demand for food fish will lead to a future increase of the share of fishmeal used for aquaculture. At that point, the strong demand for fishmeal and fish oil may affect (a) sustainability of major ecosystems, such as the Peruvian–Chilean system, because the pressure on the small pelagics used for fishmeal would affect the entire food fish chain; and (b) the poor, because price increases would take the small pelagics out of their reach. Current opinion (New and Wijkstrom 2002) indicates that this is not yet an issue, and, moreover, with the projected price increases of fishmeal, private aquaculture companies are quite actively seeking to develop fishmeal and oil-saving diets and management strategies (Powell 2003). Continuous attention to this effect of fishmeal requirements on the major marine ecosystems is recommended.

Technologies

There is a wide range of technologies and enterprise forms available for aquaculture production. These include pond culture; integrated aquaculture systems with animal husbandry and agriculture; floating cage culture; raceway culture; pen culture (net enclosure in open waters); fish and freshwater prawn culture in paddy fields with rice; seasonal rice/brackish water shrimp culture, particularly in the Mekong Delta and in southwestern Bangladesh; and tidal and suspended mollusk and seaweed culture. The species that can now be cultivated include finfish, mollusks, crustaceans, holothurians, and seaweed. Progress on cod farming is exciting. Ornamental fish and jewelry (such as pearls and shells) provide other market opportunities.

Besides the research on sources of protein, which can substitute for fishmeal and fish oil, already mentioned, other upstream research concerns selective breeding. In this area, remarkable successes have been achieved, such as a 60 percent increase in the productivity of the Norwegian salmon industry (Aerni 2001) and, for tropical fish, an 80 percent growth over six generations of tilapia (WorldFish Center 2001) is being reported. Part of the breeding work is using biotechnology techniques. There is a tremendous potential in this area, for example, by improving feed conversion efficiency, disease resistance, and resistance to freezing. Significant concerns about the environmental impact of these technologies remain,

[27] Excluding aquatic plants.

however, because the easy connectivity of aquatic environments potentially allows direct effects on wild populations (such as displacement, disease, or genetic effects) by escapees from culture.

Implementation issues—the private sector and poverty alleviation

The range of potential organisms and systems of culture has given rise to different scales and intensities of aquaculture production. Intensive, market-oriented aquaculture industries led by the private sector (and sometimes inspired by government research, for example, in the case of Norwegian salmon) have been the most effective means of contributing to balancing supply and demand. However, small-scale aquaculture can also enhance food security, livelihood, and incomes in poor communities, and is an important component of current development strategies in Asia. Carp, catfish, and tilapia—relatively productive herbivores/omnivores—are widely used in such systems globally. Additional water bodies, such as rice fields, irrigation ditches, and other temporary water bodies, can be exploited—an opportunity of potential importance to Africa, where such water bodies are relatively little exploited to produce food. Farmed supply helps stabilize fish prices when the supply from capture fisheries is in decline. Livelihood opportunities (for example, through local seed and fingerling supply, production of feeds using local materials, and the fabrication of cages) also follow the initial adoption of aquaculture in an area.

Aquaculture and fisheries

There are several important points of interaction between aquaculture and capture fisheries. As noted, intensive forms of aquaculture use a substantial part of the production of small pelagics for feed and oils. There are quite complicated price interactions and substitution effects in markets between cultured and wild-caught seafood products that are constantly evolving. Industry research into farming of species, such as cod, has been stimulated by the collapse of traditional marine fisheries. There are also interactions at the level of coastal zone and aquatic resources management, for example, in allocation of land and water use and in monitoring and preventing the environmental consequences of unregulated aquaculture. There have been social conflicts over water use, estuarine pollution, and lost fishing opportunities through the introduction of large-scale aquaculture. Conflicts, or direct effects on fisheries, can also result from overharvesting of wild fry or spat for aquaculture (for example, for milkfish in the Philippines).

Environmental regulation

The rapid expansion of aquaculture development has not been without environmental and social problems. For some of the subsectors, particularly salmon cage culture and shrimp farming, the development experience has been mixed, with instances of direct environmental degradation (for example, habitat loss, lack of effective effluent management, and exceeding carrying capacity of waters where fish cage culture is implemented). Most noticeable is the extensive conversion or destruction of wetlands (including mangrove areas) that has accompanied shrimp aquaculture, with effects on the spawning and nursery grounds for marine capture species and the potential for coastal erosion. Social conflicts have followed inequity of benefits going to local populations (for example, coastal aquaculture developments causing loss of access to traditional fishing or shellfish gathering grounds). The rapid and generally unregulated expansion of the industry has led to many of these problems. The result of environmental mismanagement often leads to lack of sustainability and failed investments until remedial measures are taken to improve management. In areas where adverse impacts have occurred with local communities bypassed, outcries against these impacts can and have led to adjustments in development practices. However, the role for public policy is clearly to assist the formulation of enabling policies for aquaculture, including environmental policies, where they do not exist. Finally, there is also a serious problem with diseases, such as in the salmon cage culture, although this is increasingly being solved by vaccination.

External funding entry points

More than in all other possible interventions described in this paper, investments in aquaculture are in principle profitable, and should be the responsibility of the private sector. Cooperation with the International Finance Corporation (IFC), and other private partners is therefore critical. World Bank funds would be justified only for investments with a clear public good nature, that is, environmental sustainability, poverty reduction, and research. Public investments will continue to be necessary in many countries to support technology development for small-scale producers, food safety, the development of environmentally safe production systems, training, and research.

For *poverty reduction* (Friend and Funge Smith 2002), the emphasis should be on alternative and supplementary employment generation. Investments will initially be for small-scale entrants and adopters (for example, "backyard" ponds, and small groups of cages), but could eventually also cover public–private partnerships for larger-scale, market-oriented developments that maximize economies of scale. Appropriate microfinance systems, which the World Bank has some expertise in setting up, would be one of the most important inputs.

