



Biodiversity and Fisheries

CHAPTER 3: AQUATIC BIODIVERSITY

Country Thematic Reviews – Mexico to Sri Lanka

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Significant aquatic biodiversity (freshwater and marine)

Mexico is one of the five richest countries of the world in biodiversity, in ecosystems as well as genetic variety. Together with another 17 countries, Mexico is recognised as ‘megadiverse’.¹⁶¹ Mexico’s EEZ totals 357 795 km² and its coastline, Atlantic and Pacific, runs for some 11 500 km.⁷⁶

Present and planned uses of aquatic biodiversity

Officially, the fisheries sector makes up about 0.4% of Mexican GDP. If more than the primary sector is taken into account, the Ministry of the Environment (Secretariat of the Environment, Natural Resources and Fisheries, known as SEMARNAP) considers it may be close to 1%.⁷⁶

Total landings in Mexico during the past decade have remained stable, around 1.5 million t. Future increases are unlikely, as fishing capacity has expanded. Several other stocks do have potential for development, including sardines from the west coast of Baja California peninsula and in the Gulf of California, yellowfin tuna, squid, and pelagic sharks.⁷⁶

Freshwater in Mexico covers about 120 000 km², from which catches in 1998 reached almost 98 000 t. The main species caught are tilapia (71%) and carp (25%). The rest are freshwater prawns, bass, trout and others. Freshwater fisheries are operated only by small boats (less than 10 GRT), of which there were 3 000 in 1998. Since the fingerlings of many of the species landed are produced in aquaculture facilities, Mexican officials usually call freshwater fisheries ‘aquaculture fisheries’, adding the amount so produced to production from intensive culture and so inflating total aquaculture production figures.⁷⁶

Aquaculture produced almost 41 000 t in 1998. Shrimp was the main species (80%); the remaining 20% comprised mostly oysters, trout, tilapia, carp, catfish, and freshwater prawn. Shrimp culture is most developed along the Pacific shore (239 facilities with an average surface of 100 ha). The largest commercial sizes of shrimp are exported, while the smaller shrimp remain for the domestic market, for which the *per capita* consumption is 0.48 kg. Because of the price (US\$ 10/kg wholesale) and to the *per capita* income of the economically active population, only 22% of Mexico’s working population can afford to eat shrimp regularly. In 1998 shrimp was most important fishery export in both value and volume. Tuna and sardines made up 36% of the volume exported but only 11% of the total value. It was supposed that the lifting of the tuna embargo in 1999 would influence the availability of tuna, by permitting fishing firms to sell tuna catches on the foreign market rather than on the domestic.⁷⁶

The current individual transferable quota (ITQ) system has allowed many Icelandic companies to invest into buying fishing companies, boats, and fishing rights, or to act as

advisors to foreign companies all over the world, including Mexico, where their shrimp fisheries seem to be successful.³⁷

Threats to aquatic biodiversity

During the second half of the Twentieth century enormous reaches of jungles, moors, and forests were eradicated, species went extinct, river basins and coastal lagoons were contaminated and invasive and aggressive species were introduced.

In one rural shrimp fishing community of Pacific Mexico, the most important fishing grounds are closed to local fishers to allow juvenile shrimp to grow and move into deeper waters where they can be caught by exporting companies. Local fishers are excluded from participating in the export industry because their 'artisanal' mode of production is considered by the government to be too unproductive, inefficient and extensive.¹³⁴

While in the short term fisheries are not in danger of collapsing, if measures are not adopted as soon as possible some fisheries may be exhausted. Of the 30 main fish stocks in Mexican waters, 20 are now being exploited at about their maximum sustainable yield level or are overfished and need recovery plans. Among the most threatened stocks are abalone and anchovies on the west coast of Baja California peninsula; sea urchins and shrimps in the Campeche Sound; queen conch in the Mexican Caribbean; and various species in the Lake of Patzcuaro.⁷⁶

Measures taken to manage fisheries for biodiversity

The Secretariat of the Environment, Natural Resources and Fish has marked the borders of the beaches, the Federal Maritime-Terrestrial Zone and the 'Terrenos Ganados al Mar' in almost 200 km of coastline, up from 90 km in 1994. It has also:

- increased fishery production from 1995-1999 by 6.4% over 1990-1994, reaching in 1997 a historic maximum;
- begun to quantify and supervise fishing effort through a census of fishing boats;
- increased aquaculture production benefiting more than 70 000 families and representing around 12% of the national fishery production;
- produced 30 000 tons of cultivated shrimp, representing a third of the total national production of this crustacean;
- fortified fishing regulations by publishing 15 official Mexican norms for the Sustainable Use of eight marine fisheries and seven impoundments;
- rehabilitated 13 lagoon systems of over 80 000 hectares;

- published the *Carta Nacional Pesquera* (National Fisheries Map) based on the determination of the level of sustainable use of the 31 principal fisheries and the status of the populations subject to special protection;
- carried out, for the first time in the history of the country, a fishery audit of the 17 fisheries that represent 62% of the volume of national production and more than half their value;
- adopted the FAO Code of Conduct for Responsible Fishing resulting from a Mexican initiative;
- licensed 196 concessions for twenty years and granted permission for longer terms, of which 92% are for between two and four years, bringing security and legal rights to fishers;
- begun the National Program of Rural Aquaculture (PNAR) for the improvement of rural living conditions; and
- actively entered the Agreement on the International Program for the Conservation of Dolphins, by which adequate protection for dolphins in the tuna fishery and above all, the sustainability of the tuna fishery, are secured. ¹⁸⁷

Since 1990 Mexico has protected all beaches and a maritime band of five nautical miles where species of marine turtles arrive and lay eggs.

Under the Program of Fisheries and Aquaculture, priority areas in the coastal and marine zone will be identified. For conservation of marine species, there is the National Program for the Utilization of Tuna and the protection of Dolphins.

Dolphin deaths in commercial tuna purse seine fisheries in the eastern tropical Pacific are declining thanks to an international agreement to bring the fleets under control, including a regulation that all tuna purse seine boats fishing in the ETP must carry professional observers. ^{134 and 218}

Some moves have been made towards the planning of activities such as regularizing riverine shrimp fishing in Magdalena Bay and clams in South Baja California, the Reserve of the Biosphere of the High Gulf of California and Colorado River delta.

The Secretariat of Health coordinates the Mexican Program of Health of Bivalve Mollusks, which has certified four culture areas for export, while five more are being processed. Eight laboratories for international certification and five support laboratories for the program were evaluated, and 3 packing plants were certified. Thus was concluded the ‘Sanitary Plan for Red Tide and Toxic Seaweed’. Courses on Purifying Bivalve Mollusks were also offered. Integrated plans to clean the lagoons of Town Viejo Alvarado, in Veracruz State, have been implemented. ²¹⁸

Four Official Mexican Norms (NOMs) were published to regulate:

- the exploitation of snail species in Campeche, Quintana Roo and Yucatan;
- the extraction of ‘osti6n’ in the lagoon estuaries of the state of Tabasco;
- the fishing of ‘lisa’ and ‘liseta’ or ‘lebrancha’ in federal waters of the Gulf of Mexico and the Caribbean Sea, the Pacific Ocean and Gulf of California; and
- sport-recreational fishing in federal waters.

Additionally, the norm that regulates the exploitation of all species of lobster of the Pacific Ocean, Gulf of California, Gulf of Mexico and the Caribbean Sea was modified. SEMARNAP promoted, in 1996, the expediting of six NOMs within the Secretariat of Communications and Transportes (SCT), to regulate the operation and prevention of the contamination of waters under national jurisdiction by boats. A NOM that establishes specifications to avoid the degradation of the coastal marshes by changing land use is also underway.²¹⁸

In the Committee of Fishery Administration, periods of prohibition for diverse fishing species were determined. Modifications to fishing gear authorized for the capture of reproductive shrimp were also made, and during fishing operations of the Mexican tuna fleet operating in the Eastern Pacific Ocean the maximum rate for accidental by-catch of dolphins was settled.²¹⁸

The Mexican official norm establishing the obligatory use of marine turtle excluder devices in dragnets during fishing for shrimp in the Pacific Ocean, including the Gulf of California, was also set.²¹⁸

Research efforts or goals

SEMARNAP conducts fisheries research through its fisheries agency, the National Institute of Fisheries (INP). INP includes 13 regional centres (CRIPs), 8 oceanographic ships, 7 food technology plants, 4 field stations, and the Centre for Conservation of Turtles. It has a staff of nearly 400, mainly technicians and scientists.

In spite of INP expertise in fisheries research, a strong cooperation link with both fishermen and academic institutions is missing.

Besides, fisheries research is financed almost entirely by federal funds. As Treasury regulations forbid INP from receiving either non-governmental or private funding, it suffers from a restricted budget, a large share of which is allocated to salaries. Lack of data is also a constraint.⁷⁶

Aquaculture research is carried out by the 43 aquaculture centres of SEMARNAP around the country, where fingerlings are also produced.⁷⁶

To begin the Cadastral Program for the Federal Maritime Zone (ZFMT), Lands Won from the Sea (TGM) and Beaches, pilot programs in Sonora, Jalisco, Baja California, Sinaloa and Quintana Roo states have been established. In the pilot programmes, the legal framework has been defined and the structures of the database and information designed. The Cadastral Program will generate digital cartographic information on a scale of 1:1 000 for the urban zones and 1:10 000 to 1:50 000 for cadastral rural or natural areas. The system has feedback from environmental tools that define ground-use policies for these areas, through the inventory and catalogue of the diversity of resources in the Terrestrial Marine Federal Zone.⁷⁶

Under the 1995 program of normalization, analysis of fisheries of ‘escama’ and shark in the Gulf of Mexico and the Pacific Ocean has advanced, as it has of sport fishing in the dams of the Presa Huites and the Primavera and Mariquitas docks in Sinaloa.²¹⁸

The Secretariat of the Navy has carried out numerous actions to protect and to preserve the marine ecosystem, as well as to prevent, fight and control contamination. The Secretariat carries out programs of awareness-building and education, and has an Oceanographic Information System.⁷⁶

Priorities for national action

With the collaboration of experts in different disciplines, (biology, ecosystem, biogeography and taxonomy) CONABIO (the National Commission for the Knowledge and Use of Biodiversity) identified 155 Priority Regions for Conservation in Mexico. These areas are identified on the basis of their biological importance, threatened state, or because they present opportunities for conservation in a national plan. They cover approx. 21% of the national territory, and some include aquatic ecosystems (fresh and marine). Priority regions were to be identified in 1998 as part of an exercise to determine Priority Marine and Coastal Regions. Despite the foregoing, it is necessary to define regional priorities and more specific actions at a local level.

Modernizing environmental regulation is considered high priority, to adapt the environmental regulation system, to widen its scope and minimize its costs, to broaden government management and social participation, and to build incentives that favor conservation. New normative schemes are proposed for wastewater and atmospheric emissions, the development of economic instruments, promotion of self-regulatory systems and environmental audits, as well as the restructuring of direct regulation processes to increase their efficiency and effectiveness, with a consolidated administrative approach. CONABIO also stresses the development of the Program for Competitiveness and Environmental Regulation, agreed upon between industry and environmental authorities.¹⁸⁷

Protecting coastal zones and ecosystems, e.g. mangrove swamps, reefs and lagoons, demands great efforts in monitoring, conservation and restoration by new mechanisms of environmental management and information. An exhaustive environmental diagnosis is needed, as is evaluation and control of terrestrial sources of ocean pollution, the construction

of a monitoring system for the seas and coastal zones of Mexico and better inspection, verification, and surveillance. All of this must serve as a basis for programs for ecological regulation of the territory in high-priority sea and coastal zones.¹⁸⁷

National or sectoral plans that include sustainable use of aquatic biological diversity

An institutional reorganisation began in 1992 with the creation of the Secretariat of Social Development (SEDESOL) and two of its decentralised organs: the National Institute of Ecology (INE), to set norms, and the Federal Procurator for Environmental Protection (PROFEPA), charged with overseeing the observance of the law. In the same year the National Commission for the Knowledge and Use of Biodiversity (CONABIO) was created, and in 1994 SEMARNAP was created. SEMARNAP was a significant advance in institutional organization, as SEMARNAP is the sole government body that concentrates actions of conservation, management and use of natural resources.

Policies and contingency plans are being orchestrated and sectoral programs integrated. Under the marine environmental protection program, environmental audits are being made, wastewater processing is being applied, and legislation on the handling of toxic substances has improved. Work on technological aspects is being carried out to identify sources of marine environmental contamination (heavy metals, hydrocarbons, pesticides), its spatial distribution and economic effects on organisms, incentives, inspection and monitoring, applying precautionary approaches, integrating marine environmental protection into general policies and improving the living standards of the coastal population, the location of coastal spills and problems with waste-waters.

Activities on other sources of marine contamination and the establishment of monitoring programs are beginning to cover the control of non-point sources of pollution and the prevention of erosion and salinization, as are techniques for rational land use. A system to predict marine conditions is being coordinated with programs of systematic observation and the development of environmental and socioeconomic indicators. The National Commission of the Water manages the Information System of Water Quality (SICA) and the Management and Control of the Discharge of Residual Waters (SACDAR).²¹⁸

At the State level, thirty-two federative bodies have promulgated their own environmental legislation and established a local entity charged with administering their own legislation and norms.

CONABIO's principal objective is to promote the exploration, study, protection and use of biological resources to conserve and ecosystems of the country and to generate criteria for sustainable use.

The mission of SEMARNAP consists in promoting transition to sustainable development. PROFEPA is charged in particular with overseeing forestry and fishery activities.

Resources for meeting obligations and recommendations

No information found.

Capacity-building measures for developing and implementing plans

The government participates in training and capacity-building programs. Six Mexican Official Norms (NOM) are related to better use of resources when regulating the sanitary specifications of fishing products. Two norms at project level establish the practices of hygiene and health in the food processing industry. Another establishes a system of risk analysis and control at critical points in the industrial plant product processing of fishery products; these last are under the coordination of the Secretariat of Health. The Subcommittee for the Improvement of the Sanitary Quality of Fishing Products was also created, to guarantee the fulfillment of sanitary conditions throughout the commercial chain of fishing products. ²¹⁸

Sixteen Mixed Committees of Inspection and Monitoring of Natural Resources were installed in sixteen states. Under the new General Law of Cooperative Societies the organization and qualification of 4 156 fishermen, constituted in 40 Cooperative Societies of Fishing Production and in associations under the figure of 'other forms of social organization', was supported. Fifteen workshops in legal and administrative matters were organised for 263 fishers' organisations, with the purpose of transmitting the contents of the new General Law of Cooperatives and advising the fishermen's bodies in organization and internal administration. ²¹⁸

Eighteen regional courses were held for qualification in inspection and monitoring of fishing and marine resources and on the Terrestrial Marine Federal Zone in thirteen states. ²¹⁸

Current state and priorities for expanding the ecological network

No information found.

Legislation or legislative framework for aquatic biodiversity

Laws, regulations and norms on biodiversity are not lacking. The fault lies in lack of precision and coordination among the laws. Some juridical instruments are obsolete, have been superseded, or are so general that they cannot be applied to specific cases. Combined to this is the discretionary powers of the authority for their interpretation or application. The population fails to observe the laws either out of ignorance or because of the little importance they attach to such interpretations. To improve this situation, efforts will be made to foment knowledge of the legislation and communicate its priority.

In 1995 the Technical Committee of the Federal Zone was constituted to establish policies and criteria for the administration of the two federal zones under the jurisdiction of SEMARNAP, the terrestrial federal marine zone and the federal zone of river banks. In the

Terrestrial Marine Federal Zone, it is estimated that more than twenty-four thousand people occupy lands, of whom around three thousand have been legalized. In coordination with the State and Municipal Governments programmes are being developed to regularize the occupations of the federal marine zones (ZFMT) in Sonora, Jalisco, Baja California, Sinaloa and Quintana Roo states. For the reasons mentioned, there is a project to reform the General Law of National Goods to include new norms for sanctions, the recovery of jurisdiction of reefs as an integral part of the terrestrial marine federal zone, and the regularization of the legal situation of lands held without legal title in this zone.²¹⁸

More than 50% of the norms elaborated by NOM (Mexican Official Norms) contain aspects on controlling water contamination.

Cooperative mechanisms among authorities, NGOs etc. to ensure integration

The participation in environmental matters of the private sector, NGOS, academic groups and the social sector has grown considerably in the 1990s.

Within the National Hydraulic Program (1995-2000) and the Modernisation of Water Management Project, in 1995 the River Basin Council was established to coordinate and concert action between the National Commission on Water (CNA), the different levels of government and the diverse users to guarantee the current and future supply and the integrity of river basins, and to create reserves in cases of emergency and concentrate necessary economic resources to carry out such actions. In that same year the Agreement on Coordination was founded to establish the Council of the Basin of the Valley of Mexico between the Federal Government and the governors of the federal district and the states of Hidalgo, México, Puebla and Tlaxcala.

The creation of a National Consultative Council for Sustainable Development in 1995 as a plural and multisectoral body encourages citizens, social groups, NGOs, academic institutions, businesses, scientists and professionals to participate in protecting and improving the environment, without hindering economic progress.

Vulnerable transboundary aquatic systems

Gulf of Mexico, Gulf of California (Sea of Cortes).

Examples of transboundary cooperation

The United Nations Convention on the Law of the Sea was ratified in 1983. The national policy on the oceans is part of the national strategy of sustainable development.²¹⁸

Cooperation technical programmes have been set up with the USA and Japan, and regionally in Central America and the Caribbean. Technical aid has also come from FAO.⁷⁶

Priority given to transboundary cooperation affecting aquatic biodiversity

Mexico is signatory to CBD, Ramsar, and CITES.

Mexico has orchestrated programs for the protection of marine mammals: gray whale, marine ‘vaquita’ and dolphins, marine turtles and others. With respect to the Code of Conduct for Responsible Fishing for the FAO, the government promotes the sustainable use of fishery and aquaculture resources, through integrated use accompanied by the development of selective technologies to reduce discards and by-catch. Mexico participates in IOCARIBE, CDS, the Program of Global Action for the Protection of the Marine Atmosphere from Human Activities on Land, and the Global Observation of the Ocean System (GOOS). Within the Asia-Pacific Economic Cooperation (APEC), actions were identified to fulfill commitments established in the Plan of Action of Osaka of 1996.²¹⁸

To reinforce conservation and protection of living marine resources, Mexico participated in the FAO negotiations that resulted in the Agreement that regulates fishing on the high seas (Agreement on the Application of the CONVEMAR relative to the Conservation and Arrangement of the Populations of Trans-zonal Fish and the Populations of Highly Migratory Fish) and the Agreement on Flag Registry (Agreement to promote the Fulfillment of the International Measures of Conservation and Arrangement by the Fishing Ships that

Fish on the High Seas).²¹⁸

The second reunion of the Global Ocean Ecosystem Dynamics Organization (GLOBEC) was held in Mexico, on the program ‘Small Pelagic and Climatic Change’ (SPACC) to determine an International Work Plan of investigation into the impact of climatic variation on marine ecosystems and the smaller pelagics.²¹⁸

Significant aquatic biodiversity (freshwater and marine)

The National Report states that little is known about Mozambique's biological diversity.

The largest natural lake in Mozambique is Lake Niassa (also known as Lake Malawi), shared with Malawi and Tanzania. Mozambican territory occupies 6 400 km² (20.8%) of the lake, the third largest lake in Africa and the third deepest in the world. Lake Malawi contains one of the most diverse fish fauna in the world, and is especially well-known for its spectacular diversity of endemic cichlid fish fauna. The majority of these are haplochromine cichlids, currently assigned to 22 genera containing 191 described species. While 320 fish species have been recorded for Lake Niassa, the lake may have about 500-1000, many of which still have to be identified. The Mozambican portion is not protected.

Other important natural lakes include:

- Lake Amaramba, c. 8350 ha (4 350 ha open water + 4 000 ha swamp),
- Lake Chiuta, 32 000 ha (3 500 ha open water + 28 500 ha swamp) and
- Lake Chilwa, 185 000 ha (including lacustrine swamps).

All are shared between Mozambique and Malawi. Lake Cahorra Bassa, created in 1975 on the Zambezi River, covers 2 665 km² and is the fourth largest man-made lake in Africa.

The most important river system is the Zambezi River, which enters Mozambique at Zumbo, where it immediately swells into the impoundment of Lake Cahora Bassa. The most important tributary of the lower Zambezi is the Shire River, which drains Lake Malawi via Elephant Marsh. The Limpopo is the second largest river in Mozambique, its catchment covering more than 390 000 km², draining parts of Botswana, South Africa and Zimbabwe before reaching Mozambique.

The hydrology of these river systems has been considerably modified by numerous impoundments. Their floodplains, such as Marromeu in the Zambezi Delta and the Lower Limpopo River, provide breeding sites for fish.

The warm southward flowing Mozambique Current traverses the Mozambique coastline of around 2 770 km. The northernmost coast extending about 770 km from the Rovuma River in the north to the Archipelago in the south is essentially a coral reef coast. Corals also occur at intervals offshore from Bazaruto Island southward to South Africa. The southern limit for shallow water fringing coral is reported from Inhaca Island.

The central section of coast (c. 978 km between Angoche and Bazaruto Island) is a swamp coast with beaches, swamps and estuaries. Along this central section twenty-four rivers

discharge into the Indian Ocean, each with an estuary supporting well-established mangrove swamps.

The third coastal region stretches south from Bazaruto Island to Ponta de Ouro on the South African border. About 850 km long, it is characterized by high parabolic dunes, north-trending capes and barrier lakes. These dunes are considered the tallest vegetated dunes in the world. Only two sections of the Mozambique coast can be classified as Delta Coasts, the Zambezi and Save River deltas.

Mozambique's coral reefs are a southern continuation of the well-developed fringing reefs that occur along major sections of the fairly narrow continental shelf of the East African coast. Corals occupy around 2500 km²,¹⁴¹ comprising at least 50 genera and 150 species. As precise data on the reefs are lacking these figures need to be revised.

Current estimates indicate that mangroves cover 396 080 ha of Mozambique's coastline, down 3.9% since 1972. Although the total area degraded appears small, uncontrolled cutting occurs close to urban centres.

Present and planned uses of aquatic biodiversity

Artisanal fishing provides livelihoods for more than 50 000 families and supplies food for much of the population. However, marine fisheries account for more than 90% of total fish production. Much of the industrial marine fishing activities are in central Mozambique (Sofala Bay). The *per capita* yearly supply is estimated at 6 kg (1997), and in recent years the share of protein from fish in total animal consumption has grown to 23%.⁷⁷

An export-oriented shrimp fishing industry produces 7 000 to 9 000 t/yr of shrimp (9 500 t in 1997) and brings in over 40% of the country's export earnings. Two private enterprises operating 34 freezer-trawlers in shallow waters are responsible for 70% of the industrial shrimp catch. These are: PESCAMAR, operating 19 freeze-trawlers in a joint venture with Spain; and EFRIPPEL, operating 15 shrimp freezer-trawlers in a joint venture with Japan. The remaining 30% is taken by small and newly formed private companies. Semi-industrial fishermen catch more than 2 000 t/yr of shrimp (sold to industrial enterprises), as well as an unspecified amount of by-catch.⁷⁷

In Mozambique – as in most African countries – inland fisheries are small-scale. The estimated potential of fish catch in rivers and lakes is 34 000 t. In recent years, due to massive investment, especially from the private sector, catches in Lake Malawi/Nyassa (the largest natural lake – 40 000 ha) and in the artificial Lake Cahora Bassa, have increased dramatically. Lake Cahora Bassa, in the northwestern part of the country, has attracted big investments because of the high price of small pelagic (*kapenta*) in the regional market (Malawi, South Africa and Zimbabwe). In 1997, the catch of *kapenta* in Lake Cahora Bassa was around 10 000 t. In the south, the Massingir reservoir also offers considerable development possibilities. Its annual production is estimated to be more than 500 t from an area of 15 000 ha.⁷⁷

Between 1988 and 1990, a first inventory was carried out of zones where marine shrimp culture could be developed. Three main regions were identified, Maputo, Beira and Quelimane, and promotional campaigns got underway. Two commercial projects are now operating in Quelimane, and may expand to cover 600 ha. In Maputo, another project is operating, with a potential development area of 70 ha. Three new projects, which would cover 500 ha, are awaiting approval, in Maputo, Beira and Quelimane.⁷⁷

In 1987, fish production, mainly of tilapia, was only 20 t. Fisheries policy and rural development plans do call for introducing fresh and brackish water aquaculture, with priority given to developing shrimp aquaculture.

The pelagic species caught by the semi-industrial fisheries are consumed domestically, mainly in the coastal areas; traditional food habits of the inland population, as well as lack of infrastructure, inhibit a wider distribution. The artisanal marine and inland catch is consumed fresh or smoked/dried using traditional methods. In Maputo a small cannery cans sardines (*magumba*) and a salting-and-drying plant processes small amounts of other fish. In Maputo harbour, a medium-sized plant is used for freezing fish products when a direct commercial outlet is unavailable.⁷⁷

Threats to aquatic biodiversity

Potential collapse of the Lake Malawi artisanal fisheries constitutes the greatest potential threat to conservation of biodiversity.¹⁷

Selective cutting of mangrove poles for local house construction is not a major threat if adequately controlled. With the development of shrimp aquaculture, a new threat to mangrove ecosystems may arise when large areas are cleared for ponds.

One of the greatest threats to marine mammals is the fisheries sector, especially shark nets, gill nets and trawl nets. Only a few dugongs still inhabit Maputo Bay, a population believed to be on the verge of extinction. Quantitative data on the distribution and abundance of marine mammals (dugongs and dolphins) and the interactions with fishing activities are urgently required for implementing improved conservation measures.

