



Biodiversity and Fisheries

CHAPTER 3: AQUATIC BIODIVERSITY

Country Thematic Reviews – Congo to Maldives

Prepared by:

Anton Baer

World Fisheries Trust

204- 1208 Wharf Street, Victoria, BC, Canada V8W 3B9

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Significant aquatic biodiversity (freshwater and marine)

Until 1985, the ORSTOM center at Point-Noire concentrated on biological and physical oceanography. Although the Center has reoriented towards agriculture, it maintains a program on the socio-economic monitoring of artisanal fishing. The aquaculture research station of Djoumouna, built in 1953, has lacked means of operating since 1991 and is being privatized.⁶⁹

Present and planned uses of aquatic biodiversity

Approximately 10 000 fishermen, men and women, capture more than half the fish landed in the Congo. Of these, around 70% are marketed smoked and the remainder are marketed fresh. The fishing boats are dugouts, numbering around 12 000, with very few motorised. The Congo River remains the principal axis of distribution towards Brazzaville, where the distribution chains for freshwater fish end.⁶⁹

The Congo and Kouilou basins are not fully exploited. Primarily obstacles are isolation, and the lack of machinery, processing and transport.⁶⁹

There no longer exists any follow-up for production statistics; only the quantities of saltwater fish of the industrial sector are more or less regularly recorded. In 1994, 60% of national demand was covered by national production, the remainder by frozen fish imports.⁶⁹

With the exception of refrigerated storage for fish at the industrial angling clubs of Point-Noire, infrastructure for the preservation and distribution of fish is poorly developed. The smoking of artisanal catches is therefore well developed in Point-Noire and, when sardines are abundant, this sector absorbs most of the industrial captures.⁶⁹

Industrial catches are distributed almost exclusively fresh or frozen, and maritime artisanal catches primarily dried or smoked. Distribution is mainly by rail towards Brazzaville. The Congo River remains the principal axis of distribution for freshwater fish, most as the dried or smoked product. The fresh fish trade is developing.⁶⁹

Although up nationally, fish consumption *per capita* varies considerably by area, depending on the distribution network. Consumption levels furthermore do not take into account subsistence farming, particularly of freshwater fish, which is very significant in remote areas.⁶⁹

Aquaculture in Congo started in the 1950s. From 1981 to 1991, aquaculture profited from significant aid from UNDP/FAO. Production rose from about 1 t/ha yearly in 1982 to 2.7 t/ha in 1989. For lack of follow-up, total production fell in 1992 to 30 tons, after having stagnated at around 250 tons between 1989 and 1991. Aquaculturists tried recently to

intensify production systems by installing commercial stations in urban zones where the market is almost guaranteed.⁶⁹

Threats to aquatic biodiversity

Congo's large hydroelectric potential (3 000 megawatts-MW) is largely unexploited. Electricity consumption is low, transmission links do not exist in many parts of the country, and civil war has periodically disrupted power supplies. Currently the generation capacity, primarily by hydropower, is around 118 MW. The 74-MW Bouenza and the 15-MW Djoué hydroelectric plants have provided the bulk of this since 1980.⁶⁵

Congo has signed an \$ 11.2-million agreement with Geo-Industria of the Czech Republic to conduct feasibility studies on four micro-hydroelectric power plants in the north.⁶⁵

Development of the \$ 925-million, 1-gigawatt (GW) Sounda Gorge hydroelectric project has been postponed. The project called for the implementation of a three phase construction plan at the confluence of the Niari and Kouilou Rivers, located approximately 85 miles north of Pointe Noire. The first phase would have involved the installation of two turbines with a capacity of 10 MW which would generate cash flow for subsequent phases. The second phase entailed the construction of a 130-foot high dam, which would boost the plant's generating capacity to 240 MW. A third phase was to increase the dam's height to over 300 feet and its generating capacity to 1 GW.⁶⁵

The Magnesium Alloy Corporation (MAC) based in Canada is studying the feasibility of establishing a 180-MW hydroelectric dam on the Kouilou River. MAC states the facility would primarily supply power for its magnesium extraction project, but an approximate 50 MW of power would be available for sale to domestic and regional consumers.⁶⁵

The marine ecosystem in Congo shows increasing signs of degradation affecting fishing, in particular pollution by hydrocarbons. Coastal erosion is another alarming phenomenon.⁶⁹

Measures taken to manage fisheries for biodiversity

The Congolese government banned shark fishing in territorial waters in May, 2001. (Sharks are currently endangered by poaching on Pointe-Noire's Atlantic coast.) Fishermen now have to pay a tax on sharks captured, a shark fishing license tax, and a tax for shark quality control and certification. Fishermen are also not allowed to export any sharks or shark products.¹⁷⁴

Both trawlers and professional small-scale fishermen hunt sharks along the Congolese coast. Under the ban, only accidental secondary catches would be allowed for the smaller sharks, while large specimens caught accidentally or intentionally must be put back. Many small-scale Beninese and Congolese fishermen practice this trade illicitly to get fins to resell at high prices to West African traders, who then sell them on the Asian market.¹⁶¹

Statistics are not yet available on how many sharks have been removed from Congolese waters. However, the identified number of dugout canoes used for this practice has risen ten-fold, from 25 in 1999 to 250 in 2000. The fisheries department does not have the means to closely monitor the 180-kilometre Congolese coastline, which is fished illegally by hundreds of pirate boats from Asia, Europe, and Africa. The present ban follows a similar one issued in 1998.¹⁶¹

Research efforts or goals

No information found.

Priorities for national action

No information found.

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

Fisheries management, supervised by the Ministry for Agriculture, Water, Forestry and Breeding, currently comprises four central offices in Brazzaville (maritime fishing, continental fishing, legislation, administrative and financial affairs) and five regional offices. The decentralized offices are responsible for statistical follow-up and popularization. There also exists within the Ministry a department of aquaculture.⁶⁹

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

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

No information found.

Priority given to transboundary cooperation affecting aquatic biodiversity

Since 1991, three significant projects ended for lack of financing: the ‘Support for maritime fishing’, financed by a loan from France; ‘Development of artisanal fishing in the Congo Basin’, financed by a loan from the FIDA; and ‘Development of rural pisciculture’ financed by the UNDP and carried out by FAO. Only the regional Project of Integrated Development of Artisanal Fishing in West Africa (DIPA), financed by Denmark and carried out by FAO, continues to support the maritime fisheries sector. Since 1991, USAID has financed twenty 20 Peace Corp experts helping to build ponds and popularize pisciculture.⁶⁹

Congo, Democratic Republic of (Kinshasa)

Significant aquatic biodiversity (freshwater and marine)

There are around 1 000 known species of fish, essentially freshwater and some brackish. The lakes of the Rift Valley contain the richest lacustrine fauna in the world; the *Cichlidae* family alone has more than 900 species. At the same time, the lakes differ profoundly. Lake Tanganyika has 250 species of fish, of which 216 are endemic, whereas Lake Kivu contains only 32 and 16, respectively.

A dense hydrographic network of water surfaces, inundated plains and lakes cover around 86 080 km² (3.5% of the national area) and have a considerable aquatic potential. The large peripheral lakes of the East cover around 48 000 km² of which 47% are under Congolese jurisdiction. The respective areas belonging to the Congo are: Lake Tanganyika, 14 800 km²; Lake Albert, 2 420 km²; Lake Kivu, 1 700 km²; Lake Edward, 1 630 km²; and Lake Moëro, 1 950 km².