For achieving *environmental sustainability*, key inputs would be for:

- *Support in the formulation of comprehensive strategic development and zoning frameworks*. This could include assistance in setting up consultative and participatory processes with all key interest groups for coastal and inland areas.
    - For coastal areas, the support could include the formulation of integrated coastal zone development and management plans to optimize the use of coastal resources and development sites, and to identify those areas best suited for competing needs (for example, urban, energy, transport, aquaculture, and tourism, and protection of critical natural habitats, including for fisheries). Win–win situations in coastal areas can be developed through integrating shrimp farming with mangrove protection and management, with effluent cycling from ponds through mangrove areas, to upgrade water quality, while at the same time improving mangrove growth.
    - For inland areas, the support could include surveys on the location of appropriate land or water resources for aquaculture, particularly to complement investments in water management and development projects (for example, aquaculture and fisheries development in hydropower/irrigation reservoirs and in downstream command area irrigation schemes).
    - For downstream areas, these could include waterlogged and saline and alkaline degraded irrigation areas, which are of limited use for agriculture, but could be effectively used for aquaculture development. Examples also include recycling systems where finfish such as flounder and turbot are cultured with water treatment ponds in which sea cucumbers are cultured, as is done in China. Because of the many externalities involved, the World Bank could support pilot operations of such win–win situations.
- *Control and implementation of other environmental standards.* In the highly dynamic aquaculture industry, public sector (and eventual World Bank) support is critical in maintaining appropriate environmental standards. This includes:
    - *Species selection and hatcheries operation.* While the actual operation of hatcheries is a private good, there are a number of critical aspects that require public sector attention, including (a) careful ecosystems evaluation, to select the most appropriate species, whereby generally, indigenous species native to the area in which they would be cultivated should be given almost exclusive priority unless introduced exotic species or improved stocks can be shown to have little or no potential impact on endemic biodiversity, or as possible vectors for disease transmission; and (b) appropriate hatchery management, ensuring that the hatcheries are operated to preclude

inbreeding within or hybridization among species, and that sterile offspring are produced, where exotic species or improved stocks may have a high probability of escaping from farms and cages.

- *Management of other inputs* include feed—where minimal use of wild fish, fishmeal, or fish oils should be sought—and water, with adequate attention to quality and effluent management. Moreover, the standards should include minimum or no use or requirements for drugs such as antibiotics, and for chemicals for pest control or water quality management. These are important not only from human health and environmental considerations, but also from a profitability viewpoint. Finally, they should also include technical standards to prevent the escape from the cages of aquaculture fish to the wild.

In conclusion, there is good experience worldwide, including that with World Bank assistance, that can help guide effective formulation of aquaculture development programs, ensuring sustainability of related investments and improvement of the livelihoods of coastal and inland rural poor. The knowledge and experience from the major aquaculture countries (for example, Bangladesh, China, India, Indonesia, Thailand, and the Philippines) can provide additional guidance on what the respective public and private sector roles can be in comprehensive development programs in the context of developing economies.

TRADE, FOOD SAFETY, AND CERTIFICATION

Background

The international trade in fisheries is very large—US$55 billion to US$60 billion annually—and fish products are the fastest growing internationally traded agricultural commodities. For fish, as a perishable product, food safety standards are a critical aspect for access to international markets. The driving force in strengthening of food safety regulations for fisheries and aquaculture products on most international markets is first and foremost the growing consumer demand for safe and healthful food, which is presently even more pronounced in the wake of major food scandals (that is, the bovine spongiform encephalopathy (BSE), dioxin, *Listeria*, and *Salmonella* scares). Driven by consumer concern, the United States,[28] Europe,[29] and Japan have made special provisions within their legislation for import of fish and fishery products. For the EU, a public system has been developed to promote the harmonization of legislation, and monitoring and control measures. In the United States, the federal Food and Drug Administration has a similar system under development. At present, all imported fish and fisheries products are required to be processed in accordance with both the Hazard Analysis at Critical Control Points (HACCP) principles and the sanitary prerequisites laid down under the existing regulations. The importers have the responsibility under those regulations to verify that the fish and fish products they are importing meet those requirements.[30]

The most common constraints in entering the European and U.S. markets are reflected in the notices (European Commission 2002), alerts (SANCO 2002), and rejections[31] of fish imports to the United States and the European markets. The food-borne pathogenic microorganisms and natural toxins that are most often listed in relation to seafood products can be divided into (see also http://www.cfsan.fda.gov):

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[28] U.S.: The Public Health Service Act (42 U.S.C. 241, 242, 264).

[29] EU: Most important for developing countries exporting to EU: Council Directive 91/493/EEC, Commission Decision 97/418/EC, Commission Decision 98/140/EC.

[30] Fish and Fishery Products Import: Affirmative Steps (on http://www.cfsan.fda.gov).

[31] http://www.fda.gov/ora/oasis/6/ora_oasis_prod_1st.html.

- Bacterial pathogens, associated with raw and processed seafood (Salmonella spp., Listeria, Vibrio cholerae, Vibrio parahaemolyticus, and Vibrio vulnificus);
- Parasites that are sometimes found in raw seafood (Anisakis sp. Diphyllobotrium spp. Nanophyetus spp.);
- Viruses that sometimes contaminate raw seafood (Hepatitis A virus, Hepatitis E virus, rotavirus, and other viral agents); and
- Natural toxins sometimes found in seafood (ciguatera poisoning, shellfish toxins, scombroid, and tetrodotoxin [pufferfish toxin]).

Furthermore, substances from secondary contamination of seafood can harm human health. For fish it is most often metals like cadmium, mercury, and lead; toxic algae; pesticide residues (FDA 2001); and drug residues, such as chloramphenicol and nitrofuran. The most common reason for rejection of fish and fish products by either the veterinary service public control, at entry point, or private industry, are filth, decomposition, insufficient packing material, and insufficient paperwork. More recently, special attention has been given to chloramphenicol, nitrofuran, and other antibiotic residues in the European import of shrimp. This follows the detection of prohibited antibiotics in shrimp from farms in Bangladesh, China, India, Myanmar, Thailand, and Vietnam. They have also been detected in wild caught shrimp and fish products, and the number of rejections on this account has been alarming. This problem is exacerbated by the imposition of a zero-tolerance level for chloramphenicol and nitrofurans within the EU, and improvements in the analytical technology allowing detection of substances at ever diminishing levels. The scientific justification of these zero-tolerance levels is being disputed. For example, the EU puts the analytical level for chloramphenicol at 0.3 parts per billion (ppb), the U.S. Food and Drug Administration defines the zero-tolerance level for chloramphenicol at 5.0 ppb, and Japan uses the definition of 50 ppb as the zero-tolerance level. Such low levels and other quality standards are often seen as designed to protect the domestic producers in the importing country, rather than protecting the health of consumers, as the example of catfish imports from Vietnam into the United States shows (see box 4.7).

Implementation issues

Most fish product exporting countries have harmonized their public legislation with the industrial country importer. Inspection reports from the EU show that the human resources in the public sector are available and well trained in the particular tasks they are supposed to perform. (See Annex 1 for the EU's appreciation of the capacity of the main fish-exporting developing countries.) When monitoring and control procedures are found to be wanting, the problems encountered are most often not the procedures as such, but the failure to act on the findings. Very often the inspectors are disinclined to use the necessary measures to correct the noncompliance observed during the frequent inspections. For the countries fully harmonized with the EU this means, for example, removing the right-of-approval number, which enables the producers/processors to access the European market with their produce.