In February 2001 the South African Environmental Affairs and Tourism Minister ordered an urgent probe into South Africa's reported pollution of key rivers feeding southern Mozambique. The order followed reports from the African Eye News Service that local industries were polluting the Selati, Limpopo and Olifants rivers so severely that animals were being born with birth defects. Villagers drinking the river water reportedly also suffer from serious kidney and stomach problems and have open sores in their mouths. Animals in the Phalaborwa, Garamakgale, Namakgale and Lulekhani areas have also developed serious physical defects, while crops and other vegetation near the rivers have been killed, the African Eye News Service article states. The Mozambican government meanwhile launched its own investigation into the uncontrolled pollution in February 2001 after detecting dangerous levels of pollution in the Olifants River, which feeds the Massingir Dam in Gaza province.¹

Eutrophication is the most serious water quality threat to maintaining healthy and diverse benthic haplochromine communities in Lake Malawi. Toxic compounds used in agriculture and industries are also a concern, especially for the predaceous fishes.¹⁷

Measures taken to manage fisheries for biodiversity

The new Land Law, passed by Parliament at the same time as the Environmental Law, provides a further legal basis for demarcating areas for protection and conservation (Article 5) and the creation of total and partially protected zones (Article 6). The latter provision will now permit the conservation and management of riparian and coastal habitat together with their associated species. In a farsighted move the new Land Law provides for the participation of local communities (Article 31). In rural areas, the communities shall participate in managing natural resource and conflict-resolution, relying upon customary norms and practices.

A joint World Wildlife Fund/National Directorate of Forestry and Wildlife project to conserve biodiversity in the Bazaruto Archipelago is currently being implemented.

Research efforts or goals

A major constraint facing Mozambique is the lack of trained personnel to carry out research.

Major gaps exist and information regarding the conservation status of ecosystems, habitats and species is often speculative.

No coordinated, comprehensive surveys of Mozambique's biological resources have been carried out, partially due to civil unrest. Consequently there is a profound lack of information regarding the conservation status of biological diversity, and no Red Data Books for fauna and flora exist. Agencies and university researchers have carried out several surveys of selected components of Mozambique's biological diversity, but these have been uncoordinated. Scientific articles, internal (unpublished) reports, project document, NGO reports, satellite imagery, etc are dispersed among various agencies and individuals. This information has not been integrated at the national, local and even in some cases, the institutional level. In addition the data sets are based on different classification systems, organized along different formats and are of varying accuracy.

The Fisheries Research Institute (Instituto de Investigacao Pesqueira, or IIP) is in charge of marine and inland fisheries research. The Small-Scale Fisheries Development Institute (Instituto de Desenvolvimento de Pesca de Pequena Escala, or IDPPE) shares responsibility for data collection with IIP.⁷⁷

A Mozambican-registered NGO, Frontier-Mozambique, in partnership with MICOA, is carrying out marine biodiversity surveys in northern Mozambique (the Quirimbas Archipelago). The IUCN, in partnership with several Mozambican agencies, is carrying out biological and socio-economic surveys of the Zambezi delta wetlands for the conservation and sustainable use of this fragile ecosystem.

The Lake Malawi Decision Support System provides background information regarding the Lake Malawi/Nyasa/Niassa catchment from previous studies, modelling results from the AGNPS model for the Linthipe subbasin, and modelling results from a hydrodynamic model of Lake Malawi/Nyasa/Niassa.¹⁷

Beginning with field programs in the rainy seasons of 1998 and 1999 (January-April) the dispersion of suspended sediments from the Linthipe River into the African rift valley Lake Malawi was to be mapped and modelled as a part of the World Bank/CIDA Lake Malawi Biodiversity Conservation Project. The plume had been mapped during two rainy seasons using NOAA AVHRR imagery and by conductivity-temperature-depth-optical backscatter profiles along transects off the river mouth. These data were to be used to validate a hydrodynamic model of the dispersal of sediment discharged by the Linthipe River.¹⁵⁷

A comprehensive survey has now been completed on persistent contaminants in the rivers, the atmosphere and biota of the lake, providing important information on baseline conditions in 1996-98 against which future changes can be evaluated.¹⁷

Research must centre on demand-driven aspects of the artisanal fisheries in Lake Malawi, as these contribute over 90% of the landings (all three countries combined). The artisanal fisheries are the least understood, the most complex and widespread, and overwhelmingly difficult to manage. They have the greatest number of people directly and indirectly dependent upon them, are fished under an open access system, are the most vulnerable to overexploitation and collapse, and would cause the greatest negative impact on poverty and food security if they did collapse. They constitute the greatest potential threats to conservation of biodiversity.¹⁷

Priorities for national action

Development policy for the fishery sector includes promoting activities such as aquaculture for crustaceans, fish and bivalve molluscs. Three regions (Maputo, Sofala and Zambezia provinces) have been selected for aquaculture projects. To support the artisanal fishery, the Government has introduced policies protecting resources and facilitating investments in infrastructure for fish production and marketing.⁷⁷

Actions to ensure biodiversity considerations are an integral part of fisheries sector legislation, policies, strategies and practices:

- to review and revise policies, legislation and programmes to ensure the incorporation of biodiversity considerations, including the adopting of codes for sustainable fisheries in accordance with the FAO Code of Conduct for Responsible Fisheries;
- to promote and coordinate inter-sectoral planning, management and monitoring for the conservation and sustainable use of coastal and marine biodiversity;
- to improve data collection techniques to ensure that not only commercially important fish species are recorded and monitored;

- to identify and adopt fisheries management practices that will contribute to the conservation and sustainable use of marine biodiversity and minimize adverse impacts on marine biodiversity;
- to promote the full participation and sharing of marine benefits by local communities;
- to review international legal instruments related to marine biodiversity and where appropriate promote accession;
- to promote training and capacity-building to ensure that biodiversity considerations are incorporated into coastal and marine research, planning and management; and
- to promote the enforcement of existing regulations for the conservation and sustainable use of marine biodiversity.

Shrimp and lobster fisheries should be developed cautiously. Lobster production fell to 81 tons in 1997 from an average of 262 t from 1987-1996. Better use of the by-catch, estimated at 15 000-30 000 t, could better increase production. Industrial opportunities also exist for high-value finfish, as well as for deep-water crab, crayfish and tuna.⁷⁷

Mozambique's abundant potential of small pelagic fish, however, is rarely exploited by the small-scale fishers since most of this stock is far from the coast (about 100 km). Inland fisheries could develop, if boats and gear for the artisanal fishermen were assured and the processing and marketing problems were solved. The kapenta fishery in the Cahora-Bassa reservoir, already considerably exploited, is still expected to yield several thousand tons yearly.⁷⁷

National or sectoral plans that include sustainable use of aquatic biological diversity

The Ministry for the Coordination of Environmental Affairs (MICOA) oversees implementation of CBD. To this end a provisional Biodiversity Unit has been established within the Ministry to coordinate all implementation activities. (The precise structure, role and function of the Unit is being defined and formalised.) One of the principal tasks of MICOA in 1997 was formulating a National Strategy for the Conservation of Biological Diversity in Mozambique in accordance with Article 6.

To ensure the effective coordination and integration of policies and plans related to environmental management at the highest level, a National Commission for Sustainable Development (NCSA), linked to the Council of Ministers, was created by a provision in the Environmental Law. The NCSA is a consultative body directly linked to the Council of Ministers (the Cabinet) and will ensure that considerations related to the conservation and sustainable use of biodiversity are integrated into plans, programmes and policies at the highest level.

A Coastal Zone Management Unit (CZMU) created within MICOA is currently drawing up an Integrated Coastal Zone Management Plan (ICZMP) to focus on sustainable use and conservation of coastal and marine biological resources. As part of the formulation of the ICZMP the CZMU is evaluating coastal and marine ecosystems, habitats and species.

Another major responsibility of the CZMU together with the National Directorate of Forestry and Wildlife is the coordination of activities to lead to a full-blown project proposal (the Conservation and Management of Coastal and Marine Biodiversity) to be submitted to the Global Environmental Bank in September 1998 for funding.

Resources for meeting obligations and recommendations

The State Budget does not provide adequate financial support to ensure the conservation and sustainable use of Mozambique's biological resources.

Capacity-building measures for developing and implementing plans

The Southern Africa Biodiversity Support Programme will involve all ten countries of the southern African region in a collaborative programme of activities related to national implementation of the CBD. The project is designed to improve cooperation and to build capacity both within and between participating nations and to integrate sustainable use into biodiversity conservation and other sectoral programmes. The project will produce five key outputs, each arising from a series of targeted activities.²²⁵

State and priorities for expanding the ecological network

No information found.

Legislation or legislative framework for aquatic biodiversity

(See also 'Measures Taken'.)

The framework Environmental Law of July 1997 was a watershed for environmental protection. Importantly, the Law obliges all sectoral legislation related to environmental management to be reviewed and, if necessary, revised so that it is consistent with the Environmental Law.

Currently no proper institutional arrangements exist to implement the National Strategy. The establishment of a National Biodiversity Unit is planned. In this regard the Ministry for the Coordination of Environmental Affairs will need to be strengthened.

Cooperative mechanisms among authorities, NGOs etc. to ensure integration

The first draft National Strategy document was widely distributed to Government agencies, Government Organizations and other agencies in Mozambique for comment and discussion.

The first draft document was presented, reviewed and revised during a three-day National Workshop in Maputo from 22-24 September 1997. The Workshop was attended by 65 persons representing 37 agencies.

Vulnerable transboundary aquatic systems

Lake Malawai (Niassa/Nyasa).

Examples of transboundary cooperation

Mozambique is receiving important external aid for the fisheries sector. TCP/RAF/6719(A): International Legal and Institutional Arrangements for the Management of Lake Malawi/Nyassa. There are currently many ongoing projects funded by bilateral (NORAD, DANIDA, ICEIDA, France, Belgium, the Netherlands, Japan), as well as multilateral (EU, UNDP, IFAD, OPEC) donors. This aid, which amounted to approximately US\$ 60 million in the 1980s, doubled in the 1990s.⁷⁷

Mozambique still needs to accede to important conventions, most notably the Ramsar Convention and the Convention on the Conservation of Migratory Species of Wild Animals. This need for Mozambique to become a party to these conventions forms part of the National Strategy and Action Plan.

Mozambique is Party to the Convention for the Protection, Management, and Development of the Marine and Coastal Environment of the Eastern African Region and related Protocols, Nairobi, 1985, ratified 1996; is a Member of the International Maritime Organization since 1991; is a Member of the Organisation on the Indian Ocean Marine Affairs Cooperation since 1991; signed the Protocol on Shared Watercourse Systems in the SADC Region in 1995 and signed the Zambezi River Basin Multilateral Agreement in 1987; and signed the UN Convention on the Law of the Sea in 1982.

Together with the other SADC states Botswana, Lesotho, Malawi, South Africa, Swaziland, Zambia, and Zimbabwe, Mozambique is taking part in the Southern Africa Biodiversity Programme of activities related to national implementation of the CBD. The project is designed to improve cooperation and to build capacity both within and between participating nations and to integrate sustainable use into biodiversity conservation and other sectoral programmes. The project will produce five key outputs, each arising from a series of targeted activities.²²⁵

Significant aquatic biodiversity (freshwater and marine)

Namibia is mostly desert. Rainfall is sparse and erratic, limiting natural freshwater resources.

The coastline, however, is extensive, spanning 1 572 km. The northerly Benguela current, which runs some 200 km along the west coast of southern Africa, from Cape Town to about 15° S, is dominated by small pelagic fish, mainly *Sardinops ocellata* and *Engraulis capensis*. The former species once dominated the system and supported catches of up to 1.3 million t (1968).³⁷

More recently, anchovies have replaced the sardines as the most important small pelagic species. Dense populations of horse mackerel (*Trachurus trachurus capensis*) are also important. Valuable stocks of hakes (*Merluccius capensis*, shallow water Cape hake, and *Merluccius paradoxus*, deep-water Cape hake) dominate the demersal ecosystem.

Seals are the top predator in the ecosystem, hakes, squid, snoek, and chub mackerel the piscivorous species, horse mackerel, round herring, saury, pilchard, and anchovy the main pelagic prey, and lightfish, lanternfish, and goby are the main demersal prey.¹⁸⁸

Present and planned uses of aquatic biodiversity

Before independence in 1990, Namibia lacked an EEZ along its 200-mile coast, one of the richest in the world. The number of licences granted to foreign trawlers to fish Namibian waters is now limited and joint ventures between foreign and local interests are encouraged.

In addition, new deep-water fisheries have developed in Namibia. The fish catch potential is calculated to be over 1 million t, and may be as high as 1.3-1.5 million t.¹⁴⁴ Namibia has become a DWFN itself, fishing for the toothfish (*Dissostichus eleginoides*) in the Antarctic Ocean.³⁷

The four main fishery resources of Namibia in weight are pilchard, horse mackerel, and hake, and, to a lesser extent, anchovy. Exploitation of fisheries in Namibia began in 1948, concentrating on pilchards, then moved to horse mackerel and anchovy as pilchard declined.¹⁴⁴

The hake population suffered a recruitment collapse in 1993-1994, apparently due to anoxia-induced mortality in shelf bottom waters.³⁴

Other fisheries minor in volume but increasingly important in economic terms include monkfish (*Lophius vomerius* and *L. vaillanti*), the deep-sea red crab (*Chaceon maritae*, peak catch of 10 000 t in 1983), and spiny lobsters (*Jasus* spp.). Probably the most important new fisheries are for Orange Roughy (*Hoplostetus atlanticus*), alfonsino (*Beryx splendens*), and

oreos (*Allocyttus* spp., *Pseudocyttus* spp., and *Neocyttus* spp.). Most of these fisheries aim for the export market.³⁷

The record of fisheries catches of Namibia as a nation starts only in 1990. Mackerel has been the major fishery since independence, followed by hake and a slowly rebounding pilchard fishery.³⁷

About 100 000 people in Namibia are estimated to benefit from inland fisheries, mainly in the north and northeast.³⁷

Little information exists on the size of the DWFs fishing off Namibia before 1990. After Namibian independence, although 88% of the demersal fleet was flagged in Namibia, 61% carried their catch back to Spain or other foreign markets (freezer-trawlers), while the rest of the fleet delivered iced product to the growing on-shore processing industry. Almost all of the mid-water trawling fleet (about 76% of the total licensed fleet tonnage) were reported to be former Soviet vessels now chartered by local companies. In a similar way, the whole tuna fleet is based in South Africa. Overall, the fleets fishing off Namibia have grown from 214 vessels in 1991 to 309 in 1996, with the proportion of Namibian-owned vessels increasing from 50% in 1991 to 76% in 1996.²⁴

Fishing and fish-processing have risen dramatically in importance since 1990, with the rigorous application of controls on fishing to ensure sustainable harvesting of fish stocks. The exploitation of new fish species such as Orange Roughy and alfonsino, as well as the processing of fish from outside Namibia, meant that the fall in tonnage landed of around 35% over the 1994/96 period was accompanied by stable earnings from fish products. By 1998 the renewed recovery of fish stocks appeared to be underway.³³

Threats to aquatic biodiversity

No information found.

Measures taken to manage fisheries for biodiversity

Before independence, more than 300 mid-water and bottom trawl vessels were reportedly operating off the Namibian coast.³² According to one report¹ the USSR had a 32% market share in the country's fish, followed by Spain with 26% and South Africa with 7%. Hake stocks declined by more than half, whilst the pilchard stock fell to only 2% of its level between 1976 and 1986. As soon as the independent government announced the EEZ in 1990, the number of unlicensed foreign vessels fishing in the area dropped by 90%.³⁷

Namibia has effectively closed access to DWFs through its licensing policy that does not allow foreign-based DWFs. Instead, most deep-water and mid-water concession-holders charter foreign-owned or operated factory ships, mainly from Russia and Spain.³⁷

Strong management measures after 1990 allowed stocks to recover.²⁰ Namibia has relatively good monitoring capabilities to deter pirate fishing. From 1990-1993 more than ten Spanish

fishing vessels operating illegally in Namibian waters were seized, discouraging further illegal fishing.³²

The key message of the 1991 White Paper 'Towards Responsible Management of the Fisheries Sector' was that conservative quotas would have to be set in the short term to allow substantial growth in the medium to long term.³³

The Namibian government manages bycatch through bycatch fees, intended to avoid the complications of multiple quotas being necessary for any vessel. There is no specific information on the levels of bycatch by fleet and fishery.³⁷

Currently, Namibia allows no foreign companies to fish in its EEZ. The only foreign access is through joint-venture companies. Many local concessionaires sell their quotas to foreigners by chartering foreign-owned and operated vessels. Some of the main countries having set up joint ventures in Namibia are Norway and Spain, for demersal fishing; Norway and South Africa in pelagic fishing; Russia and Spain in horse mackerel fishing; and South Africa in tuna fishing.³²

The benefits of the new system of 'foreign fishing' in which former DWF interests are now partners with Namibian entrepreneurs in joint-venture companies has proven very successful for Namibia. Presumably it is also beneficial to the DWFNs. Investment in the fisheries sector as a result of its joint venture policy is also up. In 1991-1995 some N\$ 300 million was invested in new processing capacity, largely for hake and principally at Walvis Bay, the main fishing industry centre, with a further N\$ 200 million invested in locally-owned fishing vessels.³⁷

One of the largest developments by Spain's Pescanova involved a N\$ 100 million investment in expanding a hake factory complex in Luderitz, while during 1995-1996 most fish factories were upgraded at a cost to the industry of around N\$ 80 million to meet EU hygiene requirements for fish exports.⁶⁵

To ensure effective decision-making, the government has invested heavily in marine surveillance and supporting institutions such as the National Marine Information and Research Centre which researches the population dynamics of commercially important fish species. The controls on the fishing industry are among the most comprehensive in the world. Technical staff of the Ministry make recommendations to the Fisheries Advisory Council (FAC) which consists of representatives of government ministries, industry and unions, and the FAC then makes recommendations to the Minister.³³

The strength of the present system is that it is oriented to setting catch levels that allow fish stocks to recover. The system could nonetheless be improved. Most importantly, excessive capacity in the industry provides a powerful lobby for interpreting scientific data too favourably. This may have led to catch levels that have inhibited recovery of the pilchard stock. Opening the Sea Fisheries Advisory Council proceedings to the public would encourage debate on how to trade short-term retention of existing jobs for more jobs in the longer term.³³

Research efforts or goals

Soviet research indicated overfishing in Cape mackerel stocks by 1991.⁴⁸ Polish ships exploited hake and horse mackerel off Namibia at least from 1973-1987 and probably beyond. Polish research suggested that the state of the hake stock was still satisfactory just before independence, although abundance has declined visibly.²³⁸

To draw together the parallel environmental monitoring aims of the Terrestrial Biomonitoring Group, Wetlands Working Group and Coastal and Marine Biodiversity Group, the Namibian Long-Term Ecological Research (Na-LTER) Network was begun in 1999. Namibia is the first (and so far still the only) African country to join the International Long Term Ecological Research (ILTER) network, and has good environmental databases.

Priorities for national action

No information found.

National or sectoral plans that include sustainable use of aquatic biological diversity

The national Wetlands Working Group is one of the earliest groups of the Biodiversity Task Force. It serves to coordinate and stimulate relevant activities by the six or seven ministries, NGOs and tertiary institutions involved in wetlands management or research. Apart from many other awareness-raising and research activities, it has developed a detailed and pragmatic action plan as part of the NBSAP. Its chair (previously based in the Department of Water Affairs) is also the national desertification coordinator and a core member of the Biodiversity Programme.

Namibia's productive coastline and Benguela Current marine ecosystem are economically extremely important and relatively pristine. The Coastal and Marine Biodiversity Working Group, chaired by the Ministry of Fisheries and Marine Resources, has developed a focused action plan as part of the NBSAP which will also serve as the national action plan for the GEF/ UNDP-funded Benguela Current Large Marine Ecosystem (BCLME) Program. A further proposal to GEF/ World Bank (from the Ministry of Regional Government) focuses on decentralised management of coastal biodiversity and development planning.

An important parallel integration effort is the Directorate of Environmental Affairs' highly consultative Environmental Legislation Project, which works in close cooperation with the Biodiversity Programme and a wide variety of stakeholders to review, revise, and in some cases draft, new legislation. The new Environmental Management Bill, which gives legal force to Namibia's progressive Environmental Assessment Policy, explicitly enshrines biodiversity conservation as a key goal. The project is also drafting new bio-trade and bio-safety legislation as part of its efforts to bring Namibian legislation in line with the CBD.

In conjunction with Namibia's State of the Environment Reporting (SoER) process, the National Biodiversity Programme commissioned a policy analysis in December 1999. This was recently completed as a 10-chapter report covering the broad range of government policies including those in fisheries and marine resources. A copy of this is feeding into NDP2 and the Environmental Legislation Project.

Resources for meeting obligations and recommendations

No information found.

Capacity-building measures for developing and implementing plans

As in many African countries, Namibia's institutional capacity to support the CBD has been declining through much-reduced budgets. As well, more skilled graduates are going into law, political studies and economics than into the sciences.

The chief incentive mechanism for biodiversity conservation is still in the widely-known CBNRM approach of communal-area conservancies. Under this system, which is comparable to the CAMPFIRE program of Zimbabwe, rights and responsibilities are returned to rural communities. Enabling activity funds are being sought from UNEP/GEF to develop this area further with grassroots input. Policy analysis also gives institutional guidance on the existence of perverse incentives in government.

Further training in environmental research skills and methods among young Namibians is strongly needed. Most of the effective training is done by an NGO, the Desert Research Foundation of Namibia, especially through its Summer Desertification Project. The Namibian National Biodiversity Programme also has strong links with the University of Namibia and Polytechnic of Namibia, and helps to identify promising candidates for placement and on-the-job training in biodiversity conservation management. However, these two institutions are small and troubled, and train only to a basic level. Collaboration with regional and international programmes is needed at the honours and masters level, as is support for practical on-the-job training.

State and priorities for expanding the ecological network

No information found.

Legislation or legislative framework for aquatic biodiversity

The White Paper on inland fisheries favours management by 'subsistence households' at a local level, with oversight by the government to ensure sustainable use. Accompanying legislation aims to resolve two local conflicts. First, subsistence fishers will be favoured over large-scale commercial harvesters, allowing more equitable access to the resource. Second, closed seasons will be allowed so that water quality is maintained in seasonal pools for use by livestock.³³

Cooperative mechanisms among authorities, NGOs etc. to ensure integration

The CBD, CCD (Convention to Combat Desertification) and UNFCCC (United Nations Framework Convention on Climate Change) are coordinated by one department, and Ramsar is managed by another department in the same Ministry of Environment & Tourism (MET).

To some extent, the integration of the four conventions in Namibia, being heavily dependent on the commitment and understanding of key individuals, is not adequately institutionalised. However, the Directorate of Environmental Affairs (DEA), which houses most of the programs, is structured to maximise this cooperation. Also, the same NGOs and individuals carry out a certain amount of the implementation activities under the four conventions.

The Namibian National Biodiversity Programme was established as a DEA core programme in mid-1994. Despite attempts to increase grassroots involvement, it is still quite low, owing to a generally very low level of civil society activism in Namibia, public apathy and passive trust in government, ‘project fatigue’ and even some distrust of the aims of the programme. However, for a country with a small population and even smaller technical community the authors of the National Report rate the involvement of different sectors and individuals as high.

The most important recommendation the Sea Fisheries Advisory Council makes to the Minister of Fisheries and Marine Resources (MFMR) is on setting ‘Total Allowable Catch’ (TAC) levels for various species. The Council includes government officials and independent outsiders, as well as representatives of the fishing industry employees. This enables it to try to balance short-term concerns of preserving existing jobs with longer-term concerns of rebuilding fish stocks. There has been some controversy in recent years over whether the decisions taken over fishing levels (especially of the pilchard stocks) have been overoptimistic^{165 and 154} and short-term. In 1995 and 1996, the MFMR scientists’ assessment was more conservative than the assessment of industry scientists. The TAC was a compromise. The MFMR has consistently tried to talk more with industry to improve the quality of decision-making and promote ownership of fishing policies by the industry.¹⁶⁸ Limited access to information, including the recommendations of MFMR scientists and the Sea Fisheries Advisory Council Public, limits debate on decisions.¹³⁵

Vulnerable transboundary aquatic systems

No information found.

Examples of transboundary cooperation

Foreign aid has helped Namibia build respectable capabilities for controlling and monitoring foreign fishing. The main donors in this are Norway – which funnelled at least US\$ 4 million in aid to the fisheries sector for training Namibian personnel and reducing the dependency on expatriates – and the United States. Iceland has also provided technical help.³¹

Priority given to transboundary cooperation affecting aquatic biodiversity

No information found.