Another two important lakes in the interior, Lake Tumba and Lake Mai-Ndombe, cover (between them) 2 300 and 7 000 km², depending on season (less in the dry season and more in the rainy season). There are also the lakes of the Kamalondo depression (6 256 km²), Lake Tshangalele (446 km²) and Lake N'Zilo (280 km²). The fluvial system covers around 34 000 km² in a network of more than 33 000 km of rivers, principal tributaries, and streams.

The Congo has a maritime coastline of 40 km, covering an area of 2 000 km².

Present and planned uses of aquatic biodiversity

No information found.

Threats to aquatic biodiversity

In the Congo, water ecosystems have never been considered ecosystems as complex as the others, where live a community of interdependent creatures (Algae, zooplankton, phytoplankton, superior plants etc).

Fish are menaced by overexploitation, pollution, alteration of habitat and destruction of shore zones. Aquatic invertebrates, used for food (harvested at moderate levels), are menaced by hydrocarbon pollution (habitat alteration). There are neither regulations nor protected zones for these organisms.

Measures taken to manage fisheries for biodiversity

No information found.

Research efforts or goals

For water resources, the Centre of Mineral and Geological Research (CRGM), and the Center for Research in Hydrobiology (CRH/Uvira) are responsible for research and information.

Priorities for national action

The Government wishes to increase the protected area surface to 12- 15% of the national area, in considering different natural ecosystems that translate into biological diversity in the Congo proper. The IUCN has identified thirteen sites of national and international interest and four sites of local interest.

The aquatic ecosystems and natural habitats of the Congo have never been considered in government planning, not even for their possible contribution to the national aquatic production to reduce the enormous imports of fish products. The hope of reducing imports justified the elaboration, with the participation of FAO, of a Master Plan for Fisheries whose implementation has been unhurried. In this regard, even the law is unadapted to current reality.

Similarly, international, regional and sub-regional accords that represent opportunities of action for sustainable use of these resources are not appropriately monitored. Apart from the fauna of certain protected areas, such as the National Park of Virunga, inventories of aquatic fauna have been highly sporadic.

Three working committees have been constituted:

1. Commission for Conservation of Resources of Biodiversity
2. Commission for Sustainable Use and Management of Resources
3. Commission for Implementing and Monitoring the Strategy and Action Plan for Biodiversity.

The Commission on the Conservation of Biodiversity, is charged with: Acquisition of knowledge; Protected areas; Vulnerable or threatened species and ecosystems; Conservation *ex situ*; Biosecurity: nuisance indigenous or exotic organisms and genetically modified organisms; Combatting harmful global changes (demographic growth, urban development, reducing greenhouse gases; and Urgent environmental measures.

The Commission on Sustainable Use and Management of Resources is charged with: Faunal resources; Forest resources; Agricultural resources; Mineral resources; Energy resources; Biotechnology resources; and Environmental evaluations.

The Commission on Implementing and Monitoring the Strategy and Action Plan on Biodiversity is charged with:

- Information, awareness, education and training;
- Participation of the population, NGOs and the private sector;
- Autochthonous collections;
- Judicial and institutional cadres;
- Incentives;
- International cooperation; and
- Evaluation and monitoring.

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

No information found.

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

No information found.

Cooperative mechanisms among authorities, NGOs etc. to ensure integration

NGOs active in the Congo include the World Conservation Society (WCS), the World Wildlife Fund (WWF), the International Union for the Conservation of Nature (IUCN), Oxfam and the Friederich Neumann Foundation.

CADIC / Friends of the Earth Congo was founded in 1988, and became a Friends of the Earth International member in 1997. CADIC unites 187 member and grassroots groups in the eastern part of the Democratic Republic of Congo, all of which are struggling to protect

the environment, with biodiversity as the main issue. CADIC organized a national consultation among national NGOs in preparation for the 1992 Rio Earth Summit. CADIC is campaigning to save the Congo basin, and for the implementation of an environmental practices code for national mining companies.¹³¹

Examples of transboundary cooperation

Following recommendations adopted at the 1st Session of the Committee for Inland Fisheries of Africa,¹ the Lake Tanganyika Research (LTR) Project ‘Research for the Management of the Fisheries on Lake Tanganyika’² became operational in January 1992. The project is shared by the four lake-basin states of Burundi, Democratic Republic of Congo (DRC), Tanzania and Zambia. It is executed by the Food and Agriculture Organization of the United Nations (FAO) and funded by the Finnish International Development Agency (FINNIDA) and the Arab Gulf Programme for United Nations Development Organizations (AGFUND). The project’s scientific coordination is carried out by the University of Kuopio, Finland.³

¹ (CIFA), Sub-Committee for Lake Tanganyika, convened in 1978.

² (GCP/RAF/271/FIN)

³ See <http://www.fao.org/fi/coop.asp>

Significant aquatic biodiversity (freshwater and marine)

In the river basin of the Napo (Amazon) 473 species and 225 genres are known to exist, numbers that exceed those reported for any other hydrographic system of similar size in the world.

Present and planned uses of aquatic biodiversity

No information found.

Threats to aquatic biodiversity

Pollution of ground, water and air is an increasing problem. Contaminants such as pesticides deteriorate ecosystems and threaten the populations of sensitive species. Attention has already been focused on the relation between air contamination (especially by lead) and its consequences for human health.⁴

Contamination of soil by oil, industrial, agro-industrial activities and solid wastes is an ever more worrisome problem. Contamination of freshwater by solid wastes and agro-industrial products has eliminated the life of many river basins, whose fish and other animals are unable to resist the contamination levels.

Introduction of some fish such as carp (*Carassius carassius*, Crucian carp, golden carp, goldfish, gibeles), guppies (*Reticulata poecilea*) has caused a serious deterioration in the aquatic surroundings where the introduction tests have taken place. The bullfrog (*Rana catesbeiana*) has become the main competitor of native amphibians, into whose communities it easily integrates.

Faunal and floral biodiversity have been harmed by destruction of habitat and excessive exploitation, and to a lesser extent by contamination and the introduction of alien species. Poaching and the export of threatened species are the main problem in the National Park of the Galápagos Islands. The main causes are corruption at the national level and lack of pressure by the international community on the importing countries.²¹⁴

Measures taken to manage fisheries for biodiversity

The CBD was ratified on 9 June 1992. In 1976 and 1979 strategies had already been laid down to preserve Ecuador's ecosystems through managed protected areas. In 1993 the

⁴ Natura Foundation, 1992, cit. in 'Outlines for the Strategy of Conservation and Use of the Biodiversity in Ecuador', GNTB, 1995, cit. in National Report.

Environmental Advisory Commission of the Presidency of the Republic (CAAM) prepared a global strategy on biodiversity. In recent years the following activities have been made to improve protection *in situ* and the conservation of resources *ex-situ*:

- extending areas protected by National Parks; founding the Instituto Ecuatoriano Forestal y de Áreas Naturales y Vida Silvestre (INEFAN) in 1992;
- creating the National Directorate of Phytogenetic Resources in the National Institute of Investigaciones Agropecuarias (INIAP);
- extending the activities of the Ecuadorian Museum of Natural Sciences;
- extending the activities of the Herbarium of the Catholic University of Ecuador.