Box 4.7. Trade conflicts in fish products: the example of farmed catfish from Vietnam

As aquaculture production continues to increase, trade conflicts in farmed fish products are rising as well. One of the most notable conflicts occurred in the recent case of catfish farmed in Vietnam and exported to the United States market. In 2002, the independent processors and Catfish Farmers of America, a trade association of U.S. catfish farmers and processors, brought a petition to the United States International Trade Commission regarding dumping of frozen catfish fillets into the U.S. market by Vietnam. Catfish farming is the largest aquaculture industry in the United States (with roughly 68,000 tons produced in 2000), and in 1999 Vietnam exported less than 1,000 tons of what was labeled "catfish" into the U.S. market. By 2001 that number was over seven times larger.

The Vietnamese product was marketed in the U.S. under the name "catfish," and included the species *Pangasius bocurti*, *Pangasius pangasius*, and *Pangasius micronemus*, or the common names of "basa" and "tra." The species farmed in the U.S. are from the *Ictaluridae* family. The domestic industry in the U.S. campaigned for labeling laws to prevent the misnaming of basa and tra, and at the same time to protect their own industry, resulting in a provision in the Farm Security and Rural Investment Act of 2002 stating that for the purposes of the Federal Food, Drug or Cosmetic Act, the term "catfish" may only be considered to be a common or usual name for fish classified within the family *Ictaluridae*. However, Vietnamese basa and tra were still found to be a similar product to U.S. catfish, and maintained market share. Vietnam was then declared to be dumping product on the U.S. market, and producers were levied antidumping duties of 36 to 64 percent.

Source: Roheim (2004; draft).

Organization of small-scale producers can be important in overcoming the economies of scale in meeting food safety standards, and in addressing the fragmented intermediary distribution channels. Good practice examples can be found in Senegal, where the artisanal fishers of Kayar effectively organized themselves to (a) standardize the size of the fish to eliminate the capture of undersized fish; (b) imposed quotas to maintain attractive sale prices, and introduced a strong internal control enforcement system for respecting those quotas; and (c) invested part of the increased revenue in ice-making equipment and other infrastructure. Because of the market concentration and improved standards, the price increased tenfold. Another successful example concerns the state fish export monopoly in Mauritania, which through plowing back the export tax on fish products into infrastructure and organizations for small-scale producers, significantly contributed to the increase in the quality of small-scale fishery products, and hence the livelihoods of the small-scale fishers.

Finally, it can be expected that the increased price, which the European, U.S., and Japanese markets will pay for safe products, will increase rather than decrease pressure on marine resources, unless the mechanisms are in place to ensure sustainable management.

External funding entry points

International funding can support developing countries with:

- *General awareness creation.* It cannot be expected that all the implications for food safety of "good practices" in fisheries, fish farming, processing, and trade concerning bacterial and viral contamination, chemical and metal contamination, toxic algae, and pesticide and antibiotic residues will be known to the individual small-scale entrepreneur in a developing or even an industrial country. Major improvements in food safety in many countries will require carefully designed programs of development assistance to ensure effective and equitable dissemination, comprehension, and application of information on standards and inspection procedures. This will include a continuation of Hazard Analysis Critical Control Points (HACCP) training initiatives (earlier conducted by FAO). This can also include support for the preparation of pesticide residue plans, especially for monitoring and control of use of antibiotics. A good example of a pesticide

management plan is the plan implemented in Uganda following a ban April 1999, which prohibited the import to the EU of fishery products caught in Lake Victoria and destined for the European market. The plan developed, which resulted in lifting of the ban in 2001, was hailed by the EU because, "Besides the official control system, the competent authorities has established in close collaboration with the local authorities, the private sector and the local fishermen association, various social controls. These information meetings and alert systems prove to be successful in stopping the misuse of agriculture pesticides in fishing in addition to the national plan." (DG [SANCO] 1999:5, Uganda)

- *Capacity building*, particularly in building organizations of fishers, to pool resources for better food safety management, as shown above.
- *Investments in infrastructure* in the areas of laboratory equipment and staff training for residue management and under public–private partnerships in infrastructure, such as ports and warehouses. This has been a favorite, although in many instances, not very sustainable, investment by international agencies. Clear ownership of private stakeholders in such investments, and agreements on the responsibility of the maintenance, would be a critical precondition.

As an area of capacity building and training, this component would be particularly suitable for bilateral (grant) funding and support from specialized international agencies such as FAO.

Certification, a special approach to enhance sustainable resource use

While the higher prices as a result of increased food safety standards and improved market access might be beneficial for producers, it will not decrease the fishing pressure; to the contrary, it will most likely increase overfishing. Ecolabeling, although still controversial, addresses those concerns. It is now often combined with food safety standards into general certification (box 4.8). Certification and ecolabeling uses the power of the market demand for fish and seafood products as an incentive to induce compliance of fisheries managers in producing countries with prescribed codes of practice (Wessells and others 2001).

Box 4.8. Categories of ecolabeling schemes

Three types of ecolabeling schemes have been used in various fisheries:

First-party labeling schemes, established by individual companies based on their own product standards. The standards might be based on criteria related to the specific environmental issues known to informed consumers through the media or advertising. This form of ecolabeling can also be referred to as "self-declaration."

Second-party labeling schemes, established by industrial associations for their members' products. The members elaborate certification criteria, sometimes by drawing on external expertise from academia and environmental organizations. Verification of compliance is achieved through international certification procedures within the industry, or employment of external certifying companies.

Third-party labeling schemes, usually established by an initiator (public or private) independent from the producers, distributors, and sellers of the labeled products. Products supplied by organizations, or resources that are certified, are then labeled with information to the consumers that the product was produced in an "environmentally friendly" fashion. The label (seal) is typically licensed to a producer and may appear on, or accompany, a product derived from a certified fishery or producer. Producers are usually expected to track the "chain of custody" of their products in order to ensure that the products derived from the certified producer are so labeled.

Source: Wessells and others (2001).

Opportunities provided by certification include (a) increased value added to existing products, (b) expanded reach in existing markets and opportunities to increase or maintain market share in a

competitive environment, and (c) improved avenues for attracting capital investment and joint ventures. Ecolabeling, in particular, has thus been viewed as the provision of incentives to the fishing community, governments, international agencies, and more local authorities to improve the aspects of fisheries management for which they are responsible. However, the major promoter of third-party schemes for ecolabeling in fisheries is the Marine Stewardship Council (MSC), a nongovernmental member organization.[32] The MSC has developed an environmental standard for sustainable and well-managed fisheries. There are three principles to the MSC standard (covering the condition of the stock, the impact of the fishery on the marine ecosystem, and the fishery management system). The principles are supported by a number of criteria in each case. (Australia has adopted national guidelines for sustainable management of its own fisheries, which are very similar.) A certification methodology has been developed by the MSC, which is conducted by third-party assessors or certifiers. The MSC uses the award of a label to identify for consumers the products that come from certified fisheries. To date, six fisheries have been certified, predominantly in industrial countries with good existing management. However, nearly 30 fisheries are at various stages of assessment for certification, and several developing country fisheries have applied for assessment.