Significant aquatic biodiversity (freshwater and marine)

The EEZ, about 1.2 million square nautical miles, is very deep but not very productive. Marine reserves are still very limited.²³⁰

Present and planned uses of aquatic biodiversity

About 90% of the commercial landings are exported. Foreign charter vessels, often with foreign crew (NZOYB, 1995, 443 and ff), catch about half.²³⁰

Recently the fishing industry has been required to pay some of the costs of fisheries management. The industry has reacted to this by arguing for a major say in the research agenda and functions of the Ministry, including policy, registrations and data management. The Cabinet has agreed to prepare the ground to contract out most of these functions, for which the fishing industry wishes to bid. Environmentalists, fearing industry capture of research, policy and other services, oppose the fishing industry's gaining the dominant say in research and management.²³⁰

Threats to aquatic biodiversity

In 1995, for the first time in five years, the Minister set TACCs at rates calculated to allow a reasonable opportunity to rebuild stocks. The fishing industry reacted by taking the Minister to court on judicial review. The previous year Greenpeace took similar action for the opposite reasons.²³⁰

Excessive fishing pressure has stressed the snapper, paua, rock lobster, oreo and Orange Roughy and several other fisheries. Bycatch issues are a serious problem for a number of other fish stocks, and for marine mammals and sea birds as well. Declines have been very severe in the Orange Roughy and oreo dory stocks. Living long and reproducing slowly, the high prices these fish fetch encourage commercial 'mining' of their stocks.²³⁰

Several of the 100 or so commercial fish stocks have been hard-pressed in the last few decades. Although Orange Roughy's mean age at maturity is estimated at 33 years, it may in fact live to 120 or 130 years. In some populations stocks are less than half of the estimated biomass at maximum sustainable yield, with catches well above sustainability. Oreos may live even longer than Roughy. Some of the inshore fisheries including snapper, paua (abalone) and rock lobster have also come under serious pressure. Though heavily fished, some other stocks appear in relatively good shape. Hoki, for instance, though taken at high volumes in the last 10 years (100 000 - 200 500 tonnes per year) are estimated to be at healthy levels.^{9 and 230}

Maori tradition held coastal reefs to be the preserve of particular hapu (family groups) and many restrictions were placed on harvesting seafood. Many of these reefs have suffered from pollution and siltation.²³⁰

Pollution and degradation have substantially modified the character of the coast and the marine ecosystem. Exotic marine species arrive in ballast water or by other means, while species such as oysters are frequently hit by outbreaks of infections or parasites, outbreaks that may be aggravated by fishing. The causes of pilchard deaths and possible viral infections may relate to environmental stress.²³⁰

Development and pollution have caused significant losses of wetlands.¹⁸¹

Measures taken to manage fisheries for biodiversity

Work on the national strategy is, overall, confirming the appropriateness of New Zealand's programme of action for biodiversity management. The challenge lies in implementation. While the draft strategy and the existing programmes recognise New Zealand's unique biodiversity, they also recognise the losses resulting from unsustainable harvest, habitat destruction, and the impacts of alien species.

Up until 1988, environmental laws were frequently overlapping, contradictory, unclear, or riddled with gaps, and involved too many different authorities.¹⁸¹ The reform that began in 1988 was dubbed Resource Management Law Reform (RMLR), and alongside it went massive local government restructuring, which shrank 800 local government bodies to 93, including 14 politically-elected regional EPA-type agencies with watershed-based boundaries.¹⁴⁶

The Resource Management Act (RMA) took effect on October 1, 1991, as the primary legislation for managing all of New Zealand's natural and physical resources. Its aim is to achieve maximum environmental benefit with a minimum of regulation. The key requirement is that while social, economic, and cultural objectives will play an important role in decision-making, they cannot be allowed to threaten the sustainability of ecosystems. One of the more remarkable features of this reform is that New Zealand's resource management is now based primarily on watershed boundaries.¹⁸¹

In the late 1970s and early 1980s, to reduce fishing effort and over-capitalisation in the overfished inshore fisheries, ministers encouraged domestic fishers to buy larger vessels for the deeper water, and encouraged New Zealand companies to enter into joint ventures with foreign vessels to fish the EEZ. The government then cut from the inshore fishery about 80% of the vessels, or all those who got either less than 80% of their income or less than \$ 10 000 from the fishery. This was done without compensation, and lowered fishing effort by about 5%. To more effectively reduce catch, the government then rewrote the Fisheries Act and in 1986 introduced the Quota Management System (QMS). Quota was 'grand parented',¹ and

¹ On a formula based on the average of the best two of the last three fishing years.

allocations of ITQ were then bought back to reduce total effort. About 15 000 tonnes of quota were retired this way.²

Because the policy was openly debated before it was implemented, fishers fished furiously to stack up a catch history, thus worsening the problem the policy was supposed to relieve. Incentives to mis-report were also high, and may have distorted catch figures, hence stock estimates and catch limits.²³⁰

Successful appeals to the Quota Appeals Authority by fishers who had missed out through illness or vessel repairs were added onto the Total Allowable Catch, so that in some cases the fishing effort once more ballooned.²³⁰

The QMS was originally designed to give fishers access rights in absolute tonnages. As environmental conditions, information and stock estimates changed, total quota was to be adjusted by the government's buying or selling of quota. Since baseline stock estimates of significant high-value species turned out to be too high, such market-place intervention would have been a huge fiscal burden; the government did not buy back quota and fishing pressure continued. Later, economist Lee Anderson's proposal that the ITQs be transformed to a percentage share of the TACC was adopted. Fisher resistance to TACC reductions has emerged, and New Zealand fishers frequently press for catch levels above those recommended by scientists.²³⁰

Quota allocations transferred much wealth to quota recipients, who mostly got them for free. The government did require annual resource rentals, which were set very low. Quota prices are now about \$ NZ 200 000 per tonne of rock lobster, about \$ 40-60 000 per tonne of snapper (depending on the area of the stock), and about \$ 12-15 000 per tonne of Orange Roughy. These are capital prices for access to the resource, not annual charges. The high prices reflect scarcity and expectations of future rents and encourage illegal fishing.²³⁰

After the passage of the Treaty of Waitangi (Fisheries claims) Settlement Act 1992, a Maori holding entity called the Treaty of Waitangi Fisheries Commission was endowed with a fishing company and fisheries quota in recognition of aboriginal and Treaty of Waitangi rights. Once in possession of the quota, Maori pursued the logic of their case and argued that they should not pay resource rentals on what was always theirs. The government's response was to abolish resource rentals for all.¹⁸¹

Not all the commercially fished species and stocks are under the QMS. The government proposes to add another 60-100 species soon.²³⁰

Stock assessments involve open scientific discussions between the government-commissioned scientists, the industry, recreational fishers, environmental interests and, on occasion, Maori interests. The stock assessment is followed by TACC setting rounds that also consider allocations for Maori customary purposes, for recreation, and for

² Wallace, 1995. See Clark *et al.*, 1988, or Sissenwine and Mace, 1992 for the mechanics of how this was done.

environmental needs. Formal allocations for these purposes are not usually made, but are implicit in the TACC setting. Bag limits and other controls may be placed on recreational catches; similarly, a variety of gear, area, seasonal and method restrictions may apply to the commercial extractive catch. Ecosystem relationships are not commonly examined except in the context of bycatch.²³⁰

In the Chatham Rise Orange Roughy fishery the mid-season 1994-95 biomass estimates ranged from 10-16% of the original. The fisheries management target is 29%, the maximum sustainable yield. The document summarising the stock assessment plenary and workshop discussions, and so already reflecting industry input, states that 'to achieve rebuilding to BMSY (the safe stock level) by 2001-2002 would require a substantial reduction in catch, and may not be possible even if fishing ceased'.⁹

Unless explicitly allowed by a plan or permit, no one is allowed to discharge a pollutant into water. Under the RMA every New Zealander is responsible for any adverse effects his or her activities may have on the environment, and is required either to avoid the adverse effects or to remedy or mitigate them. Any individual or government agency can seek a restraining order against environmentally damaging activities; the public also has a right to a voice in all environmental decisions and planning.¹⁸¹

Research efforts or goals

No information found.

Priorities for national action

Future aims for the Marine Protected Areas Network are to improve the representativeness of the network and to create new marine reserves. The acting agency is the Department of Conservation.

For freshwater ecosystem management, aims are to improve the protection of key freshwater ecosystems and to develop regional policy statements and regional plans that address this issue. Where appropriate, establishing further water conservation orders will be considered. The agency is the Ministry for the Environment and regional councils.

For coastal management, aims are to ensure effective implementation of the biodiversity purposes of the Resource Management Act, and to develop and implement effective regional coastal plans. The acting agency is the Department of Conservation and regional councils.

Fisheries management goals are to implement the ecosystem approach to fisheries management, and to develop and carry out an implementation programme. The acting agency is the Ministry of Fisheries.

New Zealand marine management has focussed largely on extractive and instrumental values. Seabirds and marine mammals have species protection in law but often not in fact, despite reporting and observer requirements. The pressing need to unify and integrate

ecosystem-based management of New Zealand's marine environment will require changing public sector entities and their missions, new ecosystem management principles, new legislation and new attitudes.²³⁰

National or sectoral plans that include sustainable use of aquatic biological diversity

The Marine protected areas network started up only over the last 25 years and includes only a few ecosystems. Protected areas are fully protected (almost all are no-harvest) and Crown-owned. They are the responsibility of the Department of Conservation.

Freshwater and all marine species are subject to sustainable harvest (which may involve full protection in some cases). Other species are fully protected within the protected area network. Agencies include the Department of Conservation, Ministry of Fisheries, and the private sector.

The Crown holds all water rights, and central and local governments control the use of water. Many freshwater ecosystems also lie within protected areas. Agencies include Ministry for the Environment and regional councils.

Almost all foreshore and seabed within the twelve-mile limit is Crown land, administered for conservation and sustainable use. A NZ Coastal Policy Statement is in place and regional coastal plans are being prepared. Agencies include the Department of Conservation and regional councils.

Resources for meeting obligations and recommendations

New Zealand's marine administration remains a confusing collection of Acts and bodies, none of which see the sea as an ecosystem. In fisheries, significant restructuring, policy changes and law re-writes have been underway for much of the last four years. In 1995 Fisheries was split from the Ministry of Agriculture and Fisheries. Further, the research functions were separated from policy and compliance and sent to NIWA, a Crown Research Institute, a profit-seeking entity. New legislation was to pass through Parliament in 1995.²³⁰

Capacity-building measures for developing and implementing plans

What most limits implementation are lack of knowledge of key biodiversity elements, particularly in relation to invertebrates, fungi and microorganisms, and marine ecosystems; lack of cost-effective techniques, particularly in relation to alien species, ecosystem recovery and species recovery; and resource constraints.

State and priorities for expanding the ecological network

No information found.

Legislation or legislative framework for aquatic biodiversity

Primary legislation for fisheries resources includes the Fisheries Act and Conservation Act.

The primary legislation on the marine protected areas network is the Marine Reserves Act. Principal legislation for species management includes the Conservation Act, Wildlife Act, Marine Mammals Protection Act, and the Fisheries Act. Primary legislation for freshwater ecosystem management is the Resource Management Act. Primary legislation on coastal management includes the Resource Management Act, Foreshore and Seabed Endowment Revesting Act.

Fisheries matters are administered through the Fisheries Act, the coast through the Resource Management Act. Aquaculture straddles both. Mineral extraction from the sea floor and other sea-based activities which could have strong environmental impacts are not covered by the RMA beyond the coastal area, or at the most out to the 12 nautical mile limit (depending on the activity). Activities out to the 200 mile limits are covered by outdated statutes that lack provisions for public notification, disclosure or submissions. Nor do they provide for the protection of the environment.²³⁰

Cooperative mechanisms among authorities, NGOs etc. to ensure integration

Maritime safety is the responsibility of the Maritime Safety Authority; marine mammal and seabird protection that of the Department of Conservation; management of coasts primarily that of the Department of Conservation and local authorities under the Resource Management Act. The Ministry of Transport, the Ministry of Foreign Affairs and Trade and the defence agencies have further responsibilities.²³⁰

National environmental standards and policy on matters of national significance are set by the central government, which monitors the implementation of the RMA. Regional authorities, which are mostly based on watershed boundaries, have the next level of responsibility, and provide an overall policy framework for integrated resource management. Regional councils may also develop detailed plans regarding specific resource issues, but only a regional coastal plan is required. Regional councils are also responsible for monitoring the state of the environment, assessing the effectiveness of district plans and their compliance with the RMA, and monitoring compliance with permit requirements.¹⁸¹

No environmental watchdog agency has the resources or mandate to put the environmental case in local government hearings. Thus, only local governments scrutinise the environmental impacts of projects. Because local governments often lack the needed skills, scrutiny has fallen to NGO environmental and community groups.²³⁰

While some industry sectors are developing environmental standards, others continue to speak out against the costs of such standards, and are intimidating the NGO sector with the threat of court case costs.¹⁴⁶

A further reason for avoiding litigation is the present lack of sympathy in the government for the environment. Litigation could encourage the government to change the Act, which miners, farmers and other resource users are already pressing to have modified.²³⁰

In 1998 an Amendment Bill proposed changes to the RMA to clear up contradictions and to increase its flexibility to better meet the needs of business. Highly critical of the proposals, New Zealand NGOs set up the ‘Action for the Community and the Environment’ (ACE) committee. ACE charged that the government had not given the RMA enough time and support to prove itself; that privatizing the ‘consent’ process risked reducing public participation and the quality of environmental decision-making; and that limiting ‘consent’ notification was undemocratic.¹⁴⁴

Vulnerable transboundary aquatic systems

No information found.

Examples of transboundary cooperation

No information found.

Priority given to transboundary cooperation affecting aquatic biodiversity

The UN Convention of the Law of the Sea places an unqualified obligation on states ‘to preserve and protect the marine environment’ (Art 192). Other obligations and rights of exploitation are constrained by Article 192. New Zealand has not yet fully ratified UNCLOS. Domestic fisheries law may require modification to conform to UNCLOS and to other international conventions, including MARPOL, the Bonn Convention and others.²³⁰

One example of ecosystem-based principles of marine management can be found in the Convention on the Conservation of Antarctic Marine Living Resources (CCAMLR). The CEMP working group of CCAMLR has made some progress over the last ten years in making this operational.²³⁰

Significant aquatic biodiversity (freshwater and marine)

The Niger Delta in southeastern Nigeria is one of the largest deltas in the world and the third largest in Africa, covering about 20 000 km². The highest annual precipitation of about 3 000mm falls in the Niger Delta and Mangrove Swamp belt of the southeast where it rains almost 10 months of the year. Towards the north, rainfall decreases.²¹⁹

The most important drainage systems are the Niger River Basin drainage system with its major tributaries of Benue, Sokoto-Rima, Kaduna, Gongola, Katsina-Ala, Dongo, Taraba, Hawal and Anambra Rivers; the Lake Chad inland drainage system comprising Kano, Hadejia, Jama'are, Misau, Koma dongou-Yobe, Yedseram and Ebeji Rivers; the Atlantic drainage system to the east of the Niger made up of the Cross, Imo, Qua Iboe and Kwa Rivers; and the Atlantic drainage system to the west of the Niger consisting of the Ogun, Osun, Owena and Benin Rivers.²¹⁹

Between the 30 nautical mile territorial limit and the 200 nautical mile EEZ, fishery resources are mainly tuna, part of the large Gulf of Guinea stocks. Nigeria is not exploiting the tuna due to technical constraints. While tuna have been actively exploited and transhipped under the management of ICCAT, no tuna vessels are based in Nigeria. Nevertheless, landings of 1-2 000 t annually from vessels operating in the EEZ have contributed to domestic supplies in the last two years.⁷⁸

Inshore resources support a very active industrial fleet of fish and shrimp trawlers, and a huge artisanal canoe fleet. The fishers trawl for finfish and shrimps along the entire 850 km coastline, but are concentrated in the eastern portion because of the higher productivity of the waters off the delta region and the wider continental shelf. Oceanographic conditions, including poor upwelling, limit the productivity of the waters off the Nigerian coast. This is compounded by the generally narrow continental shelf. Species composition is dominated by croakers (*Pseudotolithus* spp.), grunts (*Brachydeuterus* spp.), various soles, catfish (*Arius* spp.), and shrimps (*Penaeus* spp.).⁷⁸

The artisanal canoe fleet exploits coastal waters up to five nautical miles from shore, and the vast networks of brackish waters of the Niger Delta and other major rivers, estimated to be about 858 000 ha. Small pelagics – *Sardinella* spp. and *Ethmalosa* spp. – are landed in huge quantities in season (November to April). They also land demersal species such as croakers, catfish and shynose, and target shrimp (Penaeids) in the estuaries at a convenient stage of their maturation cycle, so curtailing recruitment at sea for the industrial shrimpers.^{3 78}

³ See Mexico report on conflict over shrimp stocks between industrial trawlers and inshore fishers, under the heading 'Threats to aquatic biodiversity'.

The inland capture fishery is basically artisanal, exploiting the major rivers, their tributaries, natural lakes and various reservoirs. The catch is dominated by *Lates* spp., *Gymnarchus* spp., *Synodontis* spp., *Clarias* spp. and *Chrysichthys* spp. The total surface area of freshwater bodies in Nigeria has been estimated at almost 15 million ha. About 1.75 million ha of this are available and suitable for freshwater aquaculture. An estimated 500 000 ha along the creeks are suitable for mariculture. ⁷⁸

Present and planned uses of aquatic biodiversity

Fish contribute from 20 to 25% of *per capita* animal protein intake, and in coastal and riverine communities possibly as much as 80%. However, there is a huge supply-demand gap: 400 000 t of supply against 800 000 t of demand (1997). Little fish farming goes on. Most of the functioning farms (about 75%) are private. There are also significant exports of ornamental fish – indigenous strains of species such as *Tilapia*, *Synodontis*, guppies, etc., and imports of carp species for aquaculture. ⁷⁸

The predominant species in the coastal artisanal fishery landings (the pelagics) are preferred smoked. A huge processing industry – dominated by women – along the coast distributes to inland markets. An equally important and similar trade in the opposite direction exists for processed fish from Lake Chad and some important rivers in the north. *Clarias* spp. from Lake Chad is also preferred smoked. The major freshwater species – *Tilapia*, *Chrysichthys*, *Gymnarchus*, *Lates*, *Heterotis* – are preferred fresh, but are expensive. There is room for use of industrial by-product, such as shrimp heads from shrimpers exporting only tails, and shells from peeled undeveined shrimp (p.u.d.). Much miscellaneous fish could also be made available for processing into fishmeal, but is usually dumped at sea. ⁷⁸

Threats to aquatic biodiversity

In 1968 the Kainji dam was built on the Niger River, impounding 13 000 km². Aquatic species such as hippopotamus (*Hippopotamus amphibius*) and the local manatee (*Trichechus senegalensis*) died out, probably due to the disappearance of aquatic macrophytes. Poaching by migrant tribes caused the disappearance of crocodiles and giant tortoises. Despite the later development of a macrophytic flora of Red Burugu (*Echinochloa stagnina*), in association with False Burugu (*Vossia cuspidata*) and the floating *Sacciolepis africana* during the late 1980s, when schools of hippopotamus were sighted, the manatee has not returned. Recently the water hyacinth (*Echhorinia crassipes*) has invaded the lake. ¹⁶⁷

Such problems with the Kainji Lake and other dams and barrages in Niger Republic and in Mali raised the need for a coordinated approach to the development of the River Niger system. Benin, Burkina Faso, Chad, Cameroon, Cote D'Ivoire, Guinea, Mali, Niger and Nigeria therefore formed the Niger River Commission. The commission is more or less moribund, and uncoordinated development of the Niger system continues. The operations of the dams have increased pressure on resources and led to deforestation, erosion, river siltation and biodiversity loss. ¹⁶⁷

Lake Chad has reportedly shrunk from 25 000 km² in 1963 to less than 1 500 km² today, apparently due largely to irrigation. A study in the *Journal of Geophysical Research* states that the rapid retreat of the shallow lake threatens fish stocks and crops and could raise political tensions among the four lacustrine states, Nigeria, Niger, Cameroon and Chad.²⁰⁵

Unsustainable exploitation and environmental degradation are increasingly impairing the natural resource base of the Niger Delta on which the rural communities depend.²¹⁹

Shrimp trawling is significantly degrading the coastal demersal stock. The industry is now being seen in both its positive and negative dimensions, and it is desirable to strike a balance, using appropriate technology. Current output of the shrimp fishery is clearly way beyond potential yield estimates.⁷⁸

The artisanal coastal fishers could exploit their resources sustainably if they had absolute jurisdiction. However, the area out to five nautical miles reserved for them is constantly violated by trawlers, especially shrimpers combing the river mouths.⁷⁸

For estuarine and brackish-water fisheries, the main issue is pollution: industrial, human and geophysical. Many fishing households in this environment merely subsist, the waters around them having lost their productivity. Inland fisheries resources are also highly depleted, especially the rivers, where illicit fishing practices are rife, and erosion and siltation recur annually. The reservoirs and lakes are in a better state, under some management. Natural productivity is being enhanced by re-stocking with high-quality, hatchery-produced fingerlings, and fishing effort is under some control.⁷⁸

Water quality standards exist for several uses, but water continues to be polluted and degraded by untreated effluent discharged from industries, sewers, the failure to protect watersheds, hydrocarbon contamination of groundwater, saline intrusion of groundwater, and irresponsible mining. Reckless and unregulated tapping of groundwater aggravates the problem. These trends must be arrested.²¹⁹

Measures taken to manage fisheries for biodiversity

The Nigerian-German (GTZ) Kainji Lake Fisheries Promotion Project has put in place a management plan for the sustainable exploitation of the fisheries resources of the lake. The successful project has established the true potential of the lake's fisheries resources. In 1995, 1996 and 1997, yields were 32 474 t, 38 246 t and 28 753 t, respectively, compared to less than 10 000 t/yr recorded in the 1980s. (This followed a crash in the late 1970s after ten years of overfishing.¹⁶⁷) The project is now operating a strategy for sustainable exploitation that includes by-laws and regulations for conservation and weed control. As resources become available the management model will be applied to other important waterbodies.⁷⁸

Because sustainable development will require a balance between accelerated economic growth and environmental protection, Government and other stakeholders have developed a long-term Integrated Environmental Action Plan, 'the Niger Delta Action Plan', to address priority environmental issues in the area.²¹⁹

Under the Niger Delta Action Plan, studies have been commissioned to assess the degradation of land and renewable resources and environmental pollution and to come up with adequate mitigating measures. Workshops and seminars, drawing participants from the local communities, have discussed scientists' views on aspects of the Niger Delta ecosystem.²¹⁹

Under the Protection of Water Resources, Water Quality and Aquatic Ecosystem programme, the Ministry has carried out five activities.

(i) Nigeria Register of Dams.

Faced with the dangers of dam breaks such as the failure of the Bagauda Dam in 1988, the Government decided to complete the inventory and register of dams. The project ended in 1995 when it produced the maiden edition of the Nigeria Register of Dams.

(ii) Programme for Rehabilitation of Dams.

During the preparation of the Register of Dams and inspections, it became clear that a number of dams under distress required rehabilitation to make them safe. Since 1993 the Ministry has requested funds to rehabilitate the dams under its River Basin and Rural Development Authorities, while also persuading other dam owners to keep funds aside for the maintenance of their dams, and the rehabilitation of those under distress. Rehabilitation work on the most critical dams was to begin in 1997.

(iii) Rehabilitation of Soil Erosion Sites.

The heavy monsoon rainfall on fragile soils, particularly in eastern Nigeria, erodes hundreds of gullies every year. The Ministry has a programme for arresting the massive ecological problems in the rural areas and restoring the land as much as possible. This on-going programme is paid for out of the Two-Percent Ecological Fund.

(iv) Flood Control Programme.

Soil erosion and flood control are addressed through the Department of Soil Erosion and Flood Control created in 1991 to oversee the mitigation of these problems and the restoration of devastated lands. The Federal Ministry of Water Resources and Rural Development handles inland erosion and flooding, while the Federal Ministry of Works and Housing handles marine flood control and erosion.²¹⁹

(v) Water quality laboratories project.

In 1986 the Ministry established the Regional Water Quality Laboratories and some Reference Laboratories, to serve as Centres of Excellence and for training water-quality personnel.²¹⁹

The Federal Government, through the Ministry of Transport, has also begun ratifying the Oil Spill Convention. This should provide a legal framework for Nigeria as a maritime nation to

police its waters against pollution and other environmentally unfriendly activities in the coastal areas. Apart from this, the Ministry has developed a pollution prevention officer's course and curriculum for the training of Maritime Surveyors of Nautical Machinery and Hull Specialisation to enhance capacity for oil-spill management.²¹⁹

Research efforts or goals

The Department of Meteorological Services operates two marine stations at the Institute of Oceanography, Victoria Island in Lagos and at Eket in Akwa Ibom State. Regular measurements of sea surface temperature (SST), wave height, sea level rise and other conventional meteorological elements are being undertaken. Data obtained from such systematic observations are expected to complement the existing oceanographic database of the country.²¹⁹

The Federal Environmental Protection Agency formed a link with the University of Agriculture, Abeokuta under the FEPA-University Linkage Programme to undertake further training and research in biodiversity conservation.²¹⁹

Approval is being awaited for the study of the Impact of Climate Change on Water Resources with Particular Reference to Flood Susceptible and Drought Prone Areas submitted to the UNESCO Participation.²¹⁹

Priorities for national action

Among currently on-going priority programmes are the extension of National Parks and Reserves and the compilation of the flora and fauna of Nigeria. Only the aquatic fauna has so far been documented.²¹⁹

To ensure clean water, Nigeria's strategy is to:

- establish the Inter-Ministerial Committee on Water Shed and Water Quality Management;
- provide potable water in all urban and rural areas;
- eliminate untreated effluent discharges;
- ensure the Water Resources Decree 101 of 1993 is implemented;
- develop water-quality inventories and maps;
- restore polluted water, both surface and groundwater especially in the large cities and the Delta;
- promote research in groundwater recharge and saline water intrusion;

- develop sustainable irrigation practices for food production; and
- ensure fisheries projects be established in relevant water resources management programmes.²¹⁹

To effectively manage urban, river and coastal flooding, which affects at least 20% of the population, Nigeria's strategy is:

- to enforce compliance with town planning/urban laws/edicts;
- build embankments and levies along rivers and coastlines prone to flooding;
- establish a rainstorm early-warning system;
- establish and monitor weather stations, river and tidal gauges;
- ensure dams are managed and maintained;
- ensure existing drainage channels are maintained properly; and
- enforce environmental sanitation laws in towns and cities.²¹⁹

To eliminate the water hyacinth and other invasive plant in all water systems, Nigeria's strategy is to:

- make an inventory of the spread of water hyacinth and other invasive weeds in all the river systems;
- develop an infestation index map to determine control options;
- adopt an appropriate integrated control option to ensure that the weeds are no longer a menace; and
- encourage sub-regional cooperation.²¹⁹

National or sectoral plans that include sustainable use of aquatic biological diversity

The CBD was ratified in 1994, CITES in 1974, and the UN Convention on the Law of the Sea in 1986.²¹⁹

The Nigerian Trawler Owners' Association (NITOA) is working with government to address the numerous problems of the Nigerian industrial fishery sector, which include a limited resource base, inadequate infrastructure, unfavourable fiscal policy, inefficient resource management; and environmental concerns.⁷⁸

A Country Study on Biological Diversity in Nigeria was carried out from 1991 – 1992. The study addressed a full range of biological diversity conservation problems, and the Government is implementing most of the recommendations made. The Nigerian Biodiversity Strategy and Action Plan (NBSAP) reviews the status of biodiversity conservation in Nigeria to try to fill the gaps identified in the country study programme and develop strategies and action plans to bridge the gaps in the conservation effort. The first draft report to be discussed by stakeholders in the four identified eco-regions has been produced and circulated. Inputs from the planned stakeholders workshop were to be incorporated into the Second Draft Report to be discussed at a National Workshop pending the presentation of the final report to the Government for approval.²¹⁹

The Protected Area Programme is to identify areas and sites of conservation interest and to classify the areas identified using IOCW criteria. Only four states (Delta, Edo, Kogi and Kwara) have been visited so far.