In 1994 INEFAN, collaborating with the PNUD (UNDP) and the Fund for the World-wide Environment (FMAM, or GEF), prepared a master plan for protecting biodiversity that includes plans for extending the protected areas of the country. ²¹⁴

In integrating management and sustainable development of the coastal and marine regions special attention is paid to the development of emergency plans, the improvement of coastal settlements, and promoting awareness and of technologies that do not harm the environment. Questions on wastewaters and the siting of coastal drainages are also considered important. ²¹⁴

Ecuador has begun to investigate ways of controlling and preventing water contamination. One local program has begun in the Cutuchi River and in the inter-Andean valley of the Pastaza River. The potential demand for potable water until the year 2010 and for present irrigation has been evaluated in the northern Andean zones and the rest of Ecuador. Water-quality problems are owed mainly to the forms of eliminating wastewater and to the lack of purifying residual water plants (CNUMAD Report, 1992). ²¹⁴

Several UNDP-GEF projects are ongoing in Ecuador:

- The aim of the ‘Control of Invasive Species in the Galapagos Archipelago’ project is to protect the exceptional biodiversity of the archipelago from the introduction of alien species. It involves the improvement of quarantine systems, research programs on methods of controlling invasions and eradication, animal & plant species eradication pilot programs, the establishment of a \$ 15 m trust fund, with \$ 5 m in financing from the GEF, and awareness-building among populations.
- The full-scale ‘Integrated Programme for the Control of Introduced Species in the Galapagos Archipelago’ will establish the integrated programme for the control of introduced species, as a comprehensive operational framework for investment and technical help aimed at preventing new introductions to the archipelago; controlling specific alien species; and eradicating key alien species that are particularly damaging to endemic biodiversity. ²²⁵

- The overall objective of the ‘Biodiversity Conservation in the Galapagos Archipelago’ is to conserve the globally outstanding biodiversity of the Galapagos Archipelago, and its unique evolutionary processes, by covering the incremental costs of removal of threats not fully addressed under the IDB-funded Environmental Programme for Protection of the Galapagos Islands and other on-going and planned initiatives. Whilst preparatory activities will fully define the scope of the final project, it is expected to focus on formulating and implementing a Programme to Control Introduced Species in the Archipelago.²²⁵

Research efforts or goals

No information found.

Priorities for national action

No information found.

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

At the end of 1993 the Environmental Advisory Commission of the Presidency of the Republic was created (‘Comisión Asesora Ambiental de la Presidencia de la República’ or CAAM). One of its first tasks was systematizing all aspects of managing biodiversity: conservation and use of genetic resources, biotechnology, economic use of biodiversity, commerce, and others.

In 1994 CAAM promoted and conformed the (ad hoc) National Working Group on Biodiversity (GNTB), now including 40 organizations and Ecuadorian scientists, ordered to analyze substantial subjects on biodiversity in Ecuador and to propose administrative and legal policies, strategies, adjustments, high-priority programs and projects.

Within the national planning organization (the National Council of Development, or CONADE), the Advisory Unit of Environment (UNAMA) is charged with providing political and technical support to development plans and programs related to biological diversity.

The following institutions are involved with biodiversity and genetic resources: the Instituto Ecuatoriano Forestal y de Áreas Naturales y Vida Silvestre (INEFAN); the Ministry of Agriculture and Cattle Ranching (MAG); and the National Institute of Investigaciones Agropecuarias (INIAP). Those institutions participate in adopting decisions at the national level. The present Forest Law and of Conservation of Natural Areas and Wild Life is considered ‘acceptable’. The law in itself requires no changes, but needs urgent examination and review of some regulations.²¹⁴

Resources for meeting obligations and recommendations

Difficulties have been experienced in applying the Convention on Biological Diversity, the Montreal Protocol and the Directives of Montreal for the Protection of the Marine Environment from Land-based Contamination. The cooperation of the international community is required to protect the marine environment from contamination from terrestrial and marine sources with a view to the substituting injurious chemical products used in agriculture and the industry, processing the solid remainders and residual waters, and controlling persistent organic polluting agents. The Ministry of Health and the coastal cities also need aid to identify and formulate high-priority projects.²¹⁴

External financing for projects prepared by the Environmental Advisory Commission of the Presidency of the Republic is required (CAAM).²¹⁴

Capacity-building measures for developing and implementing plans

It is very difficult to obtain information on human capacity, especially in the private sector. In 1991 a base survey was carried out on resources for scientific investigation (CONACYT survey.)²¹⁴

The activities in technology and preventive approaches for protecting the marine environment are important but few, and economic incentives do not exist. Taking into account the lack of knowledge and financial resources, the Government lacks access to many technologies that could allow the identification of the main types of contaminant in the marine environment.²¹⁴

Current state and priorities for expanding the ecological network

No information found.

Legislation or legislative framework for aquatic biodiversity

In 1996 Constitutional reforms included a section on establishing laws to regulate the preservation of the atmosphere, of ecosystems, biodiversity and the integrity of the genetic patrimony, the prevention of contamination and the sustainable use of natural resources. Article 19 states ‘the State guarantees the right to live in an environment free of contamination, its obligation being to safeguard this right and the preservation of nature.’

A series of laws under discussion in the National Congress includes the Law of Biodiversity. Additionally, the Forest Law is being modified to incorporate the biodiversity concept, to separate forest management from the management of protected natural areas, and to recognize the participation of the local communities in managing protected areas. Other changes will allow the creation of private protected areas, and the regulation of aspects of biotechnology related to biodiversity.

A national policy on oceans is anticipated. Ecuador partakes in a Managing Coastal Resources Program (PMRC, or Programa de Manejo de Recursos Costeros⁵) and participates in the Plan of Action of the Southeastern Pacific. The Navy is the coordinating center for the Plan of Action and participates, based on need, in the National Mechanism for Coordinating Sustainable Development. The Law of Prevention and Control for the Protection of the Environment discusses the previous evaluation of repercussions for the environment of facilities based on water.²¹⁴

The country has begun to create an institutional system for water resources management.²¹⁴

Cooperative mechanisms among authorities, NGOs etc. to ensure integration

No information found.

Examples of transboundary cooperation

Ecuador signed the Amazon Cooperation Treaty and the Agreement for the Creation of the Inter-American Institute of Investigation.²¹⁴ Ecuador has also ratified the Protocol of Montreal and is part of the Washington Declaration of 1995.

In collaboration with Colombia, and with support from the United Nations and the Inter-American Development Bank, a plan of sustainable development for the rivers Mira and Mataje has been formulated.²¹⁴

⁵ See: <http://www.pmrc.org.ec/>

Significant aquatic biodiversity (freshwater and marine)

About 1 200 different species of fish, belonging to about 162 different families; about 200 different corals, and 1 100 different molluscs (snails, bivalves etc.) have been identified; and many thousands of other invertebrates (sponges, worms, crustaceans, starfish, sea urchins etc.) have been described. The number of fish species is expected to reach 1 500.^{6 241}

Fiji has considerable mangroves. The present best estimate is that approximately 42 000 ha remain, irregularly distributed. The largest formations are in deltaic sites at the mouths of the large rivers (Ba, Rewa, Nadi and Labasa) and on the leeward coasts protected by barrier reefs. No mangrove species are endemic.

Fiji has one of the largest and best developed coral reef systems in the South Pacific, comprised of all the major reef types: fringing reefs, barrier reefs, platform reefs (with and without sand cays), oceanic ribbon reefs, drowned reef shoals, atolls and near atolls. Fiji has one of the longest fringing reefs (the Coral Coast of Viti Levu), and one of the longest barrier reefs (the Mamanuca / Yasawa / Great Sea Reef complex) in the world. The coral reefs are poorly studied.