For the MSC initiative, which is voluntary, to have its intended effects on the general improvement of management and sustainability of fisheries globally, it must be widely accepted. Although the MSC criteria and indicators relate to the fishery and are generic, rather than focusing on any species or product, developing countries, particularly in Asia, have expressed resistance to or concerns about the MSC initiative on the following grounds:

- Legitimacy and credibility—largely concerning the perceived extraterritorial imposition of requirements on sovereign governments;
- Complications in the application of certification to tropical small-scale fisheries—a concern recognized by the MSC and its partner, the Worldwide Fund for Nature (WWF), and under active investigation;
- Equity effects resulting from the high costs of and poor access to such schemes for small-scale fishers, processors, and traders;
- Potential distortions to well-functioning existing practices and livelihood patterns in small-scale fisheries;
- Feasibility—whether consumers globally will continue to pay the "green" premium to maintain the incentive for such schemes, and to extend the effects for better management more broadly; and
- Perceptions of ecolabeling as a disguised barrier to trade.

Many international bodies are still uncertain of the pros and cons of ecolabeling as part of action plans for their own fisheries policy. However, with the recent declaration by the WSSD, they must also consider how the industrial countries can assist governments of developing countries to start and examine controlled access, the removal of excess capacity, and improved monitoring of their natural resources. Having good management regimes in place at the national level would seem to be a prerequisite to certification and labeling, and developing countries will have to move toward improved management in general to help ensure their fisheries can enter into third-party certification schemes.

[32] See www.msc.org.

Conclusion

Within the wider considerations of trade and the environment agreements, which fall under the World Trade Organization (WTO), the area of ecolabeling would gain specifically from coordinated international efforts in testing and application. Specific areas for advancement include the definition and testing of indicators for fisheries management at different scales; assessing the socioeconomic impacts of certification at all levels of the fisher-to-market chain in different fisheries; establishment of agreed international standards which could be feasibly operated in all scales of fisheries; and forging advocacy coalitions that include representative developing country governments (Gardiner and Viswanathan, in press). Systematically examining and removing the doubts over ecolabeling would be the best means of augmenting the power of this tool for sustainable fisheries management.

External funding entry points

With a clear recognition of the potential crowding out effect of small-scale fisheries and processors, international agencies and bilateral donors alike could support the establishment of pilot certification programs for well-defined small-scale fisheries in its developing countries, provided that other institutions are available to ensure the sustainability of the scheme. The World Bank and other standard-setting agencies, such as FAO and the Codex Alimentarius Commission (Codex), could also participate in the discussion on the equity effects, thus following up on the trade-offs in meeting sustainability and poverty objectives.

PROMOTION OF ALTERNATIVE LIVELIHOODS TO FISHING

Adjustment programs cannot effectively reduce fishing pressure without reducing the number of fishers.[33] However, simply promoting fisheries management programs which result in lost livelihoods and employment is not appropriate or politically viable. Therefore, the promotion of alternative livelihoods has become a common feature of adjustment programs to reform the governance of fisheries sectors, in tandem with other policy and management measures. These alternative livelihood programs generally have the dual goals of reducing the fishing effort and raising the economic standard of living of coastal fishing communities or individual fishers, through alternative or supplemental sources of income from economic diversification.

Alternative livelihoods in different types of fisheries

Reduction in vessel numbers through buyback schemes or natural attrition under quota systems, combined with better surveillance and enforcement of controls over fishing effort, will mean that some fishers will capture less, at least initially, or leave the fishery altogether. Thus, alternative livelihoods programs will need to be introduced in parallel to sector adjustment and strengthened fisheries management initiatives. Local opportunities, fisher's skills, cultural behavior, and the role of women in the fishery (for example, in local processing and trading) are the main factors defining the most suitable approach. There is therefore a significant difference between alternative livelihoods approaches in the industrial and in the small-scale fisheries (box 4.9).

[33] The sources for this Chapter are World Bank (1998); Crawford and Pollnac (2000); Macfadyen and Corcoran (2002); and World Bank (2000).

Box 4.9. Why promoting alternative livelihoods without accompanying fisheries resource management measures failed to reduce fishing effort in small-scale fisheries

There are several reasons why alternative livelihoods programs have often resulted in supplemental income for fishing communities, in addition to fishing, rather than serving as an alternative, and why these programs alone have often not reduced levels of fishing effort in small-scale fisheries. They are:

- *Willingness to change occupations.* Willingness to enter or exit a small-scale fishery can be related less to fishers' income levels than is generally the case in many other sectors, because job satisfaction can be high in areas with strong fishing traditions.
- *Occupational multiplicity.* High levels of occupational multiplicity often characterize households in rural coastal communities. In Indonesia, rural coastal communities often engage in a mix of farming and fishing as a necessary economic strategy, to spread risk and to respond better to ecological catastrophes. In-migration and population increase will often be at least partially absorbed by fisheries. Thus, if the promotion of alternative livelihoods (for example, seaweed culture) encourages in-migration to the area to share in the benefits, that livelihood will often not be a full-time occupation for migrating residents, and the part-time fishing component of local livelihoods will result in an overall increase in fishing effort.
- *Gender and age distribution.* Males often dominate capture fisheries, so if an alternative livelihood such as seaweed farming has a higher concentration of females, it may not reduce fishing effort significantly.

Source: Crawford and Pollnac, 2000

Industrial Fisheries. In the case of *industrial fisheries*, governments and programs have often provided vocational training and education in new fields chosen by the fishers. In many cases, the alternative livelihoods will be outside the fisheries sector. Change to land-based occupations may be more difficult to induce, but avoids fishers returning to the same activities that previously led to overcapacity and overexploitation of the resources. This argues for technical assistance and capacity-building components to fisheries management activities to provide training and opportunities for displaced fishers.

Small-Scale Fisheries. The promotion of alternative livelihoods to fishing is particularly important for the implementation of sustainable management in small-scale fisheries. While overcapacity is common in small-scale fisheries and effort reduction is often needed, fishers are generally poor. They have few options in the event of reduced fishing catch, either from resource declines or from the initial introduction of an MPA. Thus, viable programs to implement small-scale fisheries management, which include temporary or permanent fishing closures, would need to include CDD programs to promote alternative livelihoods to fishing, and more general economic diversification in the communities.

Box 4.10. Is aquaculture a viable alternative livelihood to fishing in small-scale fisheries?

In many small-scale fisheries aquaculture has been introduced as an alternative livelihood to fishing. However, a survey of 10 communities in the Pacific Islands where aquaculture was introduced, showed that the benefits of these programs were perceived to be limited. None of the communities perceived aquaculture to have reduced fishing effort. Several respondents said that the problem with subsistence-type aquaculture was the large amount of work relative to fishing. These experiences confirmed similar reports that turning fishers into farmers is often difficult, and alternative livelihood strategies will generally need to look beyond the immediate local or sectoral economy.

Source: World Bank 2000b.