Resources for meeting obligations and recommendations

The Government successfully took a pioneering role in fish farming the 1960s and 1970s, and subsequently disengaged from direct production as the private sector developed. Currently, lack of resources to maintain facilities and infrastructure limits the government's support for the industry.⁷⁸

Capacity-building measures for developing and implementing plans

No information found.

State and priorities for expanding the ecological network

No information found.

Legislation or legislative framework for aquatic biodiversity

No information found.

Cooperative mechanisms among authorities, NGOs etc. to ensure integration

No information found.

Examples of transboundary cooperation

In June 1998, Nigeria accomplished harmonization in the EU market for her fish products exports, mainly shrimp (head-on, headless and p.u.d.), together with sole fillets, cuttlefish and crab claws. The harmonization of Nigeria with EU regulations resulted in the listing of approved vessels. Responsibility for monitoring and maintenance of standards and

recommendation for listing/de-listing has been vested in the Federal Department of Fisheries in accordance with the EU legislation, stating the special conditions governing imports of fishery and aquaculture products originating from Nigeria.⁷⁸

The Gulf of Guinea Large Marine Ecosystem project was formulated to control water pollution and conserve biodiversity in the Gulf of Guinea. The project is regional in outlook, including Cameroon, Cote d'Ivoire, Ghana, Benin, Togo, Guinea and Nigeria. Participating agencies in Nigeria include the federal Environmental Protection Agency (FEPA) and the Nigerian Institute for Oceanography and Marine Research (NIOMR). The project is being funded by GEF and executed by UNIDO.²¹⁹

Activities include:

- a reconnaissance survey of coastal areas in Lagos and Port Harcourt by a team of GEF, UNIDO, FEPA, NIOMR and the River State Government representatives;
- training of officers of the participating agencies through workshops and seminars;
- creating awareness among the communities and NGOs through environmental enlightenment campaigns;
- studies on pollution and natural resources conservation by various universities in surveys of plankton and mangroves, coastal pollution, industrial pollution, standards and legislation, and socio-economics.

Increased stakeholder participation has boosted the success of the programme in Nigeria, especially since 1996.²¹⁹

Nigeria is part of the Global Environmental Monitoring Systems whose overall goal is to monitor the quality of freshwater throughout the country. The Federal Environmental Protection Agency (FEPA) coordinates the programme within the country. Participating agencies include the National Institute for Freshwater Fisheries Research (NIFFR), New Bussa and the National Water Resources Institute (NWRI), Kaduna. A network of stations on rivers, lakes and reservoirs has been established and instrumented to collect samples for analyses.²¹⁹

Significant aquatic biodiversity (freshwater and marine)

The greatest range in biological diversity, sizes and types of river systems in Europe is in Norway: 440 000 lakes larger than 500 m², nine of the world's 20 highest waterfalls, two of which are unregulated, and the four deepest lakes in Europe, two of which are unregulated. Anadromous salmonid stocks have been registered in 1222 rivers. Of these, 669 are salmon rivers. Sea trout is the most widespread of these species, and is found in 1185 of the rivers. Sea char occurs in 147 rivers. Norway and Iceland have the largest remaining numbers of wild salmon stocks in Europe, but many of these are in a precarious situation. Norway is the only country in the world where Atlantic salmon, sea char and sea trout occur in the same river system.

The North Sea and the Barents Sea are nutrient-rich, highly productive shallow seas and important nursery areas for a number of commercially-important fish stocks. Most of the important fish stocks in northern waters have recovered from low levels in recent years. In recent years, marine farming has strongly affected settlement patterns and commercial activity in the coastal zone, and has also become an important export industry.

Present and planned uses of aquatic biodiversity

In the last 20-30 years, Norway's fish farming industry based on genetic material from salmon populations has developed into an export industry worth NOK 7.5 billion, or one third of Norway's total fish exports. The weight of fish produced by the fish farming industry is now greater than the weight of all the meat produced by the Norwegian agricultural sector. The Atlantic salmon is the most important farmed species, and total sales in 1996 were almost 310 00 tonnes. Aquaculture production is expected to grow 10-15% yearly in the near future.

Threats to aquatic biodiversity

About 2 500 fish stocks in southern Norway have been lost to acidification. Current rates of sulphur and nitrogen deposition exceed critical loads for acidification across 25 % of Norway. Since 1988, the sulphur content of precipitation, rivers and lakes in southern Norway has dropped by about 35 %, and certain species of aquatic invertebrates are now recovering. However, nitrogen inputs have not been reduced. River deltas are heavily exploited for industry, housing, roads and agriculture. In Western and Central Norway, 86 % of the total land formerly covered by 15 river deltas has been used for infrastructure development or agriculture. Drainage has reduced fish spawning areas and habitats.

The collapse of the capelin stock in the 1980s seriously affected other important fish stocks and seabird and marine mammal populations in the Norwegian and Barents Seas. The Norwegian spring-spawning herring stock has now recovered from its 1960s collapse to

become once again one of the most important resources for the Norwegian fishing industry, but the capelin stock will remain at a very low level for the next two years. Fish stocks in the North Sea are still very low, particularly of North Sea herring and mackerel. Large nutrient loads from the continent mainly affect the Skagerrak coast. The Kattegat and parts of the North Sea suffer from eutrophication. In some fjord basins, the deepest water layers are also deoxygenated as a result of nutrient enrichment, and the fauna in such areas has almost been wiped out.

Overfishing has had major effects on relationships between species and stocks, but this effect is now more or less restricted to North Sea fish stocks, lobster, and wild salmon stocks. Alien species introduction is also a growing problem, and petroleum activities on the Norwegian continental shelf have polluted large areas of the seabed, as much as 100 km² around some installations.

Together with acidification caused by long-range transport of air pollutants, hydropower development has caused serious losses and placed heavy pressures on river systems. Watercourse regulation, pollution and acidification, the spread of disease and parasites, and the genetic impact and other effects of the large numbers of escaped farm salmon have led to declines in many populations and overall numbers of wild fish. Freshwater fish species have also fallen to some extent in recent years, though less markedly than anadromous species.

Measures taken to manage fisheries for biodiversity

Management for the herring and capelin stocks now take account of the key role these species play in their ecosystems. In general, game stocks are currently large enough to give a satisfactory sustainable yield. In order to preserve genetic material from endangered salmon stocks, the environmental authorities have for several years been building up gene banks.

To mitigate effects of development, pollution and acidification, a five-year freshwater fish programme started in 1994 includes measures to strengthen the local fisheries administration and to encourage municipalities and fishing rights holders to take greater part in management. In 1996, a coordinated state coastal inspectorate began to strengthen control and inspection measures in marine and coastal areas. The environmental authorities also began a major Agenda 21 programme in 1997 to ensure that the local administration is based on management plans by the year 2006. Norway has also focused on local coordination and awareness-raising, which also entails obligations for holders of fishing and other rights and users to strengthen species management. Another programme is to be extended to cover all municipalities in 1999. Each municipality is drawing up its own plan for biological diversity, and classifying all relevant ecosystems (river systems and other outfield areas) according to the value of their biological diversity.

Norwegian river systems that have not been protected or already exploited for hydropower account for about 23 TWh or 13 % of Norway's total hydropower potential. A new review of the remaining resources is planned, which will take account of the provisions of the CBD. At present, 341 localities, whole river systems or parts, are protected against hydropower

development. At the same time, a concerted national effort has been made to cut pollution, generally with good results.

The interplay between marine and terrestrial ecosystems are crucially important in Arctic ecosystems such as Svalbard. Protected areas therefore extend four nautical miles out to sea. Currently, fluctuations in the Svalbard char populations appear to be entirely natural. The greatest threat to Svalbard is the prospect of changes in the marine ecosystem in the Barents Sea.

The Ministry of Trade and Industry, in cooperation with the environmental authorities and the industrial sector, has made a major contribution to the reduction of environmental pressures related to pollution. The main policy instrument in this field is the Pollution Control Act. Emissions of SO² from industrial processes have been reduced by about 68 % from 1980 to 1995, and industrial emissions of the most hazardous substances to air and water were reduced by 80-100 % in the ten years up to 1995. The latter cuts have considerably improved environmental conditions in a number of fjords and river systems. Industrial discharges of nutrients (nitrogen and phosphorus) have also been substantially reduced.

Until now, oil companies have monitored the environmental impact of their activities on the Norwegian continental shelf, and areas immediately surrounding the installations have been monitored. Focus has gradually moved from the seafloor to the water, and new guidelines (1996) require monitoring to continue around the installations, but the number of measuring stations has been reduced. A network of new stations is planned between installations, thus covering the whole of the Norwegian shelf, using a fixed grid of stations where the oil and chemical content of fish and plankton will be monitored. The Government also considers it important to ensure reductions in discharges to water of oil and environmentally hazardous chemicals in the next few years. When new petroleum deposits are found and such fields are developed independently of earlier projects, no environmentally hazardous discharges as a general rule will be permitted. Discharges to water from existing fields will be carefully reviewed and zero-discharge solutions will be introduced where practicable. This review is to be completed in about 2000 and measures are to be implemented by 2005. Discharges from exploration activities and pre-drilling are also to be limited, but it will not be possible to extend the zero-discharge principle to these activities.

Municipalities have primary responsibility for land use planning in Norway. In recent years much of the authority for natural resource management has also been delegated to them by the central authorities, e.g. legal authority pursuant to the Act relating to salmonids and freshwater fish. Given that that management of total biological diversity will depend highly on land use, municipalities clearly have a key role in the conservation of biological diversity in Norway.

The fisheries authorities will try to ensure that the whole marine food chain, including benthic species, commercial and non-commercial species, seabirds and marine mammals, is taken into account in marine resource management. Further development of multi-species management will be given high priority. Species monitoring and the development of

fisheries technology to devise fishing techniques that give greater protection to young fish and non-target species will expand.

Research efforts or goals

Research and development programmes seeking more data on food chains have provided a good basis for monitoring marine biological diversity, and have resulted in a joint strategy report drawn up by the fisheries and environmental authorities (DN-report 1995-7 Strategy for monitoring of biological diversity). Water resources authorities have not begun research directly concerned with biological diversity during the period covered by this report, but research on issues specifically relevant to general watercourse management is also relevant to biological diversity.

Up to 1997, two major research programmes had been carried out, one on biological diversity and one on sustainable management of shared biological resources. A strategy for monitoring biological diversity has also been drawn up (DN report 1995-7). The monitoring programme is to be fully operative by 2003. The information is to be used by all relevant sectors, which are to provide some of the funding needed to run the programme.

Extensive arrangements exist for monitoring inland waters, particularly long-range transport of pollutants, nutrient enrichment and hazardous chemicals, acidification, disease, infections and alien species, regulation for hydropower purposes, and escaped farm fish. Norwegian rivers with stocks of anadromous salmonids are also monitored and classified to decide on management and to draw up guidelines for open seasons for fishing.

The fisheries and environmental authorities are cooperating on the development of a new system for modeling and monitoring fish farms. The system will specify thresholds for acceptable environmental impact and include a monitoring system and simulation model for calculation of environmental impact (discharges of organic material and nutrients), so that environmental impacts of fish farms do not exceed the carrying capacity of the locality. Further efforts are required in certain fields, particularly to reduce escapes from salmon farms. Escapes reported dropped from 700 000 to 300 000 salmon from 1993-1996, but the proportion of farm salmon in Norwegian rivers has remained relatively stable and gives cause for concern.

A major research programme on the impacts of development on river systems has been started, and will provide important information that can be used in EIAs. The Ministry of Petroleum and Energy has begun a research and development programme called 'Fish, oil and oil pollution contingency planning'. The Ministry of Fisheries, the Ministry of the Environment and the Ministry of Petroleum and Energy have appointed a working group on bio-monitoring, the long-term effects of oil and chemicals and produced water.

Furthermore, five studies have been carried out to identify the effects of possible exploration activities in the Skagerrak on the west coast of Sweden, and a report summarizing the results has been produced for the Swedish authorities. The Norwegian Oil Industry Association has

carried out an environmental programme on emissions to air and water from upstream petroleum activities.

Priorities for national action

Cooperation with the EU in the North Sea will be given priority, and Norway will urge the EU to introduce legislation preventing catches of young fish and fry and prohibiting dumping of bycatches. The work being done by the NEAFC and the NAFO will also be given high priority as a means of achieving better arrangements to ensure sustainable use of migratory fish stocks in the open sea in accordance with the UN agreement on high seas fisheries. Although use of medicines in aquaculture has dropped to a relatively modest level, the goal is to reduce this still further. Greater efforts will also be made to develop fish medicines that do not have undesirable environmental effects, and an approval scheme for such products is to be established by the year 2000. The amounts of other chemicals used in the industry are also to be reduced. The project for the development of a new system for modelling and monitoring fish farms has been followed up by full-scale tests at selected fish farms along the coast. The fisheries and environmental authorities are now considering how the project results can be implemented in the overall administration of the industry. In 1997, a stricter technical approval scheme is to be introduced for all new aquaculture facilities.

The Ministry of Fisheries is administratively responsible for fishing, whaling and sealing, aquaculture, seaweed harvesting, ports and coastal shipping. To conserve biological diversity and sustainable fisheries and aquaculture the authorities will:

- Continue restrictive quota and control and inspection policies and strictly regulate capacity and structure of the fishing fleet.
- Further develop a multi-species management regime, and develop selective fishing techniques.
- Reduce emissions from the fishing fleet, fish farming, industry and petroleum.
- Reduce escapes from fish farms and take preventive measures to reduce the spread of disease and the use of drugs.

Fisheries authorities have invested significantly in the development of satellite-based communication systems for use in resource and quota control. Another important field of research is fisheries technology and fish behaviour; sorting grids for trawls ensures that young fish and fry are not caught accidentally, and a method of preventing catches of seabirds in long-lining gear has been taken into use. Several measures have been implemented to reduce pressure on fish stocks. The Norwegian fishing fleet is regulated by licences, and in recent years a scheme has been introduced that rewards shipowners who remove vessels permanently from the fishing fleet with an extra quota for their remaining vessels for a certain number of years.

Climate changes have been followed for more than 60 years, to track their effect on food chains. The goal is to develop multi-species management. The model is already being used as part of the basis for quota recommendations for cod, capelin and Norwegian spring-spawning herring.

Norway's 5000 km of coastline includes many fjords, islands and clean waters that provide uniquely suitable natural conditions for marine farming. Every aquaculture production facility for fish and shellfish is required to have a separate license from the fisheries, agriculture and environment authorities.

Preventive measures and vaccine developments have dramatically reduced consumption of antibiotics, and by 1996 the industry accounted for less than 4 % of total consumption in Norway. A new Act relating to measures against disease in fish and other aquatic animals has been adopted, and entered into force on 1 January 1998.

This focuses more closely on the relationship between the aquaculture industry and wild stocks and on overall environmental conditions. Pollution from the industry has also been greatly reduced by recycling more than 90 % of the fish waste and steeply reducing nutrient discharges. Protected zones where no new fish farms may be established have been established near the mouths of salmon rivers, and the control of fish farms and requirements for improvements of installations and operating routines are under continual evaluation.

Salmon lice (a fish parasite) pose serious problems for the fish farming industry. An action plan has been drawn up to combat the parasite, and efforts to find efficient and environmentally acceptable solutions to such problems will continue to be given priority.

National or sectoral plans that include sustainable use of aquatic biological diversity

In 1994, the Ministry of Fisheries, the Ministry of Agriculture, the Ministry of Education, Research and Church Affairs, the Ministry of the Environment, the Ministry of Trade and Industry, the Ministry of Petroleum and Energy and the Ministry of Transport and Communications drew up sectoral action plans for the conservation of biological diversity.

Those sectoral plans drawn up in 1994 have been useful in preparing the report to the Storting. Priority will be given to their revision and to the preparation of a national action plan to hasten implementation of the Convention. Coordinated sectoral environmental action plans are also being developed. As the sectoral environment plans are further developed, they will incorporate the action plans for biological diversity.

The Government has been working systematically to develop stronger cross-sectoral frameworks and obligations. Each year since the end of the 1980s, the Government has drawn up a cross-sectoral environmental budget together with the ordinary state budget. In this, each ministry sets out its contribution to environmental protection.

To ensure that the requirements for a real contribution are further developed, a review of all expenditure in the state budget is planned with a view to eliminating subsidies and financial arrangements that degrade biological diversity.

The fisheries authorities are responsible for administering the Aquaculture Act, the agricultural authorities for the Act relating to measures to counteract diseases in aquatic organisms and the environmental authorities for the Pollution Control Act and for the management of wild salmon stocks. These authorities are cooperating on environmental goals for the industry, which in order of priority are escapes, diseases, medicines, chemicals and organic waste.

The Coast Guard has been assigned wider control and inspection duties in recent years, as regards ecologically sound management of fish stocks and environmental inspection in various fields.

In their sectoral plan, the water resources authorities described how biological diversity and other environmental issues have been given increasing weight in connection with both hydropower projects and other related developments, such as the construction of power lines.

However, since the sectoral plans were completed, the power market has changed radically, and export and exchange agreements with other countries, growth in domestic electricity consumption and government policies concerning greenhouse gases and the CO₂ budget have resulted in renewed interest in hydropower developments. Parts of Norway suffered severe flooding in 1995 and drought in 1996, thus focusing more attention on the demand for power. In 1997, a committee was appointed to review the period up to 2020. A report was expected in spring 1998.

National Policy Guidelines were been adopted to safeguard permanently protected river systems against development for purposes other than hydropower production, and entered into force at the end of 1994.

The Master Plan for Water Resources includes an evaluation of the undeveloped water resources of Norway. Norway's total hydropower potential is about 177 TWh per year, of which about 115 Twh per year has been developed for electricity generation. The remaining development potential is about 15.2 TWh classified in category I in the Master Plan, and about 9 TWh per year that will currently not be considered for development in category II.

The Protection Plan for Water Resources is administered by the water resources authorities and was drawn up in cooperation with the environmental authorities. It lists watercourses that are permanently protected against hydropower development.

The Storting laid down a number of restrictions on oil exploration activities, based on the EIAs carried out for the Skagerrak and the Norwegian Sea, and refrained from opening large areas of the two seas.

Reorganization of the public oil pollution emergency services should have been completed by about the year 2000, and it was expected that central goals would be achieved without substantial changes in the use of policy instruments. However, it will be considered increasingly important to coordinate the use of resources and to cooperate with other parties in the emergency response system and to focus on oil pollution emergency services in northern waters.

Resources for meeting obligations and recommendations

No information found.

Capacity-building measures for developing and implementing plans

No information found.

State and priorities for expanding the ecological network

No information found.

Legislation or legislative framework for aquatic biodiversity

The Government adopted National Policy Guidelines for protected watercourses pursuant to the Planning and Building Act in 1994. These set out a framework for all administrative tasks of local and central authorities that may have an impact on protected river systems. Considerable efforts are being made to ensure the Guidelines result in river systems being protected against a wider range of developments and impacts.

The Wildlife Act relating to salmonids and freshwater fish provides the legal authority for the management of fish found in river systems, but applies only to a limited extent to other elements of the freshwater fauna and flora.

The most important work in progress is a new Act on Watercourses and Groundwater (Water Resources Act). Proposals include provisions to prevent environmental degradation by development in rivers that are permanently protected against hydropower development. The new act will also apply to conservation of riparian vegetation, ponds and small water channels.

Cooperative mechanisms among authorities, NGOs etc. to ensure integration

There is a great deal of public and media interest in all major hydropower development cases in Norway. NGOs are frequently involved in these cases.

Vulnerable transboundary aquatic systems

The North Sea, Barents Sea.

Examples of transboundary cooperation

Norway has ratified The Convention for the Conservation of Salmon in the North Atlantic (NASCO), intended to help conserve, restore, enhance and rationally manage salmon stocks.

Cooperation with the EU was mentioned in the summary. In the period covered by this report, Norway and Russia introduced a requirement to use sorting grids in shrimp and cod trawls in the Barents Sea. Norway and Russia are also cooperating on surveys and monitoring of radioactive pollution in the Barents Sea. The results of climate change modeling have underpinned more recent research cooperation with Russia, which has led to developing a multi-species model reflecting interactions between stocks and between different levels in the food chains.

Norway and Russia cooperate closely on environmental issues. A new Norwegian-Russian working group for biological diversity was established in 1997. Topics that will have priority for now are protection of areas, species protection, sustainable use and sectoral integration, monitoring and local cooperation.

In addition, Norway is involved in environmental cooperation with Eastern European countries, particularly with Lithuania and Latvia. Norway has also signed an agreement on an environmental cooperation programme in the Barents region. The environmental authorities in Latvia have made a national study of biological diversity in cooperation with Norway, and a similar project has been proposed for Lithuania. A national study on biological diversity has also been carried out in Indonesia within the framework of its environmental cooperation agreement with Norway.

Norway has ratified the OSPAR (Oslo and Paris) Conventions for the protection of the marine environment of the Northeast Atlantic, and is helping to develop the Arctic Environment Protection Strategy (AEPS) under the auspices of the Arctic Council, together with the other seven Arctic states. Monitoring pollution and climate change will be a central element of AMAP's future work, while threats to and monitoring of biological diversity in the Arctic are now being given priority within the CAFF programme.

Since the Convention entered into force Norway has played an active role in efforts to improve the scientific basis for implementing decisions under the Convention. Two international conferences were held in Trondheim, the first in 1993 on biological diversity and the second in 1996 on Alien Species. In addition, Norway held a workshop on biodiversity in inland waters in June 1997 with Sweden and some developing and Eastern European countries. The workshop results will be used in developing the work programme on freshwater biodiversity under the CBD.

Assistance in the fisheries sector in countries in southern Africa include surveys of fish stocks, research, development of legislation, arrangements for determining quotas and the establishment of fisheries inspection systems. Use of the research vessel *Dr Fridtjof Nansen* and cooperation between Norwegian experts and institutions in the recipient countries has

given very satisfactory results. The FAO has, with support from NORAD, used *Dr Fridtjof Nansen* for natural resource monitoring along the coast of northwestern Africa.

Significant aquatic biodiversity (freshwater and marine)

Ranked No. 2 in catches among maritime fishing nations,¹³⁴ Peru has jurisdiction over approximately 863 000 km² of the Pacific Ocean.

Continental waters are divided into three major basins (Pacific, Amazon and Titicaca) and comprise over 12 000 lakes and lagoons. Biodiversity both terrestrial and marine is high. Almost seven hundred fish species are found in the Amazon Basin.

At the species level, between 60% to 90% of the total number of expected marine and terrestrial vertebrate species are already known. With the exception of butterflies, crustaceans and mollusks, information on microorganisms, fungi, marine and terrestrial invertebrates is scarce.

Present and planned uses of aquatic biodiversity

The marine fishery provided between 6.8 and 11.3 million tons (1992 and 1994 respectively) from 30 species. In 1993, 1.7 million tons of fishmeal brought in US\$ 541 022 000, or 23% of the 1993 export income. In 1996, fishing accounted for 1.3% of the total GDP. Fishing employs about 60 000 people.

Six percent of all fish catches is for human consumption; the rest is made into fishmeal and other products. Fish from the Amazon Basin are used for decorative purposes or for human consumption, as it is the main source of animal protein (60- 70%). Of the 697 fish species found in the Amazon Basin, 30 provide an estimated 10 000 metric tons per year sold on the market for human consumption and at least an equal amount is consumed directly and not sold on the market.

Fishing of ornamental species (107 species) generates direct and indirect employment for more than 3 000 workers (Hanneck, 1982 quoted by TCA, 1995). In good years, fishing exports can generate up to US\$ 1 000 000, ranking second after lumber.

Threats to aquatic biodiversity

The major threat against Peru's biodiversity is improper land management, inadequate resource management, highly polluting technologies, lack of trans-sectoral agreements and breach of laws.

Over-exploitation is a particularly important threat to marine biodiversity.

Fish, such as the *paiche* (*Arapayma gigas*) in the Amazon Basin, and endemic species (*Orestias* spp. and *Trychomycterus* spp.) in Lake Titicaca are quickly becoming endangered. Among marine organisms, the seahorse (*Hippocampus ringens*) could also be considered

endangered. Two years ago, 1 MT of these seahorses was fished out of Laguna Grande in Paracas, for sale as an ornamental species.