Ninety-six species of freshwater and brackish fish are recorded for Fiji; three other species have been recorded from Taveuni.¹⁸⁴ Four of these are endemic, and ten introduced species are naturalised.¹⁸³ The intertidal zone, where suitable mudflats or sandy reefs occur, supports a small number of species (in vast populations) of seagrass and a wide range of marine algae. There may be well over 400 species of marine algae, many of which await scientific description.²⁴¹

There are three substantial rivers, a few lakes and some man-made impoundments where fishing and aquaculture take place.⁷⁰

Present and planned uses of aquatic biodiversity

Fisheries products are the fourth largest export item after sugar, gold, and garments. Half of all rural households may be involved in subsistence fishing and between 15 000 to 20 000 t of fish are landed each year, or slightly more than half of all domestic production. A coastal fisheries review in the Pacific Islands region in 1996 estimated the total value of Fiji's inshore fisheries (commercial and subsistence, excluding the industrial tuna fishery) at US\$ 64 million. The ex-vessel value of the tuna fishery is estimated at between US\$ 40 and 45 million.⁷⁰

⁶ A bibliography of Great Barrier Reef Marine Park Authority papers by L.P. Zann *et al.* is available at: http://www.gbrmpa.gov.au/corp_site/info_services/publications/staff_papers/z.html

The industrial fishery is entirely tuna-oriented. It is composed of:

- A pole-and-line fishery, offshore and in the EEZ, mainly targeting skipjack and small yellowfin tuna. This fishery has declined in recent years.
- A longline fishery targeting large bigeye and yellowfin tuna, virtually all within Fiji waters, and landing the chilled catch for export by air to the United States and Japan. The fleet of domestic longliners has increased substantially, landings now reaching about 4 000 t per year;
- A freezer longline fishery of mainly Taiwanese vessels chartered to the Pacific Fishing Company (PAFCO). These vessels target mostly albacore tuna and fish within Fiji's EEZ as well as the EEZs of neighbouring countries, and international waters. They have landed between 3 000 and 4 000 t of tuna in recent years, primarily at the PAFCO tuna cannery in Levuka, but with some transshipment to other destinations;
- An occasional tuna purse seine fishery in the northern EEZ under the U.S. multilateral treaty. US and other purse seine vessels sometimes visit Fiji, usually only for duty-free fuel. Normally they fish only in El Nino years, and in the extreme north of the country. Apart from the multi-lateral tuna treaty with the United States, Fiji has no access agreements in place with distant-water fishing nations.⁷⁰

The freshwater mussel (*Batissa violacea*) is the major freshwater species of commercial importance. Market sales of this species are around 1 000 t per year. Other inland fisheries for species such as freshwater prawns (*Macrobrachium* spp.) and fish are subsistence, and there is no estimation of the catch.⁷⁰

The most important aquaculture in Fiji is of various tilapia species (*Oreochromis* sp.). Giant clams (*Tridacna* sp.) are cultured at the Fisheries Division's mariculture research facility on Makogai Island. In 1996, 1 850 of 177 000 clams of various sizes being maintained at the ocean and land nurseries were used in reef re-seeding.⁷⁰

Total annual production of penaeid shrimps is about 20 t, sold locally. A single farm cultures black-lip pearl shell (*Pinctada margaritifera*) for pearl production in north-eastern Viti Levu. Farming of *Eucheuma* seaweed in the late 1980s ceased in the early 1990s, mainly because of market conditions.⁷⁰

Attempts to culture other species have generally been unsuccessful. An initiative is currently underway to culture milkfish (*Chanos chanos*) for tuna longline bait.⁷⁰

Most of the fish caught inshore is sold fresh locally. There are two fish canneries in the country: the Pacific Fishing Company (PAFCO) cannery at Levuka on Ovalau Island, which cans domestically caught and imported tuna, principally for export; and the Voko cannery outside Suva, which cans imported mackerel, largely for the domestic market.⁷⁰

In 1995 920 000 cartons of tuna valued at US\$ 25 million were exported, mainly to the UK and Canada. About 530 t of meal made from the waste were produced, most of which was sold to the local poultry and pig industry. About 2 000 t of fresh chilled fish (mostly tuna) were exported by air-freight, mainly to the United States and Japan.⁷⁰

Threats to aquatic biodiversity

Cyclones regularly cause great damage to Fijian reefs, and outbreaks of the coral-eating crown-of-thorns starfish (*Acanthaster planci*) have caused large-scale destruction of reefs in the Indo-Pacific in recent decades. Localised severe damage has been caused to reefs and shore environments by the building of ports, wharves and marinas, seawalls, and by reclamations. Major mangrove areas have been reclaimed for farming (especially in Ba, Labasa areas), for tourism (Nadi Bay) and for urban development (especially in the Suva area).

Many fish species (eg. of *Serranidae*, *Lethrinidae*) in heavily populated areas are growth overfished (i.e. small at capture). Several species (e.g. mangrove crabs, giant clams, trochus, beche-de-mer, pearl oysters in most areas, mullet in certain areas) are stock overfished and severely depleted. Destructive fishing practices are a serious problem in parts of Fiji. Dynamiting is prevalent in some areas of northern Viti Levu and northern Vanua Levu. Use of traditional fishing poisons (e.g. duva or derris) is common, and use of modern pesticides and bleach is occasional.

Invertebrates widely overfished but not biologically threatened include the trochus, mud crabs, and certain of the beche-de-mer species.

Close to population centres, artisanal fishing driven by market demand has resulted in the over-exploitation of commercially important species in the inshore areas.⁷⁰

All but two of Fiji's dumps for domestic and industrial wastes are in mangrove areas or by rivers.

Sedimentation is a major problem for coral reefs. Some reefs in the Suva area had already deteriorated by the 1920s because of sedimentation from the Rewa watershed. Dredging of estuaries (particularly Rewa, Ba and Navua Rivers) may create an additional siltation problem on nearby reefs. Coral sand used in making cement is dredged in the Suva lagoon.

Nutrients (nitrates and phosphates) are high to extremely high in the Suva area. The nutrient problem may not be confined to the urban areas of Fiji as the large amounts of fertiliser applied to sugarcane and rice are expected to increase nutrient levels in adjacent waters.

Although no field studies have been undertaken, sedimentation and eutrophication of the leeward, inner-shelf reefs of northern Viti Levu and Vanua Levu may be serious.

A review of pollution in Suva Harbour found elevated biochemical oxygen demand (BOD), elevated nutrients (nitrates and phosphates), high suspended solids, high pH, and high

coliform bacterial levels, in discharges from a large number of light and medium industries in the city. Levels of tributyl tin (TBT) were higher in Suva Harbour than in any port reported in the literature. Indiscriminate use of TBT in anti-mildew paints may also have raised levels. Heavy-metal levels in Suva harbour rival the most polluted harbours of Australia. Lagoonal sediments and shellfish from the Lami area have high levels of mercury, zinc and lead.

Litter is conspicuous in marine and aquatic environments. Plastic bags, metal cans, glass etc. are often discarded on beaches, in mangroves and in the sea.

A wide range of fish, shellfish and crustaceans have been introduced, some as ornamentals, for sports fishing or as biological controls, but most for aquaculture. At least 21 species of fish (brown trout, bass, mollies, guppies, swordtails, mosquitofish, carps, tilapia, grunTERS, Australian bass, herring etc), four species of prawns (*Macrobrachium*, *Penaeus*), six species of bivalves (oysters and mussels) and one seaweed species (*Eucheuma*) have been introduced. The Tilapia (*Oreochromis mossambica*) has thrived in every river it has been introduced into and is considered harmful to certain native species, particularly the Ika ni Vatu (*Kuhlia rupestris*).