Development programs have often recommended aquaculture as an "obvious" alternative employment. However, the apparent similarity is misleading because aquaculture is farming and presents very different demands from fishing (see box 4.10). Aquaculture can provide occupation for several thousand coastal workers in family-based enterprises (for example, spiny lobster culture in southern

Vietnam, and seaweed farming in the Philippines). However, the scope and scale of potential new aquaculture enterprises may be limited by knowledge, management skills, and market preferences. Programs supporting aquaculture as a potential alternative livelihood should therefore be preceded by thorough feasibility studies covering technical feasibility, market demand, and the capacity for absorption of labor. Association with dive tourism for displaced fishers can be attractive in the preservation of water- and boat-handling skills, although the number of opportunities in any locality will be limited.

There is a large body of experience with the introduction of alternative livelihood programs in coastal fishing communities (for example, in Indonesia, the Philippines, and Pacific Island Countries). In many of these cases, community development and alternative livelihoods were promoted both within and outside the sector, ranging from aquaculture to microcredit programs, handicrafts, and ecotourism. Often the first objective of promoting these alternative livelihoods has been achieved (to raise the economic standard of living of coastal fishing communities or individual fishers, through supplemental and increased incomes and greater economic diversification). However, examples of where the promotion of alternative livelihoods has actually resulted in reduced fishing effort are less common, and where they do exist, more holistic approaches, combining alternative livelihood programs with resource management strategies, addressing governance and the open-access nature of small-scale fisheries, were followed. Without simultaneously addressing the underlying causes of overfishing, alternative livelihoods strategies are unlikely to have any significant impact on the level of fishing effort. Those fishers that leave will simply be replaced by others, or will continue to fish in addition to their supplemental livelihood.

Alternative livelihood programs are not a substitute for effective resource management; however, they can be relatively successful in promoting economic diversification and stability in coastal fishing communities. An example of such efforts is provided by the first phase of the World Bank-financed Coral Reef Rehabilitation and Management Program (COREMAP) in Indonesia. This program promoted alternative livelihood activities in over 12 fishing communities, in conjunction with fisheries management activities, to get community "buy-in" to the management process and help reduce dependency on the fisheries. Some of the microenterprises in various sites showed initial but modest success, including tailoring, grouper fattening, food processing, brickmaking, coconut oil production, baked goods production, smoking and drying of fish by women's groups, seaweed culture and drying, bagmaking, snorkeling and fishing equipment rental, fishing net manufacture, manufacturing of coconut fiber products, and handicrafts. Because fishers were the principal target beneficiaries of these microenterprises, COREMAP I found that certain alternative land-based livelihoods were not readily accepted by fishers, and required extensive socialization before being accepted. However, fishers were often willing to undertake new livelihood activities if they could see the clear benefits and increased incomes resulting from these activities.

CONCLUSIONS AND KEY LESSONS IN PROMOTING ALTERNATIVE LIVELIHOODS TO FISHING

The goal of programs to promote alternative livelihoods to fishing is to reduce fishing effort by providing fishers with alternative sources of income, and to help diversify the economies of coastal fishing communities and improve the standard of living of fishers. As such, programs to promote alternative livelihoods to fishing should:

- Look in many cases outside the fishing sector, rather than being bound to other subsectors (for example, aquaculture and offshore pelagics). In many cases, fishing communities need general development measures to diversify their economies and options for incomes. Thus, there is a need for Community-Driven Development (CDD) initiatives (with which the World Bank has a growing body of experience) in parallel with small-scale fisheries management programs.

- Be promoted in conjunction with fisheries resource management measures (for example, co-management partnerships in small-scale fisheries and the establishment of Marine Protected Areas). Alternative livelihoods will generally not result in reduced fishing effort unless they are combined with other management measures to reduce access to the fishery; however, they do provide economic alternatives to ease the transition out of the fishery, and the implementation of greater fishing effort restrictions and reduced catches.
- Use a bottom-up approach that identifies alternative livelihood options through a fishing community needs assessment, which is further complemented by technical assistance to conduct a comprehensive feasibility study on different possibilities (see table 4.4), in order to make informed decisions about which livelihood options are most feasible.
- Emphasize training programs for fishers.

Table 4.4. Financial analysis of representative microenterprise models promoted as alternative livelihoods to fishing in COREMAP phase I sites

Microenterprise	Investment (US$)	FRR (%)	NPV (@12%, US$)	B/C Ratio	Switching Values	
					Benefits (for 12%)	Investment Costs (for 12%)
Brickmaking	403	41%	249	1.19	16%	70%
Fish-crackers processing	230	59%	254	1.13	12%	125%
Bagmaking	1,069	28%	388	1.08	7%	40%
Snorkeling and fishing equipment rental	315	46%	266	1.09	9%	95%
Seaweed culture and drying	1,179	43%	780	1.21	18%	75%

FRR = Financial rate of return. NPV = Net present value at a 12 percent discount rate. *Note:* Financial Analysis of each microenterprise covered a period of six years.
Source: COREMAP Phase I Project Appraisal Document.

External Funding Entry Points

The international donor community can assist developing countries in the establishment of the local empowerment and community-development mechanisms to develop alternative livelihood opportunities, including support for the social science research necessary to identify such opportunities. This can be in the form of Social Funds for the development of public infrastructure (roads, power, and so forth), and in the form of matching grant systems whereby public–private partnerships are funded from a public sector contribution to income-generating activities, provided the private sector also contributes. Some of the European bilateral donors, such as the International Fund for Agricultural Development (DFID) and the Deutsche Gesellschaft für Technische Zusammenarbeit (German Technical Cooperation, GTZ), and international agencies such as the International Fund for Agricultural Development (IFAD) and the World Bank, have considerable experience in this area.

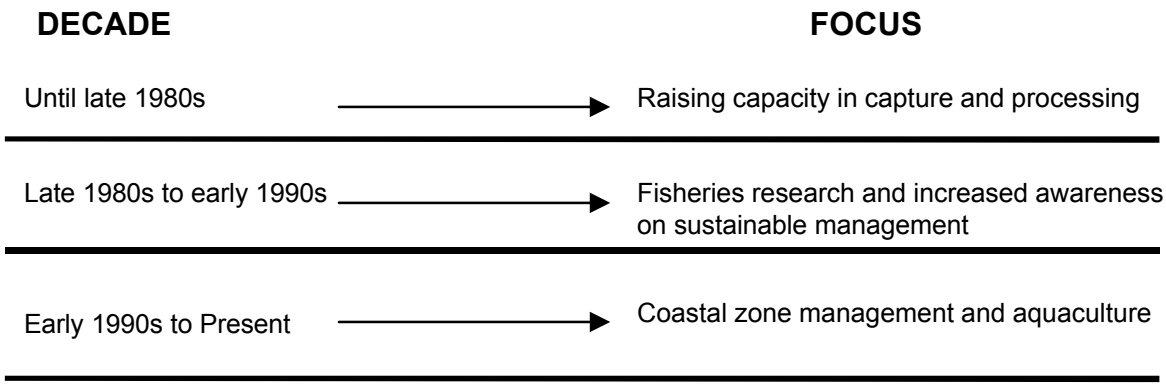
5. International Support for Fisheries, Past and Present, and the Way Forward

GENERAL TRENDS

The international community has a long history of support to the fisheries sector. Early projects focused on typical fisheries development assistance where the major objective was to increase fish production for export, based on the assumption that resources were underused.[34] For example, nearly 60 percent of all loans made by the World Bank to the sector before the early 1980s were used for large-scale fishery development, such as the building of large vessels and fishery service facilities.