Over the last decade about half of the wetlands on the southern coast (between Paracas and Ite) have disappeared. Despite efforts to preserve and recover the mangrove swamplands in the northern coast, over the past decade they have shrunk by almost a quarter. No national inventory exists on the adverse effects on wetlands, nor is there any historical reference concerning their original extension.

Mining, oil drilling and other industries and illegal activities are the main sources of the water pollution threatening Peru's biodiversity and water itself. Marine contamination is caused by domestic and industrial waste and mining tailings. While both domestic and industrial waste are important because of their volumes, mining tailings are important because they are highly toxic.

Economic measures to promote investment have encouraged mining. Correspondingly, an alarmingly higher amount of tailings are being released into water. Mercury used in gold mining seriously pollutes water. Furthermore, mining has stripped about 81 000 hectares of forest edging riverbeds in the area, especially in the Department of Madre de Dios, in the midst of the Peruvian rainforest.

On the coast, 10% of the mining companies continue to drain their tailings on the shore. Since the PAMA or Environmental Adaption Plan has been implemented, 90% have built some sort of deposit or grounds. The major direct mining tailings come from Marcona (Ica) and Ite (Tacna).

The appearance of azoic areas without benthic communities, in the Pisco and Chimbote bay areas, is directly caused by fishmeal and fish oil plant pollution. The high organic discharge drastically lowers the amount of oxygen in the water.

Domestic waste is perhaps the major pollutant dumped into the ocean and rivers near urban areas. According to information collected by DIGESA, barely 60% of coastal urban areas have sewage systems.

The oil industry in Peru today has become much more active, particularly on the northern coast, which significantly increases the risk of an oil spill. Spills have inadvertently flushed brine (amongst many other pollutants) into the Tigre, Pastaza and Marañon Rivers.

The ravines and rivers of the Peruvian rain forest are being severely polluted by chemical ingredients used to make basic cocaine paste (PBC) out of coca leaves. These ingredients are flushed into streams and rivers. According to a study by Buenaventura ⁴(1986, quoted in the November 25, 1994 issue of *El Peruano*, Peru's official newspaper), 57 million liters of kerosene, 32 million liters of sulphuric acid, 16 metric tons of quick-lime, 6 million liters of

⁴ A Peruvian mining company.

acetone, and 6 million liters of toluene are used to produce 400 tons of PBC in the Alto Huallaga.

Measures taken to manage fisheries for biodiversity

Each year since the General Law on Fisheries was approved in 1992, the Ministry of Fisheries has launched its 'Programme for the Follow-up and Control of Hydro-Biological Resources' along the Peruvian coast. This programme covers control over unloading centers, docks and wharfs, allowable fresh/live fish catch, (cooled, frozen or cured, sea food and shell fish), smallest allowable size, tolerance percentage, fishing bans, as well as control of fishing gear, minimum length of fishing nets (except for anchoveta, sardine, jurel and caballa) and other regulations to govern the preservation and exploitation of hydro-biological resources.

In the Pacaya-Samiria National Reserve, efforts have been made in concert with the local fishermen towards regulating the catch for *paiche*. The Ministry of Fisheries has recently forbidden the catch of this species in all the rainforest, except for the Putumayo River Basin.

At the Tumbes Mangrove National Sanctuary surveys are underway on monitoring the conchas negras (*Anadara tuberculosa*) populations and improving the fishing gear for prawns (*Pennaeus vannamei*), as well as monitoring the mollusk and crustacean trade.

In the Paracas National Reserve, as part of the wetlands strategy, bio-ecological surveys have been undertaken on scallops (*Argopecten purpuratus*), identifying areas for larvae capture. The Ministry of Fisheries has issued a Ministerial Resolution restricting the capture of larvae in these areas.

At the Tamshiyacu-Tahuayo Community Reserve (on a regional level), under a Community Management Fishing Plan non-residents are forbidden to fish with the use of refrigerated storage facilities and, in general, all fishing methods have been restricted.

The Ministry of Fisheries has decreed the restriction of a five-mile coastline water strip to preserve artisanal fishing. Since 1995 the Ministry of Fisheries has forbidden⁵ the catch of marine turtle species and marine cetaceous species as well as Amazon dolphins and has declared these species to be protected by law.⁶ However, no mention has been made of accidental catches.

As concerns the large quantities of scallops found in the breeding grounds in the Paracas National Reserve, 47 000 MT were harvested in 1985, damaging its population. In 1990, the catch dropped to 1 000 MT and in 1994 and 1995, to an estimated 4 000 MT. To aid recovery the Ministry of Fisheries has limited the catch of scallop larvae in the Paracas National Reserve and solely authorizes re-population initiatives.

⁵ MR 103-95-PE

⁶ Law 26 585

Concerning the fishing sector, the Regulation of the General Law on Fishing specifies that the importation of hydro-biological ornamental species requires authorization by the Ministry of Fisheries.⁷

No regulations govern the introduction of exotic species in natural aquatic environments (for instance, rainbow trout and Malaysian shrimp). However, tilapia breeding has been forbidden in natural and artificial environments throughout the Amazon Basin.⁸ The Ministry of Fisheries and the IIAP are assessing the impact of introducing exotic species in the Huallaga Basin to determine the possibility of re-introducing tilapia fish farms.

The regulation on the Law of Fishing specifies that ‘whenever a new species is introduced into Peru, a corresponding Environmental Impact Assessment must be also carried out and submitted’. If native species are to be transported to other ecosystems throughout the national territory, the Ministry of Fisheries has to issue an authorization.⁹

Plans regulate the fishing of highly commercial sea species, establishing the allowable size of the catches and the temporary closed seasons to allow for their reproduction. Plans are in effect for tuna, hake and its 16 accompanying species and are under preparation for anchovy, sardine, prawn, jack, mackerel and scallops. The regulations issued by the Ministry of Fisheries for the Peru’s continental waters for 1997 include closed seasons during the breeding period, on *paiche* throughout the Amazon region, except on the Putumayo River; *suche* (*Trychomycterus* sp) in Puno; and *boga* (*Orestes pentlandi*) and *mauri* (*Trychomycterus* sp) everywhere they are found.

In the latter case, Lake Umayo in Puno has been established as a fishing reserve for the recovery and study of *boga*, *suche* and *mauri*, which are native to the Andean highlands plateau. Even the exotic species of trout and silversides, both introduced into the lake, have been declared off-season. Stocking was stopped because of adverse effect of the silversides on the native species.

A temporary closed season has also been declared on the fishing of river shrimp (*Cryphiops caemantarius* y *Macrobrachium spp*) on the western slope of the Andes. The ending date will depend on the results of studies to be made.

No legislation deals exclusively with sea fish farming, although general guidelines do exist as part of the General Fishing Law and its Regulations.

⁷ Art. 67

⁸ Supreme Decree 002 91 PE

⁹ Art. 126

Research efforts or goals

The Marine Institute of Peru (IMARPE) conducts scientific and technological research on ocean and continental waters and their living resources with a view to using them rationally without interfering with research other institutions may be doing. The Marine Institute of Peru, whose main office is in the port of Callao, provides the Ministry of Fisheries with the scientific basis needed to secure rational management of ocean and continental water resources. IMARPE puts out statistics and publications concerning the results of its marine resource and physical and chemical evaluations and characteristics, by monitoring the seawater from the shore out to the 200-mile limit.

Priorities for national action

All Peruvian ecoregions have been qualified as top priority with the exception of the Marañón River Dry Forest, the Southern Rainforest Savannah, and the Japurá-Rio Negro Humid Forest.⁶³ The Peruvian Ocean, due to the socio-economic importance of its biological diversity and the threats it faces (overexploitation, pollution) is one of the top priorities.

The Wetlands Strategy has pinpointed 46 priority conservation zones: 11 wetlands alongside the coastline, mixed with mangroves, one estuary, lagoons, swamps, bañados (tidal areas) and one coastal area. In the highlands, the Strategy recognizes 28 wetlands amongst lakes and lagoons, and 7 areas in the rainforest.

Other important aquatic environments could be included: the area bordering the Pastaza, particularly Lake Rimachi (79 km²), the Amazonian lagoons such as Lagartococha, Papayacu, Quistococha and Supay (Department of Loreto), the Sauce Lagoon and ONERN Cocha (Department of San Martin), and the Pomacocha Lagoon (Department of Amazonas).

National or sectoral plans that include sustainable use of aquatic biological diversity

Since there is no national strategy on conservation and the sustainable use of biodiversity, there are few trans-sectoral policies.

The National Environmental Council (CONAM) is in charge of defining and implementing the national policy on the environment, by taking into account the different viewpoints and interests of each Ministry and by encouraging the participation of the private sector. CONAM is under the responsibility of the President of the Council of Ministers. CONAM's Board of Directors are the Minister of Economy and Finance, the Minister of Fishing, the Minister of Agriculture, the Minister of Energy and Mines, the Minister of Health and the Minister of Industries, Trade, Tourism and Integration (MITINCI).

CONAM's mandate is to implement the Convention on Biodiversity, the Framework Convention on Climate Change, and the Convention on Desertification and Drought within the national territory. One of CONAM's objectives is to develop an Environmental

Management System (EMS), a National System for Environmental Information and a National Strategy for Sustainable Development.

National objectives include adopting a holistic approach to terrestrial and aquatic management by applying watershed management, and to prevent terrestrial and aquatic ecosystem pollution and degradation through conservation and management. It is proposed that each watershed be considered an environmental planning and management unit.

The *Wetlands Strategy* prepared under the RAMSAR Convention, ratified by Congress in 1991 and approved by INRENA in 1996, has pinpointed some of the most important problems affecting Peruvian wetlands:

- pollution caused by tailings, fuel and agriculture;
- habitat destruction due to agriculture, over-grazing of herds, over-harvesting of the totora weed, and building of roads and other infrastructure such as dams.

The Ministry of Fisheries and the Ministry of Agriculture are both seriously concerned about alleviating poverty and promoting ways of managing resources, for example, through aquaculture and wildlife farms. The profit levels of these new management models as well as their sustainability have not yet been confirmed. Nevertheless, these alternatives must be compared to wildlife management, which may be more profitable and which matches more closely the social and economic reality of Peru.

Capacity-building measures for developing and implementing plans

No information found.

Legislation or legislative framework for aquatic biodiversity

Of the approximately 4 200 laws on the environment which exist, 500 have been adopted over the past decade. The Ministry of Fishing issues laws jointly with the Ministry of Health and the Ministry of Agriculture concerning the use of insecticides and pesticides to avoid killing hydro-biological species and polluting ocean and continental waters.

The Law on the Conservation and Sustainable Use of Biodiversity (Law 28839) is undoubtedly the best contribution for the development of the legal and political framework for the conservation and sustainable use of biodiversity in Peru. Article 1 specifies the principles and definitions of the Convention of Biodiversity (CBD) and recognizes the future National Biodiversity Strategy as the main planning instrument to fulfill the objectives proposed by the law and by the CBD. As concerns the political framework, this law stipulates trans-sectoral biodiversity cooperation and follow-up on the commitment assumed in the Convention and in the law itself.

The Law on Protected Areas¹⁰ modernizes the management of a Protected Area. This law broadens the concept of a Protected Area from an area to a space, and incorporates marine spaces. It includes new definitions for management categories and mentions new categories and the possibility of establishing private and regional Protected Areas. At present, this law has not been regulated and consequently the 1977 Conservation Unit regulations remain in force.

The Law for Private Investment to Develop Economic Activities on State-owned Lands and Land belonging to Indigenous Communities¹¹ and its Regulations¹² have several outstanding points on the conservation and sustainable use of biodiversity. They include the incorporation of the concept of a protected ecological zone in the rain forest, emphasizing its sustainable use.

The law also clearly indicates that all protected land and riverbeds, shores and marginal stretches of rivers, streams, lakes, shall no longer be recognized as uncultivated land or be classified as such. Consequently, these lands can no longer be auctioned just because they are not being used for agriculture or livestock.

Cooperative mechanisms among authorities, NGOs etc. to ensure integration

Four macro-regional centers involving 15 Regional Technical Committees have been established to implement local processes. Each has members from different sectors: a government organization which has a solid presence in the area; a local state university (preferably a DNDB associate); an NGO which works heavily in the area; a member of the Transitory Regional Management Council, and a representative of local government.

The General Port Authority and Coast Guard Bureau of the Peruvian Marine Corps, Ministry of Defence, is in charge of patrolling the coastline, while the regional fishing bureaus are in charge of monitoring continental waters.

Examples of transboundary cooperation

During talks held by the High Commands of the Armed Forces of Peru, Ecuador and Chile, the Peruvian Navy proposed organizing a joint oceanographic cruise for the last quarter of each year, starting in 1999, to monitor ocean-meteorologic conditions of the region. Each month of May since 1998 the Navies have also been used in the regional study of the El Niño Phenomenon (ERFEN), within the ‘Comisión Permanente del Pacífico Sur’ (CPPS).¹¹

The UNDP-GEF-funded project ‘Regional Support for the Conservation and Sustainable Use of Natural Resources in the Amazon’ aims to develop a regionally compatible

¹⁰ Law 26834

¹¹ Law 26505

¹² D.S. 11-97-AG

geographic information system. It also aims to enhance institutional capability in eight nations to manage protected areas, rehabilitate degraded lands, institute suitable zoning plans, share information and help the Amazon Cooperation Treaty to develop regional strategies. Efforts will be made among indigenous peoples to identify specific traditional knowledge and encourage adoption of these practices by local communities region-wide.²²⁵

The UNDP-GEF-funded project ‘Conservation of Biodiversity in the Lake Titicaca Basin’ adopts an ecosystem approach and places emphasis on working directly with indigenous peoples and local communities and on establishing clear integration of conservation and development efforts. (All of these aspects are given priority in the Convention on Biological Diversity).²²⁵

Another UNDP-GEF-funded project is ‘Integrating Global Environmental Dimensions into Public Policy Making in Latin America: A Multi-sectoral and Participatory Framework.’ Resources will be used to finalize the design of a full-scale proposal to advance the incorporation of global environmental issues into the public policy debate in six countries in Latin America. The full-scale project will target key decision-makers from the public and private sector, the NGO community, the mass media and through them the general public.²²⁵

Significant aquatic biodiversity (freshwater and marine)

Aquatic ecosystems include lakes, ponds, rivers, streams, freshwater marshes, peat swamps, mangrove swamps, *nipa* swamps, mudflats, seagrass beds and coral reefs; and man-made aquaculture ponds and reservoirs. Freshwaters have a rich diversity of fauna (3 675 species). These consist of algae, aquatic macrophytes, aquatic invertebrates, insects and fisheries. While inventories of these groups have yet to cover the 78 lakes, 42 major rivers, 4 major swamps/marshes and the many bays, estuaries and mudflats of the Philippines, the initial biodiversity record contains 5 291 species¹⁷⁷

Coastal and marine ecosystems have at least 4 951 species of marine plants and animals. Of these, 1 396 species (28%) are economically important, 403 species (10%) are flagship species, while 142 species (2.4%) are under threat, 15 species are listed as endangered, and 16 species are endemic.¹⁵⁹

Marine taxa diversity is high in the South China Sea Zone in the west and lower in the Pacific Ocean Zone. High marine biodiversity areas include Central Visayas, North and Central Luzon, Southern Luzon, and Mindoro.

Distribution and recruitment of marine organisms point to the importance of the northern Philippines for the straddling stocks of migratory species such as tuna, mackerel and sardines. The reef areas in the Spratly's Islands may play a crucial role in providing larvae for the rest of South China Sea; larvae coming from Palawan could also be carried down to Borneo or Malaysia. Hence, the Philippine reefs may be a rich source of genes and biodiversity for various parts of Southeast Asia.

Coral reefs are the most diverse ecosystems along the Philippine coasts: 3 967 species in about 25 000 km². Four hundred species of hard corals belong to 70 genera.¹⁵⁸

Next to coral reefs, seagrass beds are the most species-diverse with 481 species. The 16 taxa of seagrasses give the Philippines the second highest seagrass species richness in the world.

The diversity of Philippine mangroves has also been found to be high, at 370 species.¹⁷⁷ On the other hand, the soft bottom communities have the lowest recorded species richness, of 70 species.

Present and planned uses of aquatic biodiversity

No information found.

Threats to aquatic biodiversity

Habitat destruction from siltation and destructive fishing methods, overexploitation due to population pressure, poverty and paucity of opportunities, changing values, the open access nature of many bio-resources, pollution of wetlands from mine tailings, hazardous industrial wastes, factory discharge, agricultural fertilizers and pesticides and household wastes. Exotic species in wetland ecosystems, particularly in lakes and rivers, prey on, compete with and hybridise with the local endemic and indigenous species, or affect them indirectly through parasites and habitat alteration.

Only about 5% of the Philippines's coral reefs remain in excellent condition. From 30-50% of the seagrass beds have been lost in last 50 years, and about 80% of the mangrove areas in the last 75 years. An estimated 50% of national parks are no longer biologically important.

Illegal fishing by mainland Chinese in Philippine waters has occurred regularly and has contributed to a decrease in regional fish stocks.⁴⁴ A government-commissioned team on natural resource accounting concluded that 120 000 Filipino fishermen will lose their livelihood by the year 2000 unless access to fishery resources is restricted. Fishing of small surface-dwelling fish would have to be cut by half to avoid the collapse of some of the Philippines's most important fisheries, a two-billion Peso industry. Overfishing apparently results from lack of regulation.²⁰³

Measures taken to manage fisheries for biodiversity

In 1990, the Philippine Department of Agriculture (DA) implemented the Fisheries Sector Program (FSP) with support from the Asian Development Bank (ADB) and the Overseas Economic Cooperation Fund (OECF) of Japan. The overall goal was managing fisheries sustainably by reforming policy and institutions and intervening strategically:

- balancing fishing effort with maximum sustainable yield, rehabilitating the marine environment, and alleviating poverty among municipal fisheries;
- inducing commercial fishing away from the overfished shallow water fishing grounds and into the underexploited areas in the country's exclusive economic zone (EEZ);
- improving productivity.

The most significant achievement of the Fisheries Sector Program was 'reforming' the Philippine fisheries sector. Granting fishing permits within sustainable yield is now government policy incorporated into the new Fisheries Code.

The Fisheries Sector Program also raised awareness of the resource depletion problems among stakeholders, motivated municipal fisherfolk to participate in Coastal Resource Management (CRM) activities, and established Bay Management Councils in eleven FSP bays.

Community-based law enforcement and various CRM activities also began under FSP with active participation of municipal fisher-folk. As the first project in the Philippines to focus on fisheries resource management and rehabilitation, the FSP provided rich experience and lessons to incorporate into future projects.

The Fisheries Management and Development Plan 1993-1998 focused on the regeneration and sustained management of aquatic resources, environmental rehabilitation of the coastal zone, poverty alleviation and occupational diversification among marginal fishers, intensification of aquaculture and optimal exploitation of offshore deep-sea resources.

The Bureau of Fisheries and Aquatic Resources (BFAR) at the DA is responsible for the country's fisheries and aquatic resources. A new provision in the Fishery Code of 1998 made BFAR a line Bureau of the DA. With the policy of sustainable development embedded in the new legislation, biodiversity should be included in the Institute's research agenda. Strategies being carried out by BFAR include regulating fishing for sustainable yields, instituting a new management system for coastal areas, and coordinating environmental management of land- and marine-based resources.

Other strategies to be implemented in coastal areas are managing naturally demarcated bays, gulfs and reefs; promoting territorial use rights in fisheries (TURF)¹³ for small fisherfolks, conservation of coral reefs, mangroves and seagrasses in good condition, and regenerating damaged habitats.

The socio-economic strategy includes intensifying extension services on production and post-harvest technologies and facilities as well as credit and establishment of fisherfolk cooperatives.

The Coastal Environment Program (CEP) of the DENR (April 1993) aims to coordinate all programs and activities related to managing coastal ecosystems. Its scope takes in joint projects with other government agencies, NGOs and international organizations.

The Basin Approach to Lake Management has been developed by the Department of Science and Technology (DOST). One project being implemented under this program is the Lake Fisheries Productivity and Quality Enhancement, whose aim is to integrate researches to stop deterioration of Laguna de Bay and improve water quality to enhance aquatic productivity.

To prevent further losses from exotic fish introductions, the Philippine Fisheries Code of 1998 prohibits the introduction of foreign aquatic species in the Philippine waters (inland and marine) without a sound ecological, biological and environmental justification. BFAR is the sole CITES Permit Issuing Authority for aquatic species. Its Tanay Freshwater Experimental Station has two rescue centers: one for freshwater species and another for brackish/marine species.

¹³ See Glossary for description of TURFS, or 'Territorial Use Rights in Fisheries.' See also Ferrer, E.M., 1991.

The Department of Agriculture (DA) also takes conservation and rehabilitation measures for rare, threatened and endangered aquatic species through the Philippine Fisheries Code. The code prohibits the fishing of these species including the taking of their eggs/offsprings from Philippine waters. It further requires all government agencies, as well as private firms and entities that intend to undertake activities affecting the habitats of these species to prepare a detailed Environmental Impact Statement (EIS) that shall be submitted to the DENR.

The Philippines became the 82nd contracting party to the Ramsar Convention in 1994. Since its formulation in 1992, many of the proposed activities in the Philippine National Wetlands Action Plan have been accomplished or are in progress. The Action Plan (1996) was to protect and conserve the biological resources of wetlands, and to lay down the groundwork for regenerating what has been lost.

One effort is the national wetland inventory.

With the completion of the Management Plan for Olango Island Wildlife Sanctuary, designated for the RAMSAR List of Wetland of International Importance, a project on community-based resource management has commenced. Efforts to identify more wetlands of international importance are also underway. The DENR Memorandum Circular No. 97-17 was issued to protect the habitats of endemic, rare, vulnerable and endangered wetland species.

The Coastal Environment Program Information, Education and Communication (IEC) Campaign worked to increase awareness and foster cooperation among coastal communities in rehabilitating and preserving the local coastal resources. The programme held community dialogues/public hearings, and used information caravans, flyers, brochures, billboards, press releases, exhibits, audio-visual materials and radio programs in the different project sites.

In 1998 the Tubbataha Reef National Marine Park was declared the First National Marine Park in Philippines. In 1993, the Tubbataha Reef was inscribed in UNESCO's list of World Heritage sites. The IEC campaign to enlighten stakeholders on the importance of keeping the resource intact and productive was held for one year and employed dialogues, publication and printing of brochures, posters, calendars, news briefs, and radio and tv plugs.

UNDP-GEF projects include *Conservation of the Tubbataha Reef National Marine Park*, whose overall objective will be to prepare and finalize a GEF full project brief and draft a full project document. The full project will work to ensure the integrated conservation and development of the Tubbataha coral reef ecosystem by developing and implementing conservation activities as well as by providing alternative livelihood options.²²⁵

In 1997 the Philippine Senate approved the latest version of the 1997 Fisheries Code which will impose large penalties on foreign poachers in Philippine waters. The proposal is aimed to help protect remaining marine resources against poaching by foreign fishermen.⁴³

Fishery problems have received varying degrees of attention from the government. In the past two decades, the main thrust was to increase productivity through technology. In the late

1980s, however, the worsening inequity in fisheries shifted the concern to the socio-economic issues of sustainability and fairness. This new emphasis is largely thanks to social scientists.⁴

Another UNDP project, *Biodiversity Conservation and Management of the Bohol Islands Marine Triangle*, addresses the priorities of the Philippine National Biodiversity Action Plan (NBSAP), the Philippine Marine Policy, and the Philippine Agenda 21. It also complements past and existing Philippine coastal resources management projects, such as the Coastal Environment Program in coordination with the National Integrated Protected Areas System, the Coastal Resources Management Program, and the Central Visayas Regional Project-I (CVRP-I) and II.²²⁵

Research efforts or goals

While the government is aware of the issues confronting biodiversity conservation, no comprehensive research agenda addresses these priorities and concerns. In general, the government strategy had been biased towards action programs without providing for implementing mechanisms and research support.

A major national policy for biodiversity research in general has yet to be formulated to integrate natural resources research by public and private institutions. No clear institutional structure and mechanism rationalizes agenda-setting, oversees implementation or monitors biodiversity research. Such rationalization of research would reduce if not eliminate duplication of efforts, and would foster cooperation and promote efficient use of available resources.

Research gaps: benchmark information (taxonomy, inventory), biodiversity indicators, policy researches, habitat requirements, and the role of indigenous knowledge in choosing and assessing long-term sustainability of biodiversity. Other needs are human resources development, physical infrastructure, and information. In the absence of a national agenda for biodiversity research, the capacity needed for such activities cannot be determined.

PCAMRD (the Philippine Council for Aquatic and Marine Research and Development) has granted research funds to the Marine Science Institute (MSI) of the University of the Philippines (UP) Diliman for making an inventory of and assessing natural stocks of *Sargassum* and *Gracilaria* in selected areas. It is also funding the development of germling production and culture technology of *Sargassum*. The Institute is also researching integrated management of watershed and coastal and marine environments; ecosystem response to deforestation-derived siltation in Southeast Asia (the Philippine Component); and assessing Bacuit Bay for sustainable tourism.

Advances in coral reef research in the Philippines have taken what was almost purely a taxonomic work to a quality almost as good as that in the most advanced scientific institutions worldwide.¹³³ On-going initiatives to detect coral reef structures using reef-monitoring techniques are largely being carried out by the UP-MSI and Silliman University.