Two giant clam species (*Tridacna gigas* and *Hippopus hippopus*) have recently gone extinct in Fiji. A newly discovered species (*Tridacna tevola*), endemic to Lau and northern Tonga, is limited geographically and has been depleted by industrial fishing since 1985. The two turtle species nesting in Fiji (*Chelonia mydas* and *Eretmochelyes imbricata*) have been seriously overhunted and suffer continuous disturbance of rookeries. Numbers are estimated to be 'in the hundreds' for the former, and 'several hundreds' for the latter. Probably most of the several hundred turtles sold in Fiji each year migrate from French Polynesia and the Great Barrier Reef. The giant coconut crab (*Birgus latro*) has been seriously over-harvested and is locally extinct on many islands.

Measures taken to manage fisheries for biodiversity

Area closures and bans on gill netting for reef fish, particularly in the north and west of the country, seem to have been effective in restoring stocks of some species commercially important species in the inshore areas close to population centres.⁷⁰

There are no formally designated Marine Protected Areas, although several local initiatives protect certain sites, including the reefs of Naitauba Island, Namenalala and Eleuvia (Tai) Island. The Fisheries Department is promoting Community Marine Reserves managed by Traditional Fishing Rights Owners. The present system of existing reserved and protected areas is seriously inadequate, for a Marine Protected Area without the Fishing Rights Owner's approval and economic involvement is virtually impossible.

Research efforts or goals

Fiji's marine flora and fauna are moderately well known because of a history of active marine research at the University of the South Pacific and the Fisheries Division.²⁴¹

The Fisheries Division supports research in resource assessment, development, management, and aquaculture promotion. Recent activities include monitoring sales of fish, invertebrates and aquatic plants at Fiji's main markets; studying the nature and extent of the subsistence fishery; assessing baitfish stocks and the impacts of baitfish harvesting on juveniles of other commercially important species; experimental culture and re-seeding of giant clams (*Tridacna* spp); aquaculture research and improvement of culture techniques for grass carp, tilapia and milkfish; and stock assessment of freshwater prawns (*Macrobrachium* species), freshwater mussels (*Batissa violacea*) and mud-crabs (*Scylla serrata* and allied species).⁷⁰

The University of the South Pacific (USP) also regularly undertakes marine research activities in Fiji, often focusing on commercially important species. The University has undertaken biological studies on sea cucumbers, deep-water shrimps and marine algae, as well as carrying out social, economic and post-harvest research relevant to fisheries.⁷⁰

Priorities for national action

No information found.

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

Production from inshore and coastal areas is generally considered to have reached its limit, and the government is focusing on managing over-exploited inshore fisheries. A central feature of new management initiatives is the devolving of management authority to local government units and, beyond this, to coastal communities having traditional rights of marine tenure.⁷⁰

Much fisheries development in the past has been by government. In future this will be devolved to the private sector, enabling government to focus more closely on management. This change in focus will involve skills that are not presently available, and some retraining of government staff will probably be required. Mechanisms need to be developed to ensure that any government interventions in the fisheries sector are relevant to the interests of stakeholders.⁷⁰

Resources for meeting obligations and recommendations

No information found.

Legislation or legislative framework for aquatic biodiversity

Fiji's marine environment is better served by laws and regulations than any other sector. Some of the stiffest penalties are to be found in fisheries-associated legislation.

Under the State Lands Act 1946, control over the littoral zone, foreshore and submerged sea floor is held by Ministry of Lands & Mineral Resources.

Under the Marine Spaces Act 1977, managing and conserving fisheries within Fiji's economic zone falls under the Office of the Prime Minister (maximum fine of \$ 100 000.).

The Fisheries Act 1941 (Cap 158), under the Ministry of Agriculture, Fisheries & Forests, licenses fishing, and prohibits use of dynamite.

Under the Ministry of Agriculture, Fisheries & Forests, the Fisheries Regulations of 1965 prohibit certain methods and areas, e.g. poison, Protection of Turtles etc. (Source: Modified from Watling & Chape 1992).

The new Sustainable Development Bill is in the final stages of preparation and will replace all existing environmental, resource management and conservation legislation. A very comprehensive piece of legislation, it has 293 Clauses in the final draft form.

The Act will:

1. Establish the legal and administrative mechanisms to achieve sustainable development in Fiji;
2. Reform the law relating to environmental protection and resource management;
3. Create new legal frameworks and effective administrative mechanisms for environmental impact assessments, pollution and waste management, integrated natural resource management, biodiversity conservation and national parks management;
4. Establish mechanisms for meaningful public participation in all aspects of environmental and resource planning management; and,
5. Provide for the implementation of Agenda 21, the Rio Declaration, the Barbados Programme of Action and a number of international treaties and agreements in the area of sustainable development, environmental protection and resource management.

The Fisheries Act recognises the customary right of indigenous Fijians to fish in traditional fishing grounds and to control fishing effort in those areas. This control extends over the immediate waters enclosed by a fringing or barrier reef system.⁷⁰

Cooperative mechanisms among authorities, NGOs etc. to ensure integration

No information found.

Examples of transboundary cooperation

Fiji receives technical help in the fisheries sector from a number of bilateral donors including Japan, Australia, New Zealand, the United Kingdom, the European Union, and the United States. Assistance is also obtained from the international organisations of which Fiji is a member, including FAO and other United Nation agencies. The regional organisations serving Pacific Island countries, including the Forum Fisheries Agency, the South Pacific Commission, the South Pacific Regional Environment Programme, the Forum Secretariat, and the South Pacific Applied Geoscience Commission, as well as several UN agencies (UNDP, ESCAP) have also been actively supporting Fiji's fisheries sector.⁷⁰

Fiji was the first signatory to the United Nations Convention on the Law of the Sea (UNCLOS). Fiji is also a signatory to the Agreement for the Implementation of the Provisions of the United Nations Convention of the Law of the Sea of 10 December 1982 Relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks.⁷⁰

The Fisheries Division maintains direct contact on technical issues with regional and international organisations dealing in fisheries. Policy and other matters are managed in the first instance through designated contact points, most often the Department of Foreign Affairs. Fiji is a member of the South Pacific Commission (SPC), the South Pacific Forum Fisheries Agency (FFA) and the South Pacific Regional Environmental Programme (SPREP). Fiji is also party to a number of treaties and agreements relating to the management of regional fisheries, including: the Treaty on Fisheries Between the Governments of Certain Pacific Island States and the Government of the United States of America; the Convention for the Prohibition of Fishing with Long Driftnets in the South Pacific; and the Niue Treaty on Cooperation in Fisheries Surveillance and Law Enforcement in the South Pacific Region.

Significant aquatic biodiversity (freshwater and marine)

India is one of the 17 global megadiversity centres, representing two of the major realms and three of the basic biomes. The diversity is yet to be fully surveyed. Approximately 65% of the total land area has been surveyed, and over 47 000 species of plants and 81 000 species of animals have been recorded. This list is being constantly upgraded, especially for lower plants and invertebrate animals. India's coastline including major indentations and island shores runs for about 7 500 km. ²¹⁵

India's river systems, wetlands, coastal areas and marine zones abound in fish genetic resources, holding almost 12% of the world fish species. Out of nearly 20 000 documented fish species worldwide, 2 200 fin fish species have been recorded in India. They live in the cold fresh waters of the upper Indus, the Ganges and the Brahmaputra (73 species), in the warm waters of its 14 major river systems draining the plains (544 species), in brackish waters of estuarine areas (143 species) and in the three surrounding seas (1440 species). Twenty-seven species are considered rare/endangered/ vulnerable.

Island ecosystems in India are of two broad types: coralline, as that of Lakshadweep in the Arabian Sea, and submerged mountaintops harbouring tropical rainforests, as in the Andaman and Nicobar Islands (Bay of Bengal). Submerged land between India and Sri Lanka has created islands in the Gulf of Mannar where coral reefs are distributed. Of the three groups of islands, rainforests and associated endemic island biodiversity are found only on the Andaman and Nicobar islands.