By the mid-1980s, the reality of fisheries resource limits were recognized, and the level of support was reduced as the World Bank and others began to shift their focus toward research to assess the status of fish stocks. As a result, major international agreements, such as the Code for Responsible Fisheries, were developed under the responsibility of FAO, and several donors launched the Support Unit for International Fisheries and Aquaculture Research (SIFAR). The WorldFish Center (previously ICLARM) also dates from that time. As a result of this research, the World Bank started to design and implement projects dealing with coastal zone management and coastal fisheries (World Bank 2000b), and to increase focus on aquaculture operations. The evolution of the focus of the World Bank and other fisheries support is depicted in figure 5.1.

Figure 5.1 Evolution of the focus of fisheries sector assistance



Source: World Bank 2000b.

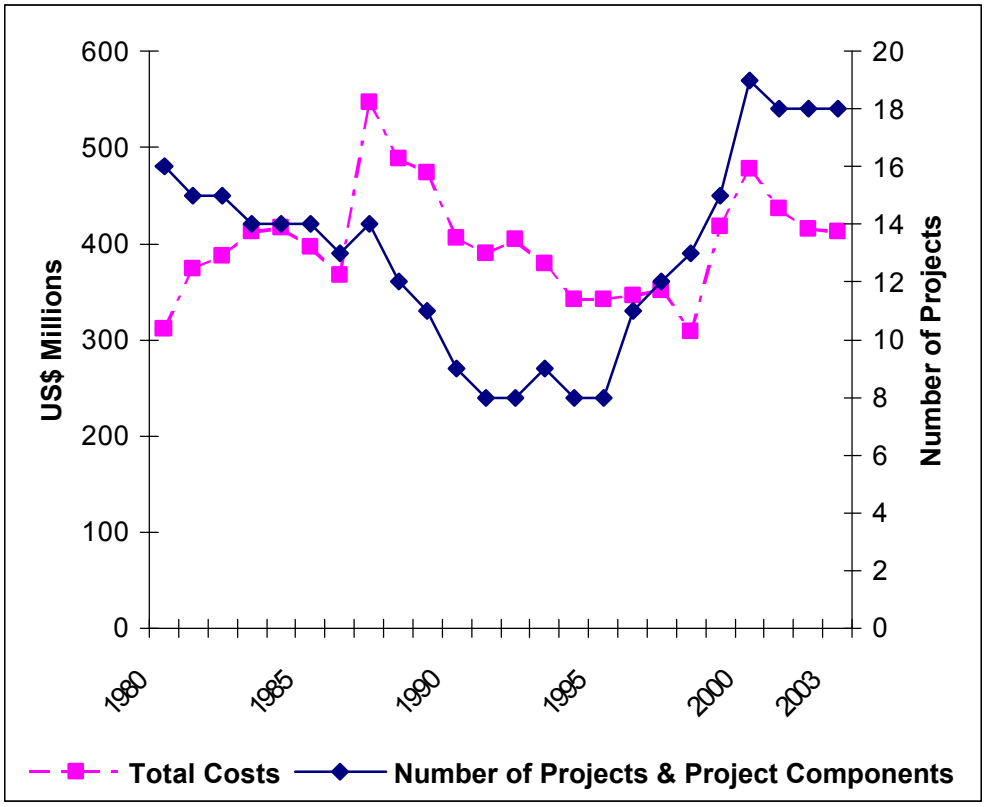
Over the last decade, the focus of World Bank and other support has been on coastal zone management and aquaculture operations, with very little attention to sustainable fisheries. As part of its mandate to protect coastal and marine biodiversity, the Global Environment Facility (GEF) initiated several coastal zone management projects, which the World Bank cofinanced.

[34] The sources for this Chapter are FAO (2002e); and World Bank (2000b).

The World Bank's involvement in aquaculture development has included investments in the full range of technologies for production expansion, including support infrastructure (for example, hatcheries, feed-processing plants, seafood-processing plants, improvement and new construction of wholesale markets, disease control facilities, coastal zone management centers, water quality monitoring laboratories, and training and education facilities). It also covered sector work, including a coordinating role in the global Shrimp Farming and Environment study with the Network of Aquaculture Centers in Asia–Pacific, the Worldwide Fund for Nature (WWF), and Food and Agriculture Organization of the United Nations (FAO) that involved 40 case studies and thematic reviews, and a guide on the assessment of Source Water Quality for Aquaculture.

Overall, quite significant levels of investment have been achieved in the past, as shown by figure 5.2 for the World Bank.

Figure 5.2 Total World Bank costs and number of fisheries projects and fisheries project components (1980-2003)



Source: Authors.

The impact of these investments has been rather modest in terms of outcome, sustainability, and institutional development; independent evaluations carried out by the World Bank rated fisheries projects and major project components significantly below the average performance of other sectors.

Reasons for such poor results include:

- The complexity of the fisheries sector, particularly fisheries governance. Early projects were generally more successful because of their simpler design, involving the clear objectives of construction of infrastructure, such as ports and harbors. This contrasts significantly with the inherently more complex activities of policy changes, involving changes in patterns of resource use

and behavior. Fortunately, now both within and outside the World Bank there is a growing body of experience and examples where countries have reformed the governance of the sector and introduced sustainability. Moreover, there is a lot of similarity between the experiences of other sectors such as forestry and water, as shown by Table V.1, which can be used.

Table V.1. Similarities in Governance Issues between Water, Forest, and Fisheries Sectors

Governance Area	Fisheries	Forestry	Water
Institutions	Broad cross-sectoral framework for policymaking fisheries councils with all stakeholders, and independent monitoring, control, and surveillance.	Regulatory framework with separation of policy and certification functions.	Broad cross-sectoral framework with clear distribution systems.
Partners	Comanagement with public sector, industry, and small fishers.	Decentralized forest management approaches.	Decentralization to water users associations (WUAs) and private entrepreneurs.
User rights	Transparent and flexible system of allocation of user rights.	Allocation of concessions or user rights to communities.	Beneficiaries' payment of water services to WUA.