The Philippine Fisheries Information System (PHILFIS), a fisheries information database system, is the processing center for priority fisheries data/information from five agencies networked under the Department of Agriculture (DA). These agencies are:

- a) BFAR and Fisheries Sector Program (FSP)
- b) Philippine Fisheries Development Authority
- c) Bureau of Agricultural Statistics
- d) Bureau of Agricultural Research
- e) Department of Agriculture Computer Service

At present, the PHILFIS has ten sub-systems, namely: a) map information, b) habitat, c) environment, d) fisheries resources, e) research and technology, policies, plans and programs, g) marketing and infrastructure, h) support services, i) BFAR library, and j) Systems Administration.

Other academic and non-academic institutions including private universities and research laboratories have made significant contributions to marine science. These are specifically along the areas of collection and identification, coastal resources ecology and management, and marine environmental protection in general. Foremost are Silliman University in Negros Oriental and University of San Carlos in Cebu and Marawi State University in Marawi City.

Biodiversity researches among NGOs are few and small in scale. However, significant contributions from a few NGOs in the country, mostly with foreign help, are worth noting. One, *Tambuyog*, is to analyse fishermen's practice and property rights on fishing grounds, participatory rural appraisal and technical research as an input to integrated site management. That of the World Wildlife Fund is to track marine fauna through the Global Positioning System.

Data Generation and Organization of Information is on-going in ICLARM's FishBase¹²⁸ and ReefBase.

Priorities for national action

The implementation of the NIPAS (National Integrated Protected Areas System) Law has been given local and international support. Consequently, more programs and projects that focused on biodiversity conservation were implemented as priority activities.

In 1988, the Integrated Protected Areas System in the Philippines (IPAS) Project was completed and a report entitled 'Development of an Integrated Protected Areas System in the Philippines' was submitted to the DENR and WWF. The report contained a listing and mapping of potential PAs classified as terrestrial, wetland and marine, indicating level of priorities for each site.

The main objective of the project was to select ten priority Protected Area sites. It was decided that the sites should contain five terrestrial ecosystems, two wetlands, two marine ecosystems, and one mixed ecosystem.

The aquatic sites were: Apo Reef (#3), Turtle Island (#6), Batanes and Siargao Landscapes/Seascapes (#8), and the Agusan Marsh Wildlife Sanctuary (#10).

The first IPAS sites cover almost 13% of the total land area of the Philippines. They include 67 national parks or marine reserves, 85 watershed forest reservations, and 27 mangrove swamp forest reserves. Two of the ten Conservation of Priority Protected Areas Project (CPPAP) sites (Subic-Bataan National Park and Turtle Island Marine National Park) are not yet proclaimed as Protected Areas under NIPAS category.

National or sectoral plans that include sustainable use of aquatic biological diversity

The Fisheries Sector Program (FSP) was conceived as a multi-sectoral effort with the Department of Agriculture (DA) as the lead agency. DA committed to undertake policy and institutional reforms and implemented six program components:

- a) Fisheries Resource and Related Ecological Assessments,
- b) Coastal Resources Management,
- c) Research and Extension,
- d) Law Enforcement,
- e) Credit, and
- f) Infrastructure.

Among the six, Coastal Resources Management is considered the centerpiece and all other components may be considered supportive. The program focused on twelve of the country's twenty-six fishing areas for coastal resource management initiatives, on six selected regions for aquaculture development, and on selected offshore areas for commercial fisheries development.

The most glaring gap in biodiversity management identified in the NBSAP is the lack of basic information on biodiversity at the sites and knowledge of economic and social dimensions. The capacity to conduct such research at the ERDB (Ecosystems Research and Development Bureau) is weak. ERDB's strength is in mangrove forests and grassland ecosystems research.

From 1996-1997, SEARCA began 10 new research and development projects. Seven were on uplands and coastal resources management, and some focused on biodiversity issues.

Community-based approaches and interventions with special attention to methodology development have become a hallmark of SEARCA's R&D projects in the uplands and coastal areas.¹⁸⁵

At PCAMRD, some initiatives at the commodity level introduce biodiversity into research. A substantial portion of the budget (about 46%) was earmarked for environmental projects¹⁷⁸ focussing on environmental protection, rehabilitation and enhancement, including conserving and managing the country's fishery resources.

Projects along these lines include the Bantayan Island Integrated Seapark Development Programme and its involvement in the Coastal Environment Programme of the DENR and the Fisheries Sector Programme of the DA. Initiatives are mostly oriented towards protecting habitat. PCAMRD is also involved in the Basin Approach to Lake Management (see under 'Action Taken').

Resources for meeting obligations and recommendations

Under the Department of Environment and Natural Resources, about 56% of the programs and projects are related to biodiversity conservation. Under the Department of Agriculture, about 52% of the budget goes into biodiversity conservation. Under the Department of Science and Technology, with a budget of 211 million Philippine pesos, the Philippine Council for Aquatic and Marine Research and Development gets 27 million.

Capacity-building measures for developing and implementing plans

The International Centre for Living Aquatic Resources Management (ICLARM), an autonomous non-government scientific research center, has engaged in marine studies that have provided analytical methodology and training. Three research programs are the Coastal Resource System Program, the Coral Reef Management Programme, and the National Research Support Programme.

Current initiatives include the Aquatic Environment Program, Fisheries Resources Assessment and Management Programme, Integrated Aquaculture-Agriculture Program and Policy Research and Impact Assessment Program.

In 1995, the EMB completed a UNDP-funded project called Human Resources Development in Environmental Planning and Management for Sustainable Development. The project was to address the lack or inadequacy of trained manpower in land-use and resource management planning. Training included Management of Protected Areas and Conservation of Endangered and Threatened Species, Regional Sustainable Natural Resources Management Planning, Integrated Watershed Management and Integrated Coastal Zone Management.

To strengthen local law enforcers, a National Training Workshop on CITES Implementation was held in 1996 with participants from the Protected Areas and Wildlife Bureau (PAWB),

the Philippine National Police (PNP), the Philippine Coast Guard (PCG), and the Bureau of Customs (BC).

Legislation or legislative framework for aquatic biodiversity

No information found.

Cooperative mechanisms among authorities, NGOs etc. to ensure integration

The management of a protected area rests with the Protected Area Management Board (PAMB), a multi-sectoral body consisting of representatives from local government, national government agencies, NGOS and indigenous communities.

The actions of NGOs in ecosystem or habitat protection and conservation have significantly complemented those of the government. The Foundation for the Philippine Environment, an NGO-fund mechanism, has provided support to projects related to biodiversity conservation employing habitat or ecosystem protection strategies.

Vulnerable transboundary aquatic systems

The Philippines has asserted jurisdiction over territorial waters by arresting foreign fishermen. The first incident occurred on August 10th 1997 when a Taiwanese fishing crew was arrested and fined for poaching just north of the Luzon Strait. On August 12th, 23 mainland Chinese were arrested for fishing off the island of Palawan, claimed by the Philippines and mainland China, among others. A Reuters report of the time claimed that China, calling for the release of the Chinese fishermen, warned that the Philippines was running the risk of ruining the 'friendly relations' between the two countries.⁴⁴

Examples of transboundary cooperation

The Philippines established the first transborder bilateral agreement with the Malaysian Government on the management of marine turtles within the Turtle Island Heritage Park.

The Integrated Protected Area System (IPAS) was begun in 1986 through a project grant by the World Wildlife Fund (WWF) of the United States. The following year, Executive Order 192 was issued creating the Protected Areas and Wildlife Bureau (PAWB) under the Department of Environment and Natural Resources (DENR). PAWB is mandated to consolidate all government efforts in conserving natural biological resources through establishing a network of protected areas.

To strengthen CITES, PAWB and BFAR in cooperation with US Fish and Wildlife Services trained personnel in CITES administration. Subsequently BFAR held Regional Training Workshops on CITES Implementation and Taxonomy of CITES and non-CITES Aquatic Species in areas with strategically located airports and seaports. The participants included law enforcers and wildlife inspectors from eleven agencies. Practical training was given on

the provisions of CITES, law enforcement procedures and requirements for handling confiscated wildlife, and on taxonomic identification of CITES-listed and non-CITES aquatic species banned and regulated under the national laws. The trainees received CITES manuals, handbooks on law enforcement and relevant laws and guides to the identification of traded species.

Dumaguete City-based Silliman University Marine Laboratory (SUML) and the Foundation for the Philippine Environment (FPE) have proposed a project for protecting and managing the ecologically sensitive Bohol Marine Triangle in Central Visayas. Years of over-harvesting, sedimentation, seaweed overgrowth, blast fishing, infestation by coral-eating snails and crown-of-thorns, garbage, bleaching, diseases and anchor damage have damaged the Triangle (the islands of Pamilacan, Balicasag and Panglao). The islands are home to five dolphin species, six whale species, three families of rays (manta, sting and eagle), five families of sharks, and 22 shell species considered locally and globally significant. Management will involve the government's tourism agencies, resorts, local communities, local governments, people's organizations, and NGOs. The aim is to establish community-based coastal resource management and intervene strategically, by declaring marine reserves, enforcing coastal law, installing an information management system, and developing sector linkages.¹⁷⁰

According to the Philippine Council of Agriculture, the disputed 1991 sea-lane passage agreement between the Philippines and Taiwan is to remain in place. The agreement, which allows passage of Taiwanese fishing vessels through Philippine waters, had been violated when Taiwanese fishermen dropped fishing nets on their way to fish in South Pacific international waters. In exchange for the right to passage, the agreement stipulates that Taiwan must help the Philippines develop agriculture and aquaculture industries and improve fishing ports.⁴²

Priority given to transboundary cooperation [as this affects aquatic biodiversity]

The sixth strategy (of six) in the NBSAP framework is 'advocating stronger international cooperation on biodiversity conservation and management.' A major project is the establishment of the ASEAN Regional Center for Biodiversity Conservation (ARCBC) in the Philippines.

At the ASEAN regional level, the Governments of the Philippines and Malaysia entered into a Memorandum of Agreement (MOA) for the establishment of the Turtle Island Heritage Protected Area.

In July 1997, the Philippines, in behalf of the Association of Southeast Asian Nations and the European Union signed an Agreement for the creation of the Regional Center for Biodiversity Conservation (ARCBC) to be located in the Philippines. The center hopes to develop a network of institutional links among ASEAN Member Countries and EU partner organizations.

Significant aquatic biodiversity (freshwater and marine)

Of Poland's 116 fish species, 23 are alien. This group is well-known for its economic significance.

Aquatic ecosystems (flowing and standing waters, including reservoirs) occupy about 3% of Poland. The total length of rivers, brooks, larger streams and drainage channels is estimated at about 98 000 km, of which about 40% is of significance to the functioning of Poland's river system. Almost 99.7% of the country lies within the drainage basin of the Baltic sea, which is mainly fed via the systems of the Vistula and Oder. One of the last large rivers in Europe, the Vistula is largely unregulated, creating a unique environment with a diverse flora and fauna.

Poland has more than 300 000 ha of lakes of 1 ha or larger.⁷⁹ Most of the country's lakes are in the north and northwest, with an estimated 9300 covering more than 1 ha. There are about 140 large reservoirs.

A great richness of species has been preserved in rivers that retain their natural character – such as the Narew and Bug and their tributaries, the rivers of east-central Poland, some sections of the Odra and Bóbr basins and sections of the Middle and Upper Vistula. Rivers in other parts of the country - including the Warta, Pilica, those in the Danube drainage basin and the Nida - have seen many species disappear and the structure of the ichthyofauna change.

In turn, the sturgeon *Acipenser sturio* and the fifteen-spined stickleback *Spinachia spinachia* have recently disappeared from the Baltic Sea, where many other species are threatened.

Wild salmon (*Salmo salar*) populations in different Baltic rivers are a significant part of the genetic diversity of the Sea's anadromous fish. Some other migratory fish have isolated and discontinuous ranges. Relict species of Arctic mollusc are also found in the Baltic.

The Slupsk Bank has unique diversity of benthic communities. This area is well separated from sources of pollution and so remains in a largely natural condition. The seabed has a diverse sessile vegetation and a bottom fauna of *Mytilus edulis* and *Gammarus salinus* communities. Still present in the area are plant species extinct in the Gulf of Gdańsk or not even noted in other regions of the Polish zone.

Present and planned uses of aquatic biodiversity

Poland is not a major world force in exploiting marine resources (including fisheries). The total catch of (marine and freshwater) fish was 358 200 tonnes in 1996, of which sea catches accounted for 320 200 tonnes, or a *per capita* annual supply of circa 9.3 kg. The share of the

country's GDP taken by fisheries hovers around the 0.05% mark. Nearly 46% of fish derive from long-distance fleets, and c. 43% from the Baltic Sea.

Deep-sea catches are processed on board and are either exported or transported to domestic markets as fillets, frozen fish and fishmeal. Baltic catches, which are landed from boats and cutters in Polish harbours, are filleted, canned, marinated or smoked. As small processing firms are distributed and do not all register production, the size of production can only be guessed at. In 1994, an estimated 36 000 mt of canned fish, 25 500 mt of marinades, 34 700 mt of smoked fish, 15 000 mt of salted fish, and 7 000 mt of other fish products were produced. Additionally, approximately 60 000 mt were delivered to markets as fresh or frozen and whole or gutted fish, whereas fillet production amounted to 100 000 mt.⁷⁹

Commercial fisheries on lakes are carried out by fish-breeding farms, which either rent the lakes from the state or own them. Commercial catches in 1995 were estimated at 28 000 mt. Approximately 25 000 mt of freshwater fish were taken from fish-breeding ponds, which cover 46 200 ha. Pond production is mainly made up of carp and other cyprinidae, as well as rainbow trout. A further 34 000 mt were caught by some 2 million anglers.⁷⁹

Threats to aquatic biodiversity

The Red Book's inclusion of only 8 species of fish plus 3 of lamprey does not provide a realistic picture of threats to Poland's ichthyofauna.

Important factors threatening diversity among freshwater fish are drainage and river regulation, as well as alien species introductions. Cyprinids released into some lakes have thus caused native plant-eating species to decline.

Highly-threatened freshwater ecosystems include oligotrophic lakes in the mountains and those of the so-called 'lobelia' type occurring mainly in the Pomeranian Lakeland. The lakes are vulnerable to eutrophication, to which the organisms present have low resistance.

Dystrophic lakes within forests are also threatened, being vulnerable to drying-out, eutrophication and acidification. A lowering water table may be threatening all lakes.

Besides pollution, construction and regulation along rivers seriously threaten biological diversity. The destruction of riverside areas of marsh and floodplain leads to higher unit flows by reducing the retention capacity and promoting the destruction of ecotonal zones.

The inadequate number of sewage treatment plants in large urban agglomerations and discharge of wastewater from rural areas not served by sewer systems is a serious problem. For many years, waste has been managed in a disorganised and random manner.

The high zoogeographical diversity of species of differing origin is characteristic of the Baltic ecosystem. The fundamental natural factor shaping diversity at present is the Sea's low level of salinity. This limits the occurrence of many groups of stenohaline sea organisms, as well as freshwater ones. In consequence, diversity is low compared with other

seas, and species numbers fall with the decreasing salinity from the Danish Straits northwards.

Subject to the greatest changes are the deep-water ecosystems of the Bornholm, Gdańsk and Gotland Deeps. In the last 50 years, a long-term oxygen deficit has virtually eliminated macroscopic life from the seabed, with considerably limited plankton and fish reproduction in the zone of water below the halocline. The highest diversity is characteristic of inshore areas, whose location in turn threatens them with degradation. A characteristic feature of this zone is the lack of any sharp boundary between the ranges of occurrence of marine and freshwater species.

The most serious threats to biological diversity in the Baltic Sea are:

- eutrophication, which promotes the disappearance of some areas where fish spawn, pass their early lives and feed;
- excessive exploitation of living resources, which changes the structure of the whole ecosystem;
- physical destruction of biotopes through shoreline construction that changes the movement of shingles (e.g. the port in Wladsyslawowo), bottom fishing, the exploitation of aggregates and oil and dredging.
- tourism and the associated development of coastal infrastructure;
- influx of pollutants, including biogenic compounds, heavy metals and pesticides (main sources are urban and industrial wastewaters and increasingly chemical-intensive agriculture);
- alien species introduction through aquaculture or by way of ballast water, fishing implements and baits, the provision of organisms for aquaria, etc. At least 50 species have been introduced to the Baltic in the last 100 years, mainly in ballast water.

Monitoring results suggest that water quality in the basin has not improved significantly, in spite of long-term efforts at combating pollution from the Baltic countries, including legislation, organisation and investment by Poland. Local improvements have resulted – mainly in coastal areas – from the start-up of many modern sewage treatment plants and a significant limitation of releases of untreated wastewater to the Vistula, Odra and coastal rivers.

In contrast, the biocoenoses of the southern Baltic have witnessed an enhancement of certain unfavourable biological phenomena first observed at the beginning of the 1990s. These changes, particularly clear in the dominance structure of species, are occurring in all ecological formations, but are most intensive in the shore zone, above all in coastal lagoons.

Most deep-sea fisheries are based in the international fishing grounds of the Sea of Okhotsk, which yield 92% of deep-sea catches. Serious long-term problems are causing Polish shipowners to search intensely for alternative fishing grounds in other regions.⁷⁹

Measures taken to manage fisheries for biodiversity

Since the beginning of the 1990s, real expenditure on environmental protection has risen. The equivalent of 464 million USD was spent in 1990, in the face of Poland's deepest post-War economic crisis. The following year – the first year the National Fund for Environmental Protection and Water Management operated – expenditures rose to 800 million USD. In 1994, pro-ecological expenditure reached 1 billion USD, and in 1996 neared 1.5 billion USD. It now accounts for more than 1% of GNP (1.1% in 1995), and more than 6% of all investment outlays in the economy. This activity is 95% financed from domestic sources. Support for environmental undertakings remains a relatively new phenomenon in Poland, albeit an element of banking that is developing rapidly.

From 1989–1995 wastewater discharges to surface waters dropped by about 12%; untreated discharges fell by more than 30%.

Nearly 1500 combined sewage-treatment plants installed from 1992 onwards and fewer untreated sewage discharges to surface waters have improved inland water quality, particularly of rivers. Monitoring by the State Environmental Protection Inspectorate show that from 1992–1995 river quality improved for all pollutant groups; excessively polluted water fell from 23.6% to 12.6%. However, under the strict Polish legal requirements for classification, assessment of microbiological and physico-chemical indices does not yet reflect the improvement.

The state, which subsidized fishing operations in the 1980s and early 1990s, has not given any financial help to fisheries for a few years.⁷⁹

In the Baltic Sea and the Polish Economic Zone, fisheries administration monitors safety at sea for fishermen and attempts to maintain fishery resources at sustainable levels.⁷⁹

Research efforts or goals

Hydrological research in the Baltic began in Poland in the 1930s. Regular environmental checks in the Baltic began after the Helsinki Convention was signed in 1974. Poland took an active part in successive monitoring programmes of HELCOM-BMP. Stage IV of the international Baltic Monitoring Programme, which began in 1994, includes regular measurements and observations of physicochemical and biological parameters. The results of Stage III of BMP are now being compiled into a *Third Periodical Assessment of the State of the Environment in the Baltic Sea*.

Poland is well equipped with fishery research facilities. The Sea Fisheries Institute in Gdynia, with its branches in Swinoujscie and Szczecin (plankton studies), in cooperation with scientific institutes in the USA, is a large and well-equipped scientific institute working

in all fields of marine fishery sciences. For research in the Baltic Sea, the institute operates a multipurpose research vessel 41 m in length, *BALTICA*, launched in 1993. The institute also works on gear and fishing techniques, as well as fish-processing technology, and cooperates extensively with foreign scientific institutes from Sweden, Germany, and other Baltic countries. The Faculty of Marine Fisheries at the Agricultural Academy in Szczecin also carries out marine research.⁷⁹

The Inland Fisheries Institute in Olsztyn researches freshwater fisheries and fish farming. The High Maritime School in Szczecin trains sea-going personnel in fisheries and also offers post-graduate and specialist training and conducts scientific research. These centres also train foreign students.⁷⁹

Priorities for national action

The draft version of the Strategy to conserve and make rational use of biological diversity includes two fundamental provisions. Firstly, Poland, as a signatory to the Gdańsk and Helsinki Conventions, should continue to take successive coherent measures in line with its obligation to restore the biological resources of the Baltic Sea. Secondly, planning to enhance water retention should involve total adjustment of hydrotechnical works to the principles of biodiversity conservation.

National or sectoral plans that include sustainable use of aquatic biological diversity

In accordance with Article 6, a priority aim is that the protection and sustainable use of biological diversity be taken into account in sectoral and intersectoral strategies, plans and programmes. Such action is taken by the Governmental Commission on Sustainable Development, chaired by the Minister of Environmental Protection, Natural Resources and Forestry.

The objectives defined in the *State Environmental Policy* for bodies in the public administration, entities in the business sector and NGOs are a good basis for the implementation of the detailed tasks in the draft Strategy and Action Plan.

The basic objectives of the 'Implementation Programme to the State Environmental Policy to the year 2000' are:

- to noticeably improve in the state of the environment,
- to create conditions for sustainable economic development,
- to enhance existing trends towards reducing emissions of particles and noxious gases into the atmosphere and pollutants discharged with wastewaters into surface waters and the Baltic Sea; and

- to reduce the deficit in clean water and to step up the protection of raw resources.

Investments are being made mainly into the building of wastewater treatment plants throughout the country, most quickly on the coast, in the drainage basins of lakes and in the basins of rivers supplying reservoirs.

In the non-investment sphere, the main actions are:

- adjusting legal solutions, procedures and standards to those in force in the European Union, and expanding and strengthening cooperation with other countries; and
- enhancing the monitoring system and the system of supervision and checks on legal compliance, as well as reform of the systems by which water management is administered and extraordinary threats to the environment countered.

One of the four fundamental principles guiding the strategy of the Action Plan is the principle of ‘Europeanization’ entailing the preparation of Poland to comply with the binding Directives, Regulations and standards forming EU law. These include the ‘Wild Birds’ Directive (79/409/EEC), the Regulation on the Conservation of Marine Mammals (348/81/EEC), the ‘Habitats’ Directive (92/43/EEC) and the ‘Agri-environmental’ Regulation (2078/92/EEC). This latter deals, among other things, with protecting rural biological diversity.

The other three fundamental principles are consolidation, regionalisation, and socialization.

Resources for meeting obligations and recommendations

Poland’s administrative system is made up of 2 486 local governmental units (gminas, towns and city districts). After 1989, these gained broader decision-making powers, as well as sources of finance by which they might implement their own programmes. The money at their disposal remains insufficient.

Capacity-building measures for developing and implementing plans

No information found.

State and priorities for expanding the ecological network

No information found.

Legislation or legislative framework for aquatic biodiversity

The strategy and action plan are not yet approved or adopted by the appropriate national opinion-giving and decision-making centres.

Cooperative mechanisms among authorities, NGOs etc. to ensure integration

No information found.

Vulnerable transboundary aquatic systems

The Baltic.

Examples of transboundary cooperation

In exploiting the living resources of the seas and oceans, Polish action is based on the 1982 Law of the Sea Convention and relating, i.a., to fisheries and defined rights to exploitation and access, as well as to an obligation to preserve marine fishery resources. In its actions to protect the living resources of the sea, Poland is directed by international agreements and conventions.

Poland has strengthened international contacts, with new cooperation agreements in the sphere of environmental protection entered into with almost every neighbouring country, (the majority are European countries) and the USA and Canada. Poland also played an active role in many regional programmes embracing, for example, the Baltic Sea Basin, the Green Lungs of Europe, the Eastern Carpathians and the Lower Oder River.

Significant aquatic biodiversity (freshwater and marine)

Russia has over 120 000 rivers and about two million lakes, covering 370 000 km²; 2 000 km² of wetlands, and 60 000 km of coastline. The wetlands are the richest in the world. Almost 400 species of coastal sea fish and 270 freshwater fish species are found in Russia.

Many rare and threatened species, including sturgeon and many salmon species, live along Russian seacoasts. Russian fauna comprises nominally 32 whale species, two of them subject to fishing, the white whale and gray whale (special quotas exist for aboriginal people living on the Arctic and northern Far East coasts). Most whales and dolphins of the Russian high seas are in the Red Data Book.

Fish fauna of Russia is diverse and understudied. 268 freshwater, semi-migrating and migrating species (sea\freshwater) and 400 species observed in coastal waters, constituting about 2% of global diversity for this class.

Freshwater fauna has a higher percentage of endemic species. The Lake Baikal basin ranks first in endemics. The highest species diversity is in the Lake Baikal and Amur basins.

Recent years have seen the Caspian Sea level rise. This has encouraged the reproduction of semi-migratory (carp, bream, Caspian roach, etc.) and fresh/saltwater fish.

Russia's maritime shelf alone constitutes one-third of the whole of its land territory. ²²⁰

Commercial fishing occupies one of the most important places in the country's economy. Sturgeons, most salmons and some perches and carps are the most economically valuable fish.

Sturgeon species catches in 1996 were 1 296 tons in the Lower Volga and Caspian Sea, while the total catch with other countries around the Caspian was 1 662 tons.

Although catches of marine fish had dropped to 3.5 million tons by 1994, by 1995 it had grown back to 4.2 million tons, to 4.5 million tons in 1996, and was predicted to be 4.65 million tons in 1997. Potential catches of fish and other sea resources in the Russian EEZ are estimated at 4.1- 4.7 million tons. Fishery statistics are not wholly reliable, however, as poaching is estimated to cost US\$ 4 billion yearly.

Inland seas and freshwater basins yield, respectively, 250 000 and 200 000 tons. The northeast Atlantic and northwest Pacific yield most of this. Principal Far East marine catches are walleye pollock, herring, cod, sole, and salmon. Pollock amount to about 2 million tons (1 million tons from the Okhotsk Sea).