The two groups of islands, the Arabian Sea Islands (Lakshadweep and Minicoy) and the Bay of Bengal Islands (Andaman & Nicobar) differ significantly in physical characteristics. The Andaman & Nicobar Islands have a unique tropical ecosystem, with an expected diversity and wild germplasm as well as natural beauty, and natural productivity is high. The mangrove ecosystems are rich and the coral reefs are extremely productive. Apart from the deep-sea fisheries resources, the shallow water area and the creeks fringing the Islands offer great potential for the development of coastal aquaculture. ²¹⁵

Lakshadweep is an archipelago of 12 atolls, 3 reefs and 5 submerged banks around 36 islands, covering 32 km². Population of the 10 inhabited islands is 51 000. Though the land area is extremely small, if the lagoon area of about 4 200 km² of territorial waters and about 400 000 km² of the exclusive economic zone are considered, Lakshadweep is one of the largest territories of the nation. ²¹⁵

Present and planned uses of aquatic biodiversity

The annual potential yield of the marine fishery resources in the Indian EEZ has been estimated at 3.92 million tonnes. About 65% of the total potential available is being tapped.

While waters to the depth of 50m are almost fully exploited, the resource available beyond 50m depth still offers room for expansion.²¹⁵

Almost all the river systems of India have reasonable resources of *Macrobrachium malcolmsonii*. The economic importance of its capture and culture has been increasingly realised, as this is the only large variety of freshwater prawn available in inland and upland areas.⁵

Threats to aquatic biodiversity

Coastal zone development, coupled with population increase, has stressed the coastal marine environment. A number of ecosystems like mangroves (estimated area of 681 676 hectares), coral reefs and marine sanctuaries lie along the coastal areas. The major mangrove areas are Sundarbans, Andaman & Nicobar Islands, Coringa, and Mahanadi. The coral reefs are in the Gulf of Mannar, Gulf of Kutch, Andaman & Nicobar Islands and Lakshadweep Islands.²¹⁵

Domestic waste from the thickly polluted coastal towns and cities like Mumbai, Chennai, and Visakhapatnam are disposed untreated either directly into the sea or through rivers, creeks, etc. Nearly 19 000 million litres of sewage are estimated to reach the coastal environment of the country every day.²¹⁵

Nearly 100 000 hectares of land are being used for prawn culture in Andhra Pradesh, Tamil Nadu, West Bengal and Orissa states. Mangroves and sizeable areas of coastal land within the reach of high tide are being occupied. Standards for regulating the waste discharged from the aquaculture farms are applicable only to large farms.²¹⁵

The western EEZ of India and the Andaman & Nicobar waters are being used as international tanker routes. Nearly 3500 tankers are estimated to ply this area, carrying about 470 million tonnes oil per year.²¹⁵

Some of the marine fin fishes threatened by indiscriminate fishing are the whale sharks (*Rhiniodon typus*), marine catfishes of the genera *Tachysurus* and *Osteogeneosus*, the white fish *Lactarius lactarius*, the flat head *Platycephalus maculipinna*, the threadfins *Polynemus indicus* (Dara) and *P. heptadactylus*, and *Sciaenids Pseudosciaena diacanthus* (Ghol) and *Otolithoides brunneus* (Koth), the perch *Pomadasyss hasta* and the eel *Muraenosox*.²¹⁵

The marine catfishes such as *T. tenuispinis*, *T. dussumieri* and *T. serratus* form large shoals during the breeding season from September to March, when the fish are exploited by purse seiners from the shallow grounds of Karnataka and Goa regions. In the total catfish landings during their breeding period more than 50% of the catch was of gestating males, each one carrying 40-150 eggs/embryos in its mouth. Since the catfish is migratory in nature, overfishing from 1979-1986 affected other centres, and production fell throughout India from 64 000 t (1988) to 36 000 t in 1992.²¹⁵

In the lobster fishdery, the indiscriminate catch of berried females of deep-sea lobster *Puerulus sewelli* from selected breeding pockets by a large number of deep-sea trawlers has

depleted landings. The sand lobster, *Thenus orientalis* and the rock lobster, *Panulirus sp.* also fell in production and these area-specific resources need conservation and protection.

The Horseshoe crab (*Limulus sp.*) is a threatened species distributed along Orissa coast. It is widely exploited for different pharmaceutical uses.²¹⁵

Measures taken to manage fisheries for biodiversity

In view of the need for sustainable fisheries development and environment protection, India's approach to coastal fisheries has been oriented towards mitigating adverse effects on the environment as well as on the users. Steps towards sustainable development include enforcement to control fishing in the inland and marine water areas, implementing the Coastal Regulation Zone (CRZ), enforcing the Marine Fishing Regulation Act (MFRA), and strengthening infrastructure for monitoring marine pollution.²¹⁵

Attempts are being made to install waste treatment plants in Mumbai, Chennai and Visakhapatnam. Assistance from the World Bank has already been obtained for treatment and disposal of waste generated from Mumbai. Several tanneries located in Calcutta and near Chennai have been strongly recommended for closure if they do not install treatment plants within the stipulated period specified by the Apex Court of the country.²¹⁵

A National Contingency Plan to deal with oil spill disasters has also been prepared, and infrastructure to deal with the oil spills is being augmented. India has ratified Marpol 73/78 and adopted the provisions in Merchant Shipping Act.²¹⁵

For the sustainable development of the Andaman & Nicobar island groups the Government has set up an Andaman & Nicobar Integrated Development Corporation to undertake development in an integrated manner to avoid conflicts. The Environment Protection Act of 1986 prohibits environmentally destructive activities including coral mining in the coral reef areas, and several developments along the coastlines of the islands have been regulated. An apex body (the Island Development Authority) has been functioning under the Chairmanship of Prime Minister of India to ensure various developments perform within the framework of sustainable development; Research and Development is being promoted to develop eco-friendly technologies such as cage culture with species indigenous to the islands; and research is being promoted for culture of bait fish in Lakshadweep to sustain the tuna fishery.²¹⁵

India became party to the Ramsar Convention in October 1981. In accordance, India has designated Chilka Lake (116 500 ha.), Keoladeo Ghana National Park (2 900 ha.), Wular Lake (18 900 ha.), Harike Lake (4 100 ha.), Sambhar Lake (2 873 ha.) and Loktak Lake (26 600 ha.) as Ramsar Sites.

In view of increasing demand for frozen marine food, the Marine Products Export Development Authority (MPEDA) has begun a document on culturable marine spp. in collaboration with ZSI (Zoological Survey of India) to help prevent over-exploiting such resources in their natural habitats.

A holistic approach to studying wetland biodiversity is being stressed. In 1990, MoEF (the Ministry of Environment and Forests) conducted a survey and published the first wetland directory (including paddy fields and mangroves). According to the survey, there are about 4 million ha of wetlands in India, of which 2.6 million are man-made.

In 1993 the WWF-India in collaboration with AWB (Asian Wetland Bureau) published a more detailed 'Directory of Indian Wetlands'. Such programmes are ongoing throughout India wherein the focus on wetlands as important habitats is not exclusive to birds but broadened to include large animals such as crocodiles, rhinos and swamp deer and also plants, invertebrates, fish and amphibians. Under the MoEF/UNDP sponsored Capacity 21 program, a draft 'National Policy on Aquatic ecosystems' has been proposed. The National Policy outlines an 'Action Plan for the Conservation and Wise Use of Indian Aquatic Resources.'