- Past efforts also by other aid agencies focusing on governance and the depletion of fish resources have focused mostly on improving technical aspects of fisheries resources management (research, monitoring, control, and surveillance [MCS]), the components of the regulatory and legal framework, and the strengthening of traditional institutions and training. These efforts were seldom part of a broadly agreed sector strategy that integrated developmental, social, and governance requirements to achieve sector objectives and address resource constraints. With few exceptions, these efforts were not aimed at strengthening local consensus building or support for the political forces favoring change. Moreover, most aid was not part of coordinated donor efforts to leverage their support in favor of improved governance.

Aquaculture development has performed better, with the outcomes of most investments being sustainable. Projects with doubtful medium- and long-term benefits were often ambitious with regard to scale, complexity of technologies employed, and dependency on public sector management for sustainability.

RECENT WORK

Over the last seven years, the program of the World Bank covered:

Economic sector work, with economic analyses of fishery sectors carried out in Eritrea, Guinea-Bissau, Kazakhstan, Morocco, Peru, and Senegal, and planned for Indonesia and Vietnam. These sector studies provide the basis for possible investment programs in those countries.

Investments in fisheries and aquaculture, with an active portfolio as of fiscal 2003 of 18 projects, with a total costs of fisheries projects and components of roughly US$412 million, over half of which is targeted to aquaculture and includes the US$200 million Sustainable Coastal Resources Development Project in China. World Bank-funded projects involving aquaculture have been implemented in Albania, Bangladesh, Cambodia, China, Egypt, India, Indonesia, Kenya, the Philippines, Thailand, and Vietnam.

AN ACTION PROGRAM

An enhanced role of the World Bank, in close partnership with the international development community, is proposed to reverse the downward trend, and introduce the "governance revolution" using all the tools for sustainable fisheries described in this document. On the substantive side, this action program would have three components:

- At the **global level**, it is proposed to establish a Global Forum for Sustainable Fisheries. This Forum would be the main vehicle for stakeholder consultation and the global awareness creation. The effect of the Organisation for Economic Co-operation and Development (OECD) subsidies and the dominant position of these countries in the negotiations on licenses with developing countries would be the core theme. Support in strengthening the negotiating and controlling capacities of the developing countries would be the main direct avenue to reduce the current dominant position of the OECD fisher nations.
- In **industrial fisheries**, the focus is expected to be on meeting the sustainability objectives of the World Summit on Sustainable Development (WSSD). In those developing countries with a strong domestic overcapacity, the support is planned to include institutional restructuring (including the introduction of transparent systems of allocating equitable use rights), effort reduction, and the strengthening of monitoring and control systems.
- In **small-scale, labor-intensive fisheries**, the focus is planned to be mainly on the poverty reduction objectives of the Millennium Development Goals (MDGs) and WSSD. It is expected to comprise the support for the organization of fishers, the allocation of use rights, alternative employment and income-generating opportunities where needed, and the establishment of Marine Protected Areas (MPAs).

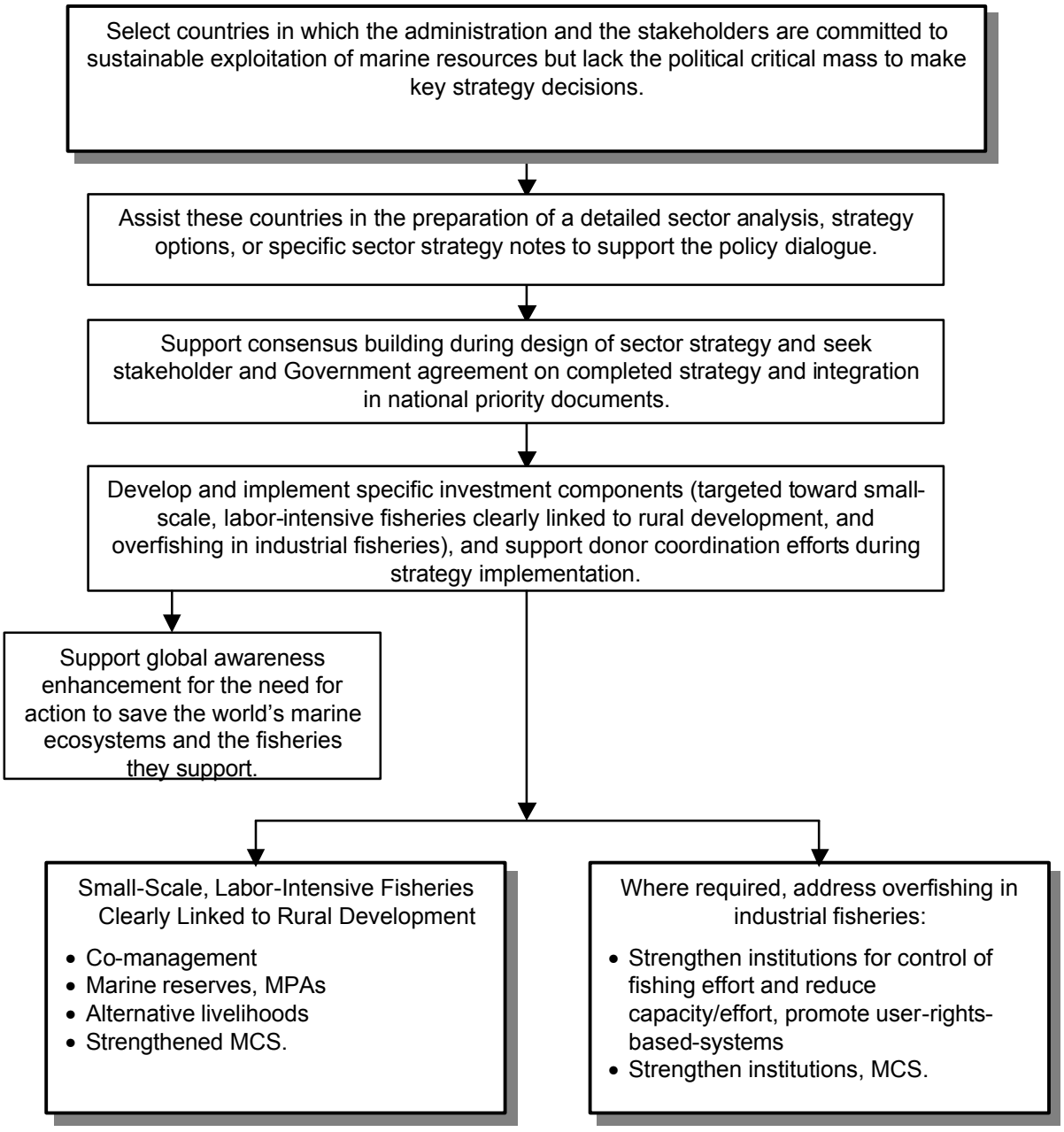
On the process side, such a partnership would follow a structured approach, as has been followed in the pilot countries covered under the Global Trust Fund for Sustainable Fisheries; that is, first prepare a long-term vision, then proceed to awareness creation and consensus building among all stakeholders, and prepare and implement an action plan, as illustrated in figure 5.3.