In the post-depression period, several Far East herring shoals have been restored: catches of 480 000 tons in the Okhotsk Sea and 100 000 tons in the Bering Sea near Kamchatka. Cod catches are relatively stable in this region (170 - 180 000 tons), while salmon catches vary from 130 - 205 000 tons. Far East seas are also rich in commercial sea invertebrates: crabs, shrimps, mollusks, and echinoderms.

Key commercial fish in the northeast Atlantic (Barents Sea) are cod (90 000 tons), haddock (40 000 tons), and sole. Since capelin fishing was prohibited, numbers have been increasing.

Baltic Sea commercial fish are Baltic herring, sprat, cod and salmon. Principal commercial fish reserves of these seas fall under the control of International Fishery Boards. The Baltic herring and sprat number is currently growing and salmon populations are maintained by artificial reproduction.

The principal commercial fish of the Caspian Sea are three sprat species, of which 82.3% (840 000 tons) is of anchovy-like sprat. The Russian fishing quota of about 94 000 tons is almost completely used.

Commercial fish of the Azov Sea are sturgeon species, khamsa, sprats, pike perch, bream, and Black-Sea roach. Modern fishing of starred sturgeon and sturgeon exists owing to artificial breeding. Natural spawning of sturgeon species is actually excluded. Fishing limit for these species have been maintained at the level of 1 500 tons (1 200 tons for sturgeon and 300 tons for starred sturgeon) in recent years.

In the Azov Sea Khamsa biomass currently accounts for 65 000 tons, sprat 150 000 tons, pike perch 43 000 tons, Black Sea roach 2 000 tons. Total catch of pike perch was 24 000 tons and that of Black:-Sea roach 2 000 tons in 1996.

Most fish caught in Russian freshwater basins (up to 60%) are from large rivers (26 000 tons), lakes (38 000 tons) and man-made water basins (41- 42 000 tons). Most intensive fishing is typical of European Russia. For instance, the large man-made water basins of Rybinskoe, Kuibyshevskoe, Saratovskoe, Volgogradskoe, and Tsimlyanskoe yield annually from 13.6 – 13 800 tons of fish according to official statistics. Four large lakes (Ladoga, Onega, Pskovsko-Chudskoe, and Ilmen) account for 7- 8 000 tons. Catches are mainly pike perch and bream, and, in northern lakes, whitefish and smelt.

In Asian Russia, maximum fish catches are in the Ob Irtysh watershed (15-17 000 tons, or about 70% of the total river fish catch in Russia). Commercial fish are whitefish species. Captures of sturgeon species (Siberian sturgeon, sterlet) are small, about 50 tons.

Among the water basins of East Siberia, the Yenisei River and Baikal Lake have the most developed fishery. The Baikal produces some 30 000- 32 000 tons (65 -73% composed of Baikal cisco) yearly, and the Yenisei 17 000-18 000 tons.

Invertebrates (crab species) are taken in Far East seas.

Present and planned uses of aquatic biodiversity

Russia's fishing industry has entered a period of acute crisis. Catches are falling, output of food products has dropped, and fish products are less available.²²⁰

Total fish catch was about 5.5 million tons in 1996.

Fishing on large rivers, lakes and man-made water basins focuses on productive and accessible high-value fish shoals. Salmon in the European north is taken mostly by local communities (the Pomors) living on commercially-fished rivers. Most fishing falls within the 'shadow' sector. Official statistics state that salmon catches in the European north fell from 659 tons in 1985 to 130 tons in 1995. According to expert evaluations, about 45% of this drop is due to poaching. Other fish fall out of the commercial pool, while continuing to play a significant role in the life of the population.

In the economic activities of aboriginal people of the North, Siberia and Far East fishing ranks first or second. It is widespread over water basins of large Siberian rivers and the Pacific coast, and both customary and modern fishing gear are used. In the Siberian north, all appropriate means are used, including sweep nets and standing nets. Valuable and numerous species easily caught in large amounts get the most attention. Individual fishing can dramatically reduce the number of some fish species in places, mainly around cities and on small rivers, where salmon migrate.

Non-professional fishing is typical of the European Russia center and Chernozemie. Nets and sweep nets are very rarely used here, where fishing is mostly for relaxation and sport. Non-professional fishing catches can be estimated only roughly. For example, the population of Moscow and its oblast, making up about 10% of Russia's total population, accounts for only 14 000 tons of fish. Sport fishing as a factor affecting water biodiversity is so far unimportant and has only local impacts.

Threats to aquatic biodiversity

The main threats are from the destruction of marine and coastal ecosystems, resulting from oil extraction from the coastal shelf, the sinking of military radioactive waste, and uncontrolled fishing. Consequences are practically irreversible. Artificial regulation, pollution and exploitation of rivers (Volga, Don, Dnepr, Southern Bug, the rivers of Central Asia) jeopardize the existence of many unique aquatic and semi-aquatic ecosystems and species, including sturgeon species of the Caspian Sea, and the Aral, Azov and Black sea regions.¹⁷⁴

Sakhalin sturgeon and white salmon are recorded in the International Red List.¹⁴ Nationally a whole range of species, subspecies and individual geographic fish shoals are threatened by

¹⁴ For 'useful links', see 'Biodiversity in the Russian Federation' at:
<http://www.grida.no/enrin/biodiv/biodiv/national/russia/>

water deterioration (pollution, flow of rivers) and overfishing, including poaching. This affects all sturgeon species, the basic world reserves of which are concentrated in Russia, and a considerable part of salmon and carps. At regional levels, almost 8.5% of fresh-water, semi-migrating and migrating species are endangered. The RF (Russian Federation) Red Data Book presently contains 39 fish spp. The second edition will be supplemented with 44 fish taxons.

In tundra and taiga zones of Russia where rivers serve as main transportation ways, intensive development of small water transport has opened remote lands, and population has concentrated along rivers. Consequently, the load on river and near-river ecosystems has grown while that in interfluvial areas has dropped. Rising fuel prices have caused a drop in traffic to remote lands and in coastal fleet and local air traffic, formerly used by poachers to get to seacoasts and watersheds.

Pike perch reserves in the Russian Federation are falling due to the shift of the main shoal to the eastern part (Kazakhstan) of the Volga delta. Sturgeon numbers and reserves of the Volga fall every year. In 1996, the absolute number for all sturgeon species was 25 million. The role of artificial breeding in replenishing sturgeon is not high. Annually, 45-52 million sturgeon-like fry are introduced, but the number of young fish, e.g. in the Caspian north, has dropped, linked to growing poaching and renewal of marine sturgeon fishing by the new Caspian states of Kazakhstan, Azerbaidzhan, and others.

Since the end of the 1980s, the Azov Sea has witnessed mass reproduction of crested dog-tail's grass, an active zooplankton consumer. The resulting feedstock disruption reduced many fish species.

The status of all lampreys in European Russia is alarming and they need legal protection. Caspian (*Caspiomyzon*) and river lampreys are of commercial value.

The Okhotsk-Korean population of the grey whale (*Eschrichtius gibbosus*) appears to be on the verge of extinction, numbering not more than 100 animals. Their summertime habitats are in close proximity to oil extraction sites on the northeast Sakhalin shelf (international project 'Sakhalin-2').

Measures taken to manage fisheries for biodiversity

To compensate for low reproduction of Caspian sturgeon, in 1997 Russia decided to cease commercial fishing in the Volga. However, poaching must be stopped and agreement on sturgeon conservation reached with Caspian states.

SCEP (the Russian regulatory agency, the State Committee on Environmental Protection) is developing a proposal to organize a special zakaznik to preserve the summer feeding grounds of the Okhotsk-Korean population of the grey whale (*Eschrichtius gibbosus*).

Lake Baikal entered the UNESCO List in 1996.

After the collapse of the USSR, only three wetlands under the Ramsar Convention remained in Russia. In 1994, a special edict confirmed international status for the three areas and assigned it for another 32 areas. The total number of Russian wetlands of international importance has reached 35, covering 10 700 km². As of late 1997, the jurisdiction of the Ramsar Convention spread over 35 wetlands containing 9 state zapovedniks, 1 national park, 10 federal state zakazniks and 8 regional state zakazniks.

The recently drafted federal programme for the development of the fishing industry up to the year 2000 ('Ryba') sets out stabilization measures. This approach is essentially based on genuine State support (budget allocations, grants to meet additional expenditures connected with higher prices of energy, fishing equipment and feedstuffs, organization of preferential tax and credit terms, reduction of customs duties) and on expanded foreign investment to secure an increase in marine catches of 4-4.5 million tons by 2000. ²²⁰

Efforts are being made to combat the effects of the rise in the level of the Caspian Sea. A system being developed for forecasting the level over various time spans will be able to predict erratic changes. ²²⁰

Research efforts or goals

Biological diversity on Russian high seas has not been fully evaluated. The closest realistic attempts to evaluate flora and fauna date back to the 1960s. ¹⁵

Because of the severity of the climate over Russia's seas, maritime activities need well-organized and sophisticated hydrometeorological services. Under the marine research programme, new methods of marine forecasting that have been devised are being brought into use; the foundations have been laid for a modern national system for processing marine data, including the use of super-computers; and marine information systems are being developed in the Arctic and Antarctic. Regular Antarctic research activities are continuing, together with work at an extensive network of Antarctic stations. ²²⁰

In developing the forecasting system and other services considerable attention is given to improving the forecasting and detecting of dangerous natural phenomena, such as high water levels, storm waves and tidal waves, and to developing an early-warning and response system for such phenomena. ²²⁰

A water-quality monitoring programme has been operating for some time in the territorial waters of the former USSR. In spite of the economic difficulties, this programme will be continued in the territorial waters of the Russian Federation (at a level determined by available resources). It has been decided to establish a national reporting centre under the MARPOLMON programme. ²²⁰

¹⁵ Table 8 of the NR

Russia has a standing programme of data collection, analysis, evaluation and application with a view to rational resource use, including evaluation of the environmental impact of activities affecting coastal and marine regions. Databases are being created for evaluation and rational use of coastal regions and all seas and their resources, and measures are being carried out to support regular monitoring of the state of the environment of coastal and marine regions.²²⁰

Priorities for national action

Federal target programs include *Environment Improvement on the Volga River and its Tributaries, Recovery and Degradation Prevention of the Volga Watershed Natural Complexes (Volga's Revival), 2010*, and *Federal program on the development of the Russian Federation Fishery, 2000*.

Priorities of the fish conservation strategy include protection of waterbodies and breeding grounds, establishment of new aquaculture facilities, maintenance of natural collections (fish-ponds, aquaria, fish-breeding farms, zoos), and cryobanks. Under the FTSTP Research and Development in Civil Science and Technology program, seven priority subprograms are implemented. The seventh of these is 'Complex Studies on Oceans and Seas, Arctic and Antarctic Regions.'

National or sectoral plans that include sustainable use of aquatic biological diversity

In 1995 the former Ministry of Environmental Protection and Natural Resources, now the State Committee for Environmental Protection (SCEP), was put in charge of the CBD. To coordinate, an inter-departmental commission was created to consider questions on drafting a national biodiversity strategy, on including specific measures in sectoral plans, and establishing a database. Sectoral decisions are taken by the relevant federal executive organs, amongst them the State Fisheries Commission.²²⁰

In 1994-1997, State Committee for Environment Protection in cooperation with Russian Federation subjects and assisted by Wetlands International and the Ramsar Convention Secretariat generated the legal protection mechanism and information base on the status of wetlands. Preliminary information on the status of protected ecosystems and its determinant factors has been generalised for all 35 wetlands. Regulations to control human activities on 12 Ramsar territories have been developed. Twenty-six territories have been outlined and mapped.

Resources for meeting obligations and recommendations

Russia continues to suffer economic crisis and lawlessness.

Capacity-building measures for developing and implementing plans

A biodiversity scientific-coordination centre is being established under the All-Russian Scientific Research Institute for Environmental Protection in accordance with a decision of the inter-departmental commission.²²⁰

State and priorities for expanding the ecological network

The experience in building the Ecological Network in Western and Central Europe as well as in some NIS regions has not been properly taken into account by state organs.¹⁷⁴

Due to socio-economic challenges, full implementation seems unfeasible. Starting in 1992, the state zapovedniks network has grown to 301 000 km², increasing the total area of Russian national parks by 45%.

Maritime biota and ecosystems are conserved in 15 state zapovedniks and 2 national parks covering over 120 000 km². By 2005, another 15 zapovedniks are planned on more than 70 000 km². On the Russian coast of the Black Sea alone over 30 protected areas are to be integrated into a regional ecological network, part of a unified network of Black Sea protected areas in Turkey, Georgia, Russia, Ukraine, Bulgaria, and Romania.

Three zapovedniks carry out target protection of maritime ecosystems, namely seashores and the Dalnevostochny Morskoy (Far East Marine shelf), Komandorsky (Commander Islands), and Ostrov Vrangela (Vrangel Island). Because of increasing oil and gas extraction on the sea shelf, creation of marine protected areas on the Barents Sea coast, in the Chuckchee Sea and various sections of the Caspian Sea is urgent. Oil and gas terminals and an oil pipeline are planned for building near Novorossiisk and along the Black Sea coast. Similar problems afflict the Barents shelf (Shtokman and Prirazlom deposits), the maritime zone of the Nenets Autonomous Area, Yamal peninsula, in coastal waters of Sakhalin (Sakhalin-1 and Sakhalin-2 projects) and in the northern and western Caspian Sea aquatic areas.

Following the collapse of the USSR, a drastic shortage of maritime recreation areas for Russian nationals has increased recreational pressure on the Black and Azov Seas and near the Caspian Sea. A network to protect highly valuable wetlands and take in no less than 400 locations in long-term prospect is needed. A list comprising 77 wetlands is already available. This long-term effort needs a specific program to be developed for the whole country.

Legislation or legislative framework for aquatic biodiversity

Unfortunately biodiversity considerations are not considered in spatial planning, construction and functioning of processing plants, terminals, linear structures, and in mining, forestry and agriculture. Regional ecological and social aspects are not taken into account when prioritising actions for biodiversity conservation.

Most regulatory and methodology documents declaring requirements for work procedures on fishery water pools were developed before 1990 and do not correspond to current

conditions defined in the Water Code on water biology protection. Specific state bodies authorized for water objects protection and state fishery agencies thus plan to develop methodology documents on hydrobiological analysis of small rivers quality, requirements for the construction of hydraulic works, and regulations on the use of water storage basins.

The Federal Law On the Russian Federation continental shelf adopted in 1995 secured a complex approach to sea environmental protection that focuses on preventing, exposing and curtailing violations of international norms and standards as well as of RF laws and regulations on marine life resources protection. With marine flora and fauna conservation in mind, this law stated requirements for

- investigating, protecting and using continental shelf life resources,
- issuing licenses on trade, and
- rights and duties of initiators of economic or other activities in creating artificial islands, installations and facilities for preserving the sea environment and habitats of sea organisms.

Incentives for biodiversity conservation were in the RF Water Code of 1995. The Code lists requirements for protecting aquatic habitats from pollution, contamination and depletion, and from the building of hydraulic works and their operating conditions.

To govern fishing management, the RF Government confirmed the Statute on licensing of industrial fishing and fish breeding and the Statute on licensing of activities in managing sport and non-professional fishing of valuable fish, water fauna and floral species.

Special legal subordinate acts govern hunting and fishing, the key acts being ‘Rules for management of relevant activities on the level of the Federation or RF subjects’; the ‘RF Water Code, 1995’; and the RF Government Edicts: of 25.05.1994 No 575 ‘On approval of taxes for estimating the amount of recovery for damage imposed by illegal fishing and preying on water biological resources’.

Cooperative mechanisms among authorities, NGOs etc. to ensure integration

No mention of co-operative mechanisms is made in the National Report.

The Biodiversity Conservation Center (BCC), in Moscow, is the largest professional NGO working in the field of biodiversity conservation on the territory of the former Soviet Union. BCC develops and implements nature conservation projects in Northern Eurasia; provides information, methodical and consulting support for conservation initiatives; coordinates the activities of environmental organisations in Russia and abroad; supports Zapovedniks, National Parks and other protected natural areas; develops mechanisms for making charitable investments in wildlife conservation.¹⁷⁴

NGOs are calling for the government to support the initiative to create a Pan-European marine ecological network and the adoption of a European Coastal Code. Introduce to the text of the PEBLDS (Action Theme 5, Coastal and Marine Ecosystems) an addendum connected with the protection of the Arctic seas (Barents Sea, Kara Sea, Laptev Sea, East-Siberian Sea, Chuckchee Sea) and the seas of the Pacific Ocean (Bering Sea, Sea of Okhotsk, and Sea of Japan). In the fishing industry, the Government is being called on to pay attention to the role of artificial lakes in formation and destruction of freshwater (resident and mitigating) fish species.¹⁷⁴

Vulnerable transboundary aquatic systems

Serious new problems in the international situation are primarily a matter of water-resource and fisheries relations with the former republics of the Soviet Union which are now sovereign States: Estonia, Lithuania, Latvia, Ukraine, Georgia, Azerbaijan, Kazakhstan and Turkmenistan.²²⁰

International disputes over at least two small sections of the boundary with China remain to be settled, despite a 1997 boundary agreement. The islands of Etorofu, Kunashiri, and Shikotan and the Habomai group, occupied in 1945, are claimed by Japan. Caspian Sea boundaries are not yet determined among Azerbaijan, Iran, Kazakhstan, Russia, and Turkmenistan. Russia has made no territorial claim in Antarctica, though has reserved the right to do so, and does not recognize the claims of any other nation.⁵⁸

Other matters of fundamental importance for the Russian Federation are the forthcoming use of the northern sea route by international shipping and international cooperation in the Russian sector of the Arctic.²²⁰

Examples of transboundary cooperation

In connection with its marine activities and use of marine resources Russia is extensively engaged in international work under the auspices of the United Nations and other international governmental and non-governmental organizations, and in bilateral and multilateral cooperation. The Russian Federation participates in scientific research on and observation of the marine environment, and actively exchanges research and systematic observation data and information through a network of world, regional and national centres. The Russian Federation has several data banks of direct relevance to the international programmes of WMO, including the World Weather Watch (WWW), and of the Intergovernmental Oceanographic Commission (IOC). The Federation takes an active part in international cooperation in the exchange of data and information and their storage and in the creation of archives through world and regional data centres.²²⁰

In cooperation with IOC, WHO, UNEP, ICSU and other international organizations, the Russian Federation is taking an active part in the Global Ocean Observing System (GOOS).²²⁰

Together with countries bordering on the Sea of Japan (China, Republic of Korea, Japan) Russia is participating in the NEARGOOS project under the GOOS programme. Similar activities are being developed with the Black Sea countries. Russia has in operation an extensive system for the training of experts in marine hydrometeorology and oceanography and is also in the Training, Education and Mutual Assistance programme (TEMA).²²⁰

The Russian Federation is helping to strengthen international cooperation for the protection and rational use of seas and oceans. It is active in the following programmes: The marine aspects of WWW; the marine programmes of IOC, WMO, UNEP, ICSU, IMO, ICES and other international organizations; the marine components of global systems for monitoring climate and droughts and of the Global Ocean Observing System; and marine pollution monitoring programmes. Great importance is attached to expanding regional cooperation in the Black and Azov Seas and in the Caspian, Baltic, Japan and Bering Seas.²²⁰

The federal programme 'World Ocean' (under preparation) envisages coordination of regional programmes for monitoring phenomena in coastal areas and coastal waters and connected with climate change, for improving forecasting to ensure the safety and efficient conduct of marine activities, and programmes concerned with rational use of marine resources and protection of the marine environment.²²⁰

In 1996 the United Nations Convention on the Law of the Sea, signed in 1982, was submitted to the President for transmission to the State Duma for ratification.²²⁰

UNEP-GEF programmes include the 'North Pacific Transboundary Fisheries Stock Conservation and Management Project' to ascertain the true condition of the areas fishery and the realistic baseline improvements and incremental needs for a long-term fisheries management and conservation intervention by GEF, including the removal of barriers to investment potential; and the 'Conservation Management of Wild Salmonid Diversity in Kamchatka', which would focus on three river systems from which no more than 4 watersheds would be selected along Kamchatka's sparsely populated western coast to capture the full range of Kamchatka's salmon, steelhead, trout and char diversity. These discrete, manageable areas would be the focus of a comprehensive demonstration program designed to remove the root causes of threats to salmonid diversity, jointly financed by the GEF and other sources.

Priority given to transboundary cooperation affecting aquatic biodiversity

Co-operative management and use is made difficult by the absence of common biodiversity conservation methodology and terminology. Simply taking on the lists of endangered species from the Conventions will be ineffective, since many species rare in Western Europe (bear, lynx, otter etc.) are plentiful in Russia. The list of species and other nature objects to be protected should be created for each biogeographical region according to general rules.¹⁷⁴

The financial and economic mechanisms required for the conservation of biodiversity are undeveloped or do not exist. More than 70 years of communism have left NIS countries without the skills and consumer power to influence environmental unfriendly industries.

Also, a principal difference in geographical scale leaves large areas, which in Western Europe would usually be managed by national governments or even International Agreements, to be managed by local administrations. ¹⁷⁴

Cultural landscapes are much more abundant in Western Europe than in the east, giving rise to the western tradition of protecting wildlife along with cultural landscapes. In the east cultural landscapes are practically not protected as such. ¹⁷⁴

Significant aquatic biodiversity (freshwater and marine)

One hundred and twelve freshwater fish are found in South Africa, or 1.3% of the world total. Marine fish amount to 2 150 species or 16.0% of the world total. South Africa ranks as the third most biologically diverse country in the world, thanks to its extraordinary plant richness.

Present and planned uses of aquatic biodiversity

No information found.

Threats to aquatic biodiversity

Neither terrestrial nor marine protected areas in South Africa form part of a planned network. Protected areas have remained inaccessible to the majority of South Africa's people, and are perceived to be playgrounds for a privileged elite, from which few benefits are derived. These imbalances are well recognised, and are in some instances being redressed by conservation and other agencies.

Wetland conservation is extremely poor in South Africa and the majority of wetlands fall outside of protected areas. Exceptions to this include the 15 Ramsar Sites in the country, which are recognised in terms of the Convention on Wetlands of International Importance especially as Waterfowl Habitat (Ramsar Convention) and protected through various laws. These total some 488 859 hectares.

Several marine protected areas are along South Africa's extensive coastline, representing most marine biogeographic regions, and they include two of the largest 'no-take' reserves in the world. As with terrestrial protected areas, there has been no overall planned development of marine reserves, a large number being either poorly positioned or inadequately policed. Furthermore, existing marine protected areas do not protect the full range of coastal and marine habitats, such as sandy beaches, estuaries, dunes, and different types of rocky shore.

Measures taken to manage fisheries for biodiversity

The national policy on the conservation and sustainable use of biological diversity has influenced a number of policies in South Africa. The Marine Fisheries Policy (5 May 1997) and the White Paper on Water Policy also recognise the values of biodiversity conservation.

¹⁶ For South Africa's full Fisheries Policy, see: http://www.polity.org.za/govdocs/white_papers/marine.html

Under, 'Promotion of sustainable utilization and the replenishment of living marine resources', the principles of replenishment and restocking of the resources are accepted as the prime objectives to achieve optimum sustainable use and the maintenance of biodiversity. The principles should be fundamental to managing resources on a long-term basis, and will be implemented taking due cognizance of the Precautionary Principle, and the need to manage fisheries so that populations of harvested and other marine organisms are kept at levels consistent with their roles in the ecosystem.

A Wetlands Bill was to be tabled during the 1998 Parliament. Research programmes linked to various river systems are being undertaken. The Kruger Park Rivers Research Programme is an outstanding example of an integrated approach to river management. The National Aquatic Ecosystem Biomonitoring Programme is a national programme aimed at using biological indicators in conjunction with traditional physical and chemical indicators, to monitor, assess and report on the health, status and trends of South Africa's freshwater ecosystems.

Research efforts or goals

The Foundation for Research Development is supporting a large body of research to establish the status of marine ecosystems and species. Areas covered by the programme include hard and soft subtidal substrates, sandy beaches and dunes, rocky shores, marine microbial diversity and estuaries. Taxonomic aspects are also being addressed. Status reports are currently being produced and will form part of the South African Country Study.

Existing biological knowledge is patchy. In particular, the interactions between biological and social processes are poorly understood, as are the causes underlying the decline in biodiversity. There has also been an under-investment in the application of research results to biodiversity management.

Priorities for national action

Coordination and networking within and across disciplines and between different programmes need to be improved. The Government, working with interested parties, will develop a multidisciplinary national biodiversity research plan, encourage researchers to popularise their work and to place relevant biodiversity information and data in the public domain, and develop partnerships with the scientific community to facilitate the effective implementation of the goals and objectives articulated by this policy.

National or sectoral plans that include sustainable use of aquatic biological diversity

To achieve sustainable use of biological resources and to minimise adverse impacts, considerations of biodiversity must be integrated into all spheres of national, provincial and local decision-making, both within and across different sectors. This is a key objective of the

national biodiversity policy, as well as being an integral part of the development of general national policy on environmental management.

National policies on coastal zone management and marine fisheries are being developed. Government believes it necessary to adopt a cross-sectoral approach that embraces the need for wide-ranging, comprehensive, transboundary responses to threats; that treats the entire hydrological cycle as an integrated unit; and that governs actions on land and sea.