India has been closely associated with the GEF (Global Environmental Facility) movement since its inception. The first meeting of the GEF Assembly was held in New Delhi in April 1998. Through their Small Grants Program, UNDP/GEF have begun a project in Orissa for demonstrating the use of turtle exclusion devices (TEDs) in trawlers to protect turtles that arrive to breed.

Other GEF-funded projects are:

'Management of Coral Reef Ecosystem of Andaman and Nicobar Islands.' This ten-month project is designed to develop a full project for coastal conservation, management and sustainable use of coral resources and sustainable economic activities of the coastal communities of the region. It will include assessing threats to coastal communities, such as an ecological inventory, assessing stakeholder participation, investigating co-financing options, studying other global and regional coral reef conservation initiatives, and beginning short-term actions to counteract immediate threats.

'Conservation and Sustainable Use of India's Wetlands.' This project will demonstrate community-based sustainable use and promote in-situ conservation of threatened wetland ecosystems through a small network of sites containing globally significant (endemic and endangered) species of flora and fauna. This project will serve as an archetype to guide future wetland policy and administrative measures.

'Conservation and Sustainable Use of the Gulf of Mannar Biosphere Reserve's Coastal Biodiversity.' The Gulf of Mannar Biosphere Reserve is located in Southern India's Gulf of Mannar and the biodiversity is principally threatened by habitat destruction, over-harvesting of marine resources, and to a lesser, more localized extent, civic pollution. The overall objective of this project is to conserve the Gulf of Mannar's globally significant assemblage of coastal biodiversity and to demonstrate, in a large biosphere reserve with various multiple uses, how to integrate biodiversity conservation into coastal zone management plans.²²⁵

Research efforts or goals

The Ecosystem Surveys under the programmes for inventorying and monitoring India's biodiversity ⁷ include Himalayan, Forests, Marine, Islands, Deserts, Mangroves, Wetlands and Coastal. The major institutional support system in identifying and creating databases and monitoring coastal and marine biodiversity is from the National Institute of Oceanography (NIO), a Council for Scientific and Industrial Research (CSIR) institution in Goa. Other support is from the Central Marine Fisheries Research Institute (CMFRI) (an Indian Council of Agricultural Research (ICAR) institute with a few Regional Stations in the coasts and islands) and ZSI.

ZSI stations in Port Blair, Chennai, Calcutta and Dhiga undertake maritime faunal explorations. The Dhiga station has also begun the first National Marine Aquarium for the public in the country. Institutional support in the identification and documentation of coral reef biodiversity has been provided by NIO (National Institute of Oceanography), ZSI and CMFRI. CSIR laboratories have on-going programmes on conserving medicinal plants, culturing of microorganisms useful in soil reclamation, and marine biodiversity. ZSI and BSI have contributed primarily to knowledge of estuarine biodiversity. The regional station of ZSI in Behrampur, Orissa has surveyed the Chilka Lake, Mahanadi estuary, Hooghly estuary and the Godavari estuary. Further south, the estuarine flora and fauna have been extensively studied and documented by the Centre for Advanced Studies in Marine Biology, Annamalai University in Parangipettai. SACON ⁸ recently concluded a study on the status of sea grasses throughout the country.

The National Remote Sensing Agency (NRSA) and similar facilities in universities and institutions have launched a number of programmes to monitor India's coasts by satellite. Data have been used to monitor coastal vegetation, shoreline changes and movements of fish.

The National Bureau of Fish Genetic Resources (NBFGR), located at Lucknow and administrated by the Indian Council of Agricultural Research, is devoted to the conservation and sustainable use of fish diversity in India. Its mandate includes collecting, classifying and evaluating information on fish genetic resources of India; cataloguing genotypes; maintaining and conserving fish germplasm in collaboration with other centres; conserving endangered species; and monitoring the introduction of exotic fish species in Indian waters.

In the oceans, emphasis has been laid on stabilising the Antarctic and polymetallic nodules programmes and the development of ocean data and information system. Several achievements have been made in coastal ocean monitoring and prediction, marine satellite

⁷ Implemented by the Botanical Survey of India (BSI), the Zoological Survey of India (ZSI), and the Forests and Fishery Survey of India

⁸ The Salim Ali Centre for Ornithology and Natural History (SACON), in Coimbatore, Tamil Nadu.

information, preparing and disseminating potential fishing zone information and the setting up of a new institute, the National Institute of Ocean Technology (NIOT).²¹⁵

Priorities for national action

India is one of the earliest signatories of the Convention on Biological Diversity (CBD), to which it became Party in early 1994. To carry forward the Agenda 21 of UNCED, India's Environment Action Programme of 1993 identified conservation and sustainable use of biodiversity in selected ecosystems as the first of seven priorities for future action. The Action Programme strengthens capabilities in environment assessment, environmental awareness and the association of NGOs in sustainable development.

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

The Ministry of Agriculture is responsible for Fisheries Research Support, the Watershed Development Programme, and the 'Rainfed Agriculture in National Watershed Development Project'. BNHS (Bombay Natural History Society) is the agency responsible for Conservation of Wetlands, Coral Reefs and Mangroves. The Department of Ocean Development (DOD), while supporting an All-India Coordinated Project on Drugs from the Ocean, is also providing funds to promote research on regenerating corals in the Andaman islands and seaweeds in Mandapam in Tamil Nadu.

A national committee was constituted by MoEF in 1986 to advise the government on policy for conservation, management and research in fifteen mangrove areas and four coral reefs identified for intensive conservation and preparation of management action plans. A training project to build capacity in mapping, identification and management of coral reefs has been finalised with Australian Aid. GEF-supported programmes to conserve and monitor coral reefs in the Andaman and Nicobar Islands and the Gulf of Mannar have also begun, and UNDP/GEF have supported projects for preparing management plans for the coral reefs.

MoEF has sponsored workshops on Conservation and Sustainable Use of Coastal and Marine Biological Diversity. An All-India Coordinated Project on Coastal and Marine Biological Diversity is also being developed. As per the Coastal Zone Regulation Notification of 1991, coastal zone management plans have been prepared by all coastal states and Union Territories. The Government of India has set up Standing Committees for monitoring development in fragile ecosystems such as islands. Development Authorities under the Chairmanship of the Deputy Chairman, Planning Commission (*sic*) review the implementation and impact of the programmes.

Three Centrally Sponsored Schemes for pollution abatement of rivers are being implemented: the Ganga Action Plan (GAP) Phase I, Ganga Action Plan Phase II and National River Conservation Plan. The main objective of the Ganga Action Plan is to improve the water quality of the Ganga by preventing pollution from reaching the river. The Action Plan primarily addresses itself to intercepting, diverting and treating 873 million litres

per day (mld) of municipal sewage out of the estimated 1340 mld from 25 towns, 6 in Uttar Pradesh, 4 in Bihar and 15 in West Bengal. ²¹⁵

The Madras Science Foundation, an NGO, has conducted studies in the Krishna and Cauvery estuaries amongst others in south India. NIO and M.S. Swaminathan Research Foundation (MSSRF) have independently and collaboratively carried out extensive studies on the mangroves of the west and east coasts respectively. MSSRF has developed and maintained a database on Indian mangroves. Databases containing general information on marine fauna and flora are available from NIO, CMFRI, ZSI and BSI. The Annamalai University with the support of MoEF is also developing a database on Indian Mangroves.