To mobilize the required resources, an international program is proposed, with the following components:

- Strengthening and broadening the *Global Trust Fund for Sustainable Fisheries* into a multidonor forum and fund, which would support (a) the global awareness creation mentioned above, and (b) the preparation of upstream analytical sector notes on the needed governance reforms, providing the seed money for initial investment preparation.
- Development of broad-based partnerships with interested institutions, such as GEF, FAO, and the international nongovernmental organization (NGO) community, interested in supporting needed investments in the sector. Such a partnership, to be supported by a GEF grant, is currently under development for sub-Saharan African countries among the World Bank, WWF, and FAO.
- Strengthening the in-house capacity and financial flows of the international financial agencies. Fisheries must be brought back on the agenda of the international financial institutions if WSSD targets are to be met. As described above, the required actions described in this Approach Paper need a significant level of funding and a financial package with a wide variety of financial instruments, such as programmatic lending (Program Structural Adjustment Loans, Poverty Reduction Credits) for governance reforms and fleet reduction, while specific investment or adaptable program loans can be used to strengthen institutions and MCS, implement long-term comanagement programs, and promote alternative livelihoods to fishing in rural coastal communities. GEF and bilateral donor funding would

be a critical component of this package to finance activities, with a large amount of externalities, such as MPAs.

Figure 5.3. Schematic presentation of the comprehensive approach to fisheries sector development



Source: Authors.

ADDITIONAL CRITICAL INPUTS

Some additional critical inputs for the successful implementation of this program are:

- Fostering a more prominent role of the fisheries sector in the dialogue on policy and investments. Investment programs of the international financing and donor agencies largely respond to priority-setting exercises carried out by the national governments through the Poverty Reduction Strategy and the Country Assistance formulation processes. Fishery departments, fisher organizations, and individual fishers are notoriously weak in participating in such national policy debates, and lose out to the much better equipped manufacturing sector, and finance and planning ministries. As a result, fisheries are rarely mentioned in these priority-setting documents, and therefore do not get integrated into the World Bank and other major donors (the European Union, bilateral European donors) financing program. As has been shown in other sectors, the preparation of short, well-founded analytical notes, which demonstrate the importance of the sector for poverty reduction, environmental sustainability, and economic growth can be a catalyst for an increased priority for the sector in investment programs of Government, donors, and institutions such as the World Bank. Such well-prepared, timely, and opportunely injected notes, in a language understandable by staff of Ministries of Finance and international agencies, can help in the short term to increase the priority allocated to the sector. The proposed Global Forum and Trust Fund for Sustainable Fisheries would support the preparation of such notes. Over the longer term, the strengthening of grassroots fisher organizations that can adequately represent their needs in the policy dialogue is essential.
- Use the comparative advantage of the different international organizations. The comparative advantage of the World Bank lies in its convening power to draw global attention to the plight of fisheries, its significant experience in participatory and decentralized development, its broad experience in sector analysis and strategy development, knowledge of the economy of the countries concerned, and capacity to work across sectors. Above all, it lies in its experience in the introduction of governance and structural reforms, which the highly distorted fisheries sector needs, and the capacity to combine such policy and institutional adjustments with the required high level of investments. The comparative advantage of international organizations like FAO lies in its close contacts with the fisheries authorities of its member states, its large collection of specialist knowledge in virtually all aspects of marine resource management, and its recognized role as the forum for the dialogue on international agreements. The comparative advantage of bilateral donors is their specific focus (poverty, sustainability) and the funding resources available. Finally, the NGOs are essential because of their close links to the grassroots level, but also because of their capacity to mobilize global opinion. A global coalition, as proposed, is therefore essential for success.
- Develop convincing evidence that there is now the knowledge and experience to satisfactorily implement the new type of projects. This paper documents these experiences and shows that there is now enough experience in the fisheries and other similar sector to ensure success.

THE PROGRAM'S IMPACT

What could be the measurable impact of a proactive international approach toward the fishing sector? Looking at current and future trends, including those in other sectors, that have launched major international initiatives (forestry), such an approach could result, over the next 10 years, in major fisheries reform programs in about 20 countries or regions, predominantly in Asia and Africa (such as India and Indonesia). These programs would in the first instance be designed to halt and prevent the ongoing decline of millions of tons of fish biomass. Depending on the specific countries interested, some 5 to 15 percent of Asian fishers and 20 to 40 percent of African fishers (3 to 5 million fishers and shore-based

workers) would no longer experience declining incomes, or would have access to training and credit to support alternative livelihoods. Similarly, export earnings from fish would stabilize at current or higher levels. Beyond the 10-year horizon, fish catches may actually increase as biomass substantially expands, and sector income may expand as the industry adjusts to a stable, predictable output scenario. While total costs are difficult to estimate, based on recent experience in countries such as Senegal (US$20 million), Indonesia (US$100 million), and the estimated reform cost for Thailand (US$150 million), the 20 countries would require an investment of about US$1.5 billion to US$2 billion.

Appendix 1 Degree of Harmonization with EU Food Safety Regulations in Fisheries Products; Selected Countries

Country	Legislation	Human Resources	Training of Staff	Monitoring & Control Fishing/ Freezer Vessels	Monitoring & Control of Establishments	Official Super-vision	Health Certification	Laboratories	Private Sector Performance Fishing/ Freezer Vessels*	Private Sector Performance Establish-ments*
Angola	(+)	+	-	-	-	-	-	(+)	-	-
Benin	-	+	(+)	-	-	-	(+)	(+)	NA	(+)
China[1]	+	+	+	+	+	+	+	+	+	+
Indonesia[2]	-	+	(+)	NA	(+)	-	NA	(+)	NA	(+)
Kenya	+	+	+	-	-	NA	NA	(+)	+	-
Morocco	+	+	+	-	-	-	+	+	-	-
Mozambique	(+)	+	+	-	-	-	+	+	+	+
Senegal	(+)	(+)	+	(+)	(+)	-	-	+	-	-
Seychelles	(+)	+	+	(+)	(+)	+	-	+	-	-
Thailand	+	+	+	NA	+	+	+	+	NA	+
Uganda	+	+	+	+	+	NA	+	(+)	NA	+
Vietnam	(+)	+	+	NA	+	+	+	+	NA	(+)

+ = Full harmonization. (+) = Partial harmonization. – = Limited harmonization. For the private sector it can mean some deficient enterprises. Within the same country, some may be fully compliant. *In general, a minus (-) under Private Sector Performance may apply only to individual or to a few fishing/freezer vessels or establishments, while others fully comply with EU regulations. 1. The mission conducted in 2001 to evaluate the control of residues showed serious shortcomings in harmonization, monitoring, and control of residues, notably chloramphenicol, nitrofurans, and pesticides. 2. Shellfish only. 3. NA = Not available.

Source*:* Various inspection reports from (DG) SANCO; please see Reference list.

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