Towards this, the Government, in collaboration with interested parties, will:

- ensure that considerations of conservation and sustainable use of marine and coastal biodiversity are effectively incorporated into national policies on integrated pollution control and waste management and marine fisheries;
- support the rapid development of a national policy on coastal zone management incorporating biodiversity considerations;
- require that those using marine resources, receiving services from marine and coastal ecosystems, or producing waste must bear all environmental, social, and economic costs, and the responsibility for any consequential detriment to the environment and to associated biota;
- prevent inappropriate activities and development along the coast, and that of linear or ribbon development in particular;
- ensure that adequate buffer strips are retained to protect the coastal zone;
- amend existing legislation or introduce new legislation to control the exploitation of all marine organisms not presently legally protected.
- investigate the impacts of commercial fishery practices on ecosystems, on target, non-target and by-catch species, on the viability of populations, and on genetic diversity;
- determine the impact of recreational fishing on fisheries, fish and their habitats, and develop a national strategy and guidelines for managing recreational fishing on an ecologically sustainable basis;
- undertake research concerning the management and control of subsistence artisanal fisheries, including the development of appropriate monitoring systems;
- determine the impact of mariculture species and management practices on biodiversity, and develop appropriate guidelines for mariculture developments; and
- develop and promote fishing techniques and procedures that are species and size specific, and that have the least impact on ecosystems and on non-target species.

Resources for meeting obligations and recommendations

No information found.

Capacity-building measures for developing and implementing plans

South Africa's approach to capacity-building has three main components:

- increasing public appreciation of the importance of biodiversity, and public involvement in its sustainable use;
- improving the understanding of biodiversity through research, improving biological inventories, establishing and maintaining monitoring systems, sharing information, and incorporating traditional knowledge; and
- strengthening existing management capacity through appropriate training.

State and priorities for expanding the ecological network

No information found.

Legislation or legislative framework for aquatic biodiversity

No information found.

Cooperative mechanisms among authorities, NGOs etc. to ensure integration

The function of the national government is to implement national legislation, develop and implement national policy and coordinate the functions of national departments and provincial administrations.

Within this framework, the Department of Environmental Affairs and Tourism, as the lead agent for the environment, is responsible for developing national environmental policy and for coordinating central and provincial government institutions.

The main government agents at national level for conservation and sustainable use of biological diversity are the Departments of Agriculture, Land Affairs and Water Affairs and Forestry, the National Parks Board, and the National Botanical Institute.

Provincially the major responsibility lies with the nine provincial environment and nature conservation departments.

The establishment of Private Nature Reserves is encouraged by all of the provincial conservation agencies. Game ranches and private protected areas are much more numerous and more extensive in area than formally protected areas. Private protected areas provide a variety of important conservation and other services.

These include providing safe havens, the breeding of endangered species in the wild for subsequent re-introduction, nature-based tourism and sustainable use of wildlife. The private sector makes an invaluable contribution to biodiversity conservation.

Vulnerable transboundary aquatic systems

No information found.

Examples of transboundary cooperation

The *Pretoria News* reported in May 2001 that the South African National Defence Force (SANDF) and the Australian Defence Force (ADF) warn of strong action against illegal fishing operators. In April 2001 the SANDF assisted in the interception and arrest of the illegal fishing vessel, South Tommy, which was carrying a cargo of fish worth about R4-million. The vessel reportedly outran a patrol boat from the Australian Fisheries department, until it was intercepted by the South African Navy. In a joint statement the SANDF and the ADF warned that ‘foreign fishing interests’ should know that they cannot avoid South African and Australian fishing regulations.²³¹

Priority given to transboundary cooperation affecting aquatic biodiversity

No information found.

Significant aquatic biodiversity (freshwater and marine)

With 3 200 km of Mediterranean coast, 1 200 in Cantabria and 3 500 km in the Atlantic (including the Canary Islands), species diversity in Spanish coastal waters is the highest in Europe. Estimations put the number of marine 'metazoos' at 10 000 species. Spanish territory includes the Balearic archipelago (500 km² in the Mediterranean), the Canary Islands (7 500 km² in the Atlantic Ocean, and 110 km² of NW Africa. The coastal waters, from 200-240 m deep, cover between 80 000 and 100 000 km².

Knowledge of the marine biodiversity at the species level continues to be poor. Spanish waters belong to three marine bio-geographical regions: the Lusitanian, or Portuguese (encompassing the Azores and the northern shores of Iberia); the Mauritanian (south of the Azores, encompassing Madiera and the Canary Islands off the coast of Africa) and the Mediterranean.

Spain is rich in freshwater habitats. Among these stand out wetlands such as the marshes of Guadalquivir and the delta of the Ebro, important migratory routes of birds between Europe and Africa. The Spanish wetlands are relatively small, numbering 1 500 and covering only 0.22% of the national territory (110 000 ha). To these natural wetlands can be added some 250 000 hectares of manmade impoundments.

Present and planned uses of aquatic biodiversity

The gross value of fisheries output in 1994 was US\$ 2 598 million and *per capita* consumption was 37 kg. Since membership of the European Union in 1986 forced Spain to adapt to the Common Fisheries Policy, the structure of the Spanish fleet has evolved to reflect stock availability. While the national shelf area is well stocked, it is also narrow, so much of the fleet fishes in international or other national waters.⁸⁰

Spain brings in 1 300 000 metric tons of fish yearly, of which approximately 400 000 are taken in littoral waters.

The Spanish Distant Water Fleet has taken about 10 % of all catches worldwide between 1954-1994, or 22 860 000 tons, concentrating in the Atlantic and Indian Oceans, CE Atlantic Ocean, NW Atlantic Ocean, SE Atlantic Ocean, and taking mainly Atlantic cod, Cape hakes, European pilchard, yellowfin and skipjack. Historically Spain (together with Russia) has dominated the fleets fishing the Central Eastern Atlantic.³⁷ For many years, especially before 1977, Spain also fished unchecked in the waters off Mauritania and Senegal, taking more than 3 million tons.¹⁵⁵ According to one report,¹ Spain had a 26% market share in the country's fish.³⁷

More than 80% of Spanish fishery production is for human consumption. About 62 % is consumed fresh or chilled, while the rest is frozen or salted. Fresh fish is caught by the inshore fleet in local waters: whitefish, such as hake, megrim, monk, seabream and wedge sole; shellfish, such as langoustine, shrimp, and lobster; cephalopods, such as squid, cuttlefish and octopus; and bluefish, such as sardine, anchoveta, mackerel and tuna. The frozen fish is from various fishing regions: hake from the southern Atlantic; cephalopods from the sub-Sahara and southern Atlantic; shrimps and prawns from Senegal and neighbouring waters, Mozambique and Angola; tuna from the Atlantic and Indian Oceans and some from the Pacific. Salted cod continues to come from the northern Atlantic, both the Northwest, where catches have fallen, and the Northeast.⁸⁰

Particular attention should be paid to extensive aquaculture, particularly mussel farming using floating raft, an activity that has developed spectacularly in the rivers of Galicia. Output has risen to about 200 000 tons and is currently under consolidation. Efforts have also been made to develop large coastal areas economically, by setting up fish and mollusc farms that increasingly employ floating structures for production.⁸⁰

Threats to aquatic biodiversity

Some commercial species have been overexploited and are now at risk. The patudo or bigeye tuna (in the Canary Islands), pez espada or swordfish, bonito del norte (presumably northern Atlantic bonito) and the red tuna (northern bluefin) are listed as threatened by the IUCN. So too are the cod and the eglefino, or haddock, in Newfoundland, whose populations were exploited by the Spanish fisheries. Moreover, the anchovy and the sardine of Cantábria are beyond the biological limits of security.

Marine biodiversity is, in general, in less critical a state than terrestrial. Chemical contamination and eutrophication, as well as the physical alteration of habitats, have had their impact. Around 40% of the Spanish littoral is urbanised or occupied by infrastructures that impact nearby waters. Aquaculture may constitute an important local resource in regions such as Galicia, but causes periodic contamination.

Two species of fish are in danger of extinction, more than one are vulnerable, and five are of interest.

Cod fishing in the northern hemisphere has been affected by cyclical, climatic, biological and other factors. The Arctic cod crisis of 1989-93 was followed by the NAFO cod crisis of 1993. The cod fleet has therefore shrunk more than 50% in recent years, both in number and capacity. However, the fleet was given access to Arctic cod in Norwegian EEZ waters from 1994 following trade concessions granted in negotiations for the European Economic Area.⁸⁰

Of the 7 300 km of rivers in Spain, 11% are substantially contaminated (800 km) and another 15% are moderately contaminated. A large part of the marshy terrain, marshes and lagoons were drained for sanitary reasons; in less than 50 years, more than 60% of the wetlands in Iberia are estimated to have been drained. The marshlands of Guadalquivir, for

example, were reduced from 200 000 ha to 36 000. Doñana as well as Daimiel are in the register of Montreux as threatened Ramsar sites. The most recent inventory of Spanish wetlands (1995) recognises 1 275 sites in the interior (16 421 ha) and 104 coastal (104 116 ha).

Past shortcomings in Spain's wetland policies included erroneous perceptions of wetlands as biodiversity reservoirs with definite boundaries; neglect of aquifers and downstream coastal wetlands; exclusion of wetlands from water policies; and weak protection of Ramsar sites. Spain's current approach focuses on inventorying and rehabilitating all wetland types; mapping risks and pollution sources; maintaining minimum riparian ecological functions; combining ecological and economic valuation; and integrating wetlands into inter-sectoral biodiversity, forest and water strategies.⁶⁰

Introduction of exotic species is another potential problem for marine biodiversity. Currently, of the seven seaweeds, two mollusks and two crabs introduced, only in two cases (seaweeds) have there been detectable changes in the ecosystem with loss of biodiversity.

The fishing of large migratory stocks in the Atlantic and Indian Oceans has suffered from the indiscriminate use of long driftnets. A ministerial ordinance of 22 October 1990 prohibited their use to further conservation, forcing 100 vessels operating in the straits of Gibraltar to be reconverted. The international and European Union ban has improved prospects, though a number of problems still exist in the Mediterranean and the Gulf of Biscay.⁸⁰

Measures taken to manage fisheries for biodiversity

The global and sectoral adjustment of the Spanish fishing fleet to resource availability is taking place according to established objectives as set out in the EU's multiannual orientation programmes. The underlying aim is to modernize and streamline the fleet, strengthening those sectors that use selective fishing gear and therefore better apply the concept of responsible fishing. The alignment of effort to resource availability, the measures taken to replenish domestic fish stocks and the relocation and diversification of fishing grounds represent an assurance of stable fishing fleet activity. Spain was also the only whaling country to vote in favour of the moratorium at the International Whaling Commission meeting of 1982 and started dismantling its whaling industry when this came into effect in 1985.⁸⁰

Spain leads Europe in protected marine areas, with 1 288 km². Species and habitat protection has been tremendously intensified through the promulgation of the Conservation Law of 1989. Protected marine reserves created by fishery legislation (Law of Conservation, Special Protected Zones of the Mediterranean, derived from the Convention of Barcelona) currently consist of nine reserves totaling 92 173 ha. To these must be added 36 680 more in marine or maritime-terrestrial protected areas established by the Law of Conservation of 1989 (in Galicia, Valencia, Balearic Islands and the Canaries.)

In inshore waters, stock rehabilitation actions undertaken have proved effective and have resulted in the establishment of 9 marine reserves and 62 artificial reefs. Another important

aspect has been the national regulation of coral fishing in the Mediterranean since 1984, and the ban on the use of the Italian beam in 1986.⁸⁰

The 38 Spanish wetlands protected under the Ramsar Convention total 158 648 ha. However, overlapping is frequent, as, for example, the marshlands of Santoña are counted under ZEPA, Ramsar and the Reserva Natural de la Comunidad Autónoma de Cantabria. With so much overlapping, it is difficult to arrive at the true extension of protected territory.

The restructuring of the Spanish fleet in 1990-1995 has resulted in a reduction of about 120 000 GRT, either by scrapping vessels or exporting them to third-party countries to set up more than 70 joint ventures.⁸⁰

Research efforts or goals

Fishery research is carried out by the Spanish Institute of Oceanography, under the Ministry of Agriculture, Fisheries and Food, and other institutes which are answerable to the Higher Scientific Research Council (Ministry of Education and Science): Institute of Marine Sciences of Barcelona, Institute of Fishery Research of Vigo, Institute of Marine Sciences of Andalucía and the Institute of Aquaculture of Torre de la Sal.⁸⁰

The Spanish Institute of Oceanography, based in Madrid but having coastal branches, is responsible for research related to the sea and fisheries. The other four institutes are primarily involved in research. Their research essentially concerns fisheries, both coastal and offshore, with focus on stock assessment, reaction to fishing techniques, mollusk and fish culture, and marine biology and oceanography in general. A large oceanographic research vessel of 1 000 GRT is available to help investigations, in addition to a 250 GRT vessel and various small crafts. A number of marine culture research centres operate under the central and autonomous administrations and the universities.⁸⁰

Apart from drawing up inventories and revising groups, other aspects are being studied, such as factors influencing mortality, and criteria for defining marine reserves. The Ministry of Food and Fisheries is negotiating a database on marine ecosystems and habitats, and a directory of investigations on marine themes (274 on marine biology and 98 on fisheries.) Marine fauna was published in 1992 for only the Canary Islands.

Eight autonomous regions have already developed their regional catalogues. The draft catalogue of *Cananas*, for example, contains 905 entries, mostly endemics: 435 flowers (including algae or seaweed) and 475 animals which include 322 terrestrial invertebrates and 60 marine species.

Priorities for national action

The introduction into other policies of criteria for preserving biodiversity have not been a priority of Spanish policy (but will be with the new Strategy). The National Plan of Marine Science and Technology gives priority to marine biodiversity, with some 50 projects planned for territorial waters.

National or sectoral plans that include sustainable use of aquatic biological diversity

When Spain ratified the CBD in 1993 the responsibilities for biodiversity were shared essentially between the Ministry of Agriculture, Fisheries and Food, (MAPA) and the Ministry of Public Works, Transport and Environment (MOPTMA). The obligations assumed by Spain under the CDB are shared between the National Government and the autonomous regions, which can develop basic norms and additional means to protect natural resources.

Fisheries fall under the Ministry of Agriculture, Fisheries and Food (Instituto Español de Oceanografía),

The relevant legislation is the *Ley de costas* (1986), or Coastal Law. Natural conservation has proceeded very quickly in the last two decades, especially following Spain's accession into the EC in 1986. Much of present policy concerning diversity and conservation results from EC common directives. Nonetheless, integration remains a complex and difficult task.

Resources for meeting obligations and recommendations

Reforms are slow and difficult because of strong traditions and administrative inertia. A recommendation the OCDE has made to Spain is for greater integration of environmental concerns in the political sectors.

Capacity-building measures for developing and implementing plans

No information found.

Current state and priorities for expanding the ecological network

No information found.

Legislation or legislative framework for aquatic biodiversity

No information found.

Cooperative mechanisms among authorities, NGOs etc. to ensure integration

No information found.

Vulnerable transboundary aquatic systems

No information found.

Examples of transboundary cooperation

Some of the main countries having set up joint ventures in Namibia are Norway and Spain, for demersal fishing, and Russia and Spain in horse mackerel fishing. Spain has given aid to Mauritania's fishing sector to develop local fisheries and coastal surveillance programmes, and to promote traditional fishing development.³²

Priority given to transboundary cooperation affecting aquatic biodiversity

No information found.

Examples of transboundary cooperation

The EU has taken over Spain's bilateral fishing agreements with third-party states and included the Spanish fleet in the EU's agreements, many of which were reached under EU cooperation policy.⁸⁰

Significant aquatic biodiversity (freshwater and marine)

Sri Lanka is an island with a land area of 6 570 134 ha and a coastline of 1 600 km. Nearly 20 % of the gross domestic product is from agriculture and fisheries, and the biodiversity of coastal and marine ecosystems provide over 65 % of the animal protein requirement of the country.

Surveys carried out by the research vessel Dr. FRIDTJOF NANSEN in 1978-80 estimated a total biomass in the coastal shelf and immediate adjacent area of about 750 000 mt and a maximum sustainable yield (MSY) of about 250 000 mt: 170 000 mt of pelagic species and 80 000 mt of demersal species. The highest landings on record from the coastal areas are 184 000 mt (1983). Current landings are around 149 000 m.⁸¹

Present and planned uses of aquatic biodiversity

Except for small quantities of shrimp, lobster and tuna, all fish landed is marketed locally, and most are sold fresh. Freezing is uncommon, though more ice is being used. Most frozen products are exported. Sun-drying, salting, and smoking are practised on a small scale.⁸¹

Fish marketing is mostly the business of private traders, most of the larger of which have their own transport. Fish bought in major production centres is sent to commission agents at St. John's wholesale fish market in Colombo. Cooperatives play only a marginal role in fish marketing. A small quantity is also handled by the Ceylon Fisheries Corporation (CFC).⁸¹

Shrimp is the major export commodity of the fisheries sector, accounting for nearly 40% of total export earnings. About 60% of the shrimp production is in aquaculture. Shrimp culture is expanding steadily.⁸¹

Threats to aquatic biodiversity

Establishing tea plantations after 1840 destroyed forests on the hill-slopes. This accelerated loss of topsoil and generated floods and landslides. The changes in the biotic regime of the catchment areas altered the physical and biological characteristics of the hill streams, resulting in the decline of the fish and other forms of aquatic fauna. The increasing use of chemical fertilizers and pesticides further added to the loss of fish species. The rivers arising out of the protected forest areas like Sinharaja Forests contain most of the endemic fish species, because of the natural conditions existing in the catchment areas.²²

Measures taken to manage fisheries for biodiversity

A coastal zone management plan has been prepared by the Ministry of Fisheries to adopt an integrated approach to the management of coastal resources and to involve local

communities in the planning and implementation of programmes for the conservation and sustainable use of marine resources and the conservation of the coastline. Regulations have been developed to prevent overfishing and the coastal management plan provides for zones to conserve marine species threatened by indiscriminate fishing and the use of inappropriate fishing techniques. The policy on coastal fishing has been oriented towards mitigating the adverse effects on the environment and maximizing the protection of fish in a sustainable manner. A national contingency plan to deal with oil spills is also under consideration.²²¹

The current inland fisheries and aquaculture development programme includes stocking waterbodies with fingerlings, raising fish in ponds, cages, and pens, and providing subsidies for buying canoes and fishing gear. The newly established Aquaculture Development Division of the Ministry of Fisheries & Aquatic Resources Development is acting to rehabilitate the two fish breeding stations at Dambulla and Udawalave and to encourage fish feed production by the farmers, fishermen and NGOs.⁸¹

Two capture fisheries projects are operating: a Fisheries Sector Development Project funded by ADB, and the Marine Fisheries Management Project funded by UNDP/FAO. The first started in 1993 and will run for six years, and cost US\$ 33 million. It aims to support rehabilitation of fishing harbours and anchorages, fishing community development, research and institutional development. The second project is a 5-year technical assistance project that started in 1993, at a cost of US\$ 1.8 million. Its purpose is to establish a fisheries management mechanism.⁸¹

There are also four FAO Technical Assistance projects in aquaculture:

- Project on Management of Ornamental Fishery - with the help of the Bay of Bengal Programme (BOBP);
- Project to Minimize the Post Harvest Losses and to Improve the Quality of Fish - with the help of ODA;
- FAO/TCP Project on Disease Prevention and Health Management in Coastal Shrimp Culture; and
- FAO/TCP Project on Aquaculture Development.⁸¹

Research efforts or goals

No information found.

Priorities for national action

The BCAP's broad objectives include building capacity for gaining a better understanding of indigenous biodiversity, identifying adverse impacts on biodiversity, and developing programmes to enhance public awareness on biodiversity and encourage public participation in biodiversity conservation programmes.

National or sectoral plans that include sustainable use of aquatic biological diversity

The preparation of the National Biodiversity Conservation Action Plan (BCAP) demonstrates the government's commitment towards conserving biodiversity. The BCAP preparatory process was intensely participatory, involving consultations and meetings with a large body of stakeholders of biodiversity, including state agencies, over 100 NGOs and others. The draft BCAP was then reviewed at several workshops with heads of state departments, particularly those with a mandate for implementation of the BCAP, NGOs, CBOs, researchers and university personnel. In its review of cross-sectoral areas, the BCAP examines Research and Development, and Education and Training. Lack of clear evidence of a focus on research and development by various research institutions on issues relevant to CBD has been emphasized. In Education and Training, the BCAP reviews the current initiatives and programmes of both the state and the NGO sectors.

Resources for meeting obligations and recommendations

No information found.

Capacity-building measures for developing and implementing plans

No information found.

State and priorities for expanding the ecological network

No information found.

Legislation or legislative framework for aquatic biodiversity

The Department of Fisheries and Coast Conservation, under the Ministry of Fisheries, is responsible for policy-making and implementation of the coastal zone plan. The major policy decisions are approved by the Cabinet.²²¹

The implementation of the BCAP (National Biodiversity Conservation Action Plan) will fall to the Ministry in charge of the Environment (the focal point for the Convention on Biological Diversity). A special Secretariat will deal with matters relating to the implementation of the BCAP. This Secretariat will be assisted by a National Steering Committee and Task Forces which will provide technical back-stopping and policy advice to the Ministry.

In the area of coastal and marine habitats, the BCAP highlights findings of the *Report on Resource Management Strategy for Sri Lanka's Coastal Region*, and the problems associated with coral mining.

Major legislative enactments include the National Environmental Act 1980, and the Fisheries and Aquatic Resources Act.²²¹

Cooperative mechanisms among authorities, NGOs etc. to ensure integration

The Ministry of Forestry and Environment is responsible for policy-making with the approval of the Cabinet. A network of over 100 NGOs has been built up and biodiversity focal points have been established in development ministries and agencies to get environmental advocacy in formulating biodiversity.²²¹

Vulnerable transboundary aquatic systems

No information found.

Examples of transboundary cooperation

Regionally and nationally there is cooperation for technology transfer, capacity-building and the exchange of information. The SAARC countries cooperate in identifying regional issues and taking regional and international measures for the conservation and sustainable use of biological resources. However, national action regarding conservation and sustainable use of biodiversity and an equitable share of benefits, demands contributory action on the part of the international community, particularly the developed countries.²²¹

Priority given to transboundary cooperation affecting aquatic biodiversity

The UNDP 'Conservation of Biodiversity through Integrated Collaboration Management in the Rekawa, Usangoda, and Kalametiya Coastal ecosystems' project aims to ensure the conservation of valuable coastal ecosystems through the development of collaborative management actively involving local communities, NGOs and government agencies.²²⁵

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Glossary

ADB	Asian Development Bank
AEP	Aquatic Environments Program (Philippines)
ARCBD	ASEAN Regional Center for Biodiversity Conservation
ASEAN	Association of South-East Asia Nations
AWB	Asian Wetland Bureau
Benthic	Flora or fauna living on reefs
CBD	Convention on Biological Diversity
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
DANIDA	Danish International Development Assistance
Demersal	Bottom stocks
EEZ	Exclusive Economic Zone
FMAM	Fondo para el Medio Ambiente Mundial. Spanish acronym for ‘Global Environmental Facility.’
GEF	Global Environmental Facility. English acronym for ‘Fondo para el Medio Ambiente Mundial’
GOOS	Global Ocean Observing System
IICA	Interamerican Institute for Cooperation in Agriculture (<i>Instituto Interamericano de Cooperación para la Agricultura</i>)
IUCN	International Union for the Conservation of Nature, or World Conservation Union
IUU	Illegal, Unregulated and Unreported Fisheries
JICA	Japan International Cooperation Agency
MEGADIVERSITY	In ‘Megadiversity: Earth’s Biologically Wealthiest Nations’, by Mittermeier, R.A. <i>et al.</i> 1997 (Conservation International, Washington DC) the 17 megadiversity countries that have more than two-thirds of the Earth’s biodiversity are: Australia, Brazil, China, Columbia, Democratic Republic of Congo, Ecuador, India, Indonesia, Madagascar, Malaysia, Mexico, Peru, Philippines, South Africa, Papua New Guinea, United States and Venezuela.
MERCOSUR	Southern Cone Common Market.
MSY	Maximum Sustainable Yield
NR	National Report

NORAD	Norwegian Agency for International Development
PEBLDS	Pan-European Biological and Landscape Diversity Strategy
Pelagic	Open water
PNUD	Programa de las Naciones Unidas para el Desarrollo. English acronym is UNDP.
RAMSAR	The Convention on Wetlands, signed in Ramsar, Iran, in 1971, is an intergovernmental treaty which provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources.
SBSTTA	The CBD's 'Subsidiary Body on Scientific, Technical and Technological Advice'.
SIDA	Sida is the Swedish government agency dealing with bilateral international development cooperation and the major part of the cooperation with Central and Eastern Europe.
TED	Turtle Exclusion Device. A cage-like structure that fits in the neck of a trawl net. Since turtles and large fish cannot pass through the cage, they are forced upward through an escape hatch. Studies by the NMFS (USA) on shrimp boats found the device to be 97% effective, reducing shrimp catch by only 2 %. ¹⁷
TED	Trade and Environment Database, created by Jim Lee and accessible at http://www.american.edu/ted/hp1.htm .
TRAFFIC	WWF Wildlife monitoring arm
TURF	Territorial Use Rights in Fisheries. TURFs can be leasehold arrangements, franchises, or allocations of ownership over an area or fish stock (e.g., award of a certificate of stewardship). The Marine Conservation Development Program (MCDP) of Silliman University illustrates the potentials of TURFs as an alternative management scheme for artificial reefs, in particular, and for coastal resources in general. The TURFs concept was used by the MCDP so that the 'owners' of the resources would take interest in the productivity and health of 'their' coral reefs, and thus control fishing practices and efforts to improve benefits.
UNDP	United Nations Development Fund. Spanish acronym is PNUD, 'Programa de las Naciones Unidas para el Desarrollo.'
WWF	World Wildlife Fund, also known as World Wide Fund for Nature

¹⁷ See 'Trade Environment Database Case studies, Shrimp and Sea Turtle' at <http://www.american.edu/projects/mandala/TED/SHRIMP.HTM>