Capacity-building measures for developing and implementing plans

Greater human resources development in all areas of concern is necessary. ²¹⁵

It is proposed to adopt the concept of Integrated Coastal and Marine Area management (ICMAM) to deal with several coastal and marine issues, and to launch a new programme of ICMAM from 1997 onwards. Development of a few Model ICMAM Plans and capacity-building exercises are also to be carried out. A programme on Coastal Ocean Monitoring and Prediction System is engaged in the systematic monitoring of marine pollution in the country. Studies relating to waste-assimilation capacity of coastal waters should be undertaken from 1997-98 onwards. ²¹⁵

India trains candidates from developing countries in water resources development and sends its own personnel abroad for training. It participates in many regional programmes sponsored by ESCAP, particularly on flood control and reservoir sedimentation. ²¹⁵

Under the Ganga Action Plan, improving sewage-treatment technologies has been emphasized. Consequently, the programme has led to the development of appropriate technologies like Upflow Anaerobic Sludge Blanket (UASB), improved oxidation ponds, and sewage treatment through plantations. These technologies are cost-effective and so will reduce the burden on the State Government. Such developments will facilitate Ganga Action Plan and make future programmes sustainable.

GAP also emphasizes maximising resource recovery from sewage treatment to improve its sustainability. These include using biogas for co-generation of power and selling treated sewage and sludge (a bio-fertiliser) and nutrient-rich treated effluents for agriculture. Pisciculture is proposed for most of the stabilisation ponds constructed under GAP. Action plans for the Yamuna, Gomti and Damodar rivers are being drawn up on lines similar to those of the GAP. ²¹⁵

The objective of the ten-month GEF project 'Strengthening the Management of the Gulf of Mannar Marine Biosphere Reserve' is to formulate a full project, and to develop and implement a biosphere reserve management programme for the Gulf of Mannar. This will enable the full project in building national capacity in the area of reserve management and for the development and initiation of a management plan. Identifying alternative sustainable

economic activities will be sought for local communities within the reserve, who will participate in the management plan.²²⁵

Another GEF project is ‘Conservation and Management of Marine, Coastal Biodiversity’. The exact thematic and geographic scope of the expected project within the coastal areas and management sector remains to be determined, but is expected to be of a technical help/capacity-building nature. Identifying the nature and scope of the project will be the major output.²²⁵

Current state and priorities for expanding the ecological network

A number of NGO initiatives to integrate biodiversity conservation exist in programmes nationwide. A directory of active environmental NGOs published by the WWF recently lists 1400 NGOs spread across the country. Most NGOs focus on building awareness. Celebrating Environment Days and spreading environmental messages through traditional folk media, street plays and campaigns are some of the ongoing activities.

Legislation or legislative framework for aquatic biodiversity

The Indian Government has rules and regulations for various activities in the coastal zone, which covers the inter-tidal area and the land area of 500 metres from the hightide line. The States have prepared a coastal-zone management plan indicating various zones so that the rules and regulations can be applied appropriately at these zones. The government proposes to extend these rules to the ocean part.²¹⁵

A National Action Plan on Biological Diversity is being finalised. While consolidating the ongoing efforts of conservation and sustainable use of biological diversity, the draft Action Plan aims at establishing a policy and programmes including capacity-building and biosafety.²¹⁵

India had begun the processes necessary for conservation and sustainable use of biodiversity long before CBD. These were reviewed and cross-sectoral policies and actions required for sustainable use and benefit sharing were outlined in the National Conservation Strategy and Policy Statement on Environment and Sustainable Development of 1992.

Laws included the Fisheries Act of 1897, the Marine Products Export Development Authority of 1972, the Maritime Zones of India (Regulation of Fishing by Foreign Vessels) Act of 1980, and the Territorial Waters, Continental Shelf, Exclusive Economic Zones and Other Maritime Zones Act of 1976.

The UN Convention on the Law of the Sea was ratified in June 1996.²¹⁵

Some important post-CBD developments are increased awareness cutting across the different stakeholder groups on conservation and sustainable use of biodiversity, review of the existing strategies and policies, and steps taken to plan and implement the insights or recommendations emanating from the review.

Major central acts relevant to biodiversity are: Wildlife (Protection) Act, 1972; Forest (Conservation) Act, 1980; and the Environment (Protection) Act, 1986. ²¹⁵

State laws and statutes concerning forests and other natural resources support the central acts. Policies and strategies directly relevant to biodiversity include National Conservation Strategy and Policy Statement for Environment and Sustainable Development; National Fisheries Policy (under preparation); National Biodiversity Policy (under preparation); National Wildlife Action Plan; and the Environmental Action Plan. ²¹⁵

India's National Water Policy was adopted in September 1987. The National Water Resources Council (NWRC) under the Chairmanship of the Prime Minister lays down the National Water Policy, reviews development plans and advises on implementation. The Policy aims at planning, developing and conserving water resources on an integrated and environmentally sound basis keeping in view the needs of the State Governments. Envisaged strategies include groundwater development, water allocation priorities, drinking water, irrigation, water quality, water zoning, water conservation, flood control and management. The State Governments make their water policies within the overall framework of the National Water Policy. ²¹⁵

Cooperative mechanisms among authorities, NGOs etc. to ensure integration

To ensure strong policy and strategic support, national and state committees guide programmes for scientific management and wise use of fragile ecosystems, and specific programmes for managing and conserving wetlands, mangroves, and coral reef systems. ²¹⁵

A programme captioned 'eco-development' through World Bank's help for *in situ* conservation of biological diversity involving local communities has begun in recent years. The concept of eco-development integrates the ecological and economic parameters for sustained conservation of ecosystems by involving the local communities in maintaining earmarked regions surrounding protected areas. To conserve the representative ecosystems, a Biosphere Reserve programme is being implemented. Applying the UNESCO MAB criteria, eight biodiversity-rich areas of the country have been designated Biosphere Reserves. ²¹⁵

MoEF has taken steps to develop appropriate programmes, developmental schemes and projects. By identifying other ministries, departments, institutions and NGOS as partners, MoEF is making every effort to integrate the various provisions of CBD meaningfully in the conservation, sustainable use and equitable sharing of benefits in the country. For monitoring Indian wetlands MoEF has identified SACON, (the Salim Ali Centre for Ornithology and Natural History) WII (Wildlife Institute of India) and BNHS as institutional partners.

Important ongoing national programmes and projects with domestic and external help to implement recommendations of Agenda 21 include:

- Guidelines for sustainable water resources development and management (a hydrology project with World Bank help is under implementation for systematic collection and analysis of data);

- Master Plans for river basins for optimisation and inter-basin transfers are under preparation. Flood and drought management, environmental and social impact assessment are integral part of project formulation, implementation and monitoring in the country in various States and are continuous processes of all plans;
- Documents on non-structural aspects of flood management in India and a draft bill on flood plan zone have been prepared, while a National Flood Atlas is under preparation;
- Human resources development is being implemented through water and land management institutes and other organisations and agencies. (As part of the mass-awareness programme Water Resources Day is observed every year); and
- Research and development programmes in water resources are being undertaken through Indian National Committees by universities, research institutes and other organisations.

Generally, the projects in the water resources sector are being implemented under the categories of major, medium and minor (surface water and also groundwater) projects and schemes, flood control projects and Command Area Development Programmes.²¹⁵

Examples of transboundary cooperation

India has ratified almost all multilateral environmental conventions including the Framework Convention on Climate Change (FCCC), the Convention on Biodiversity, and the Convention on Straddling Fish and Highly Migratory Fish Stocks.²¹⁵

A UNDP-GEF funded programme involving Ethiopia, India, and Peru, ‘Good Practices for Operationalizing the Benefit-sharing Provisions of the Convention on Biological Diversity at the Project Level’ will involve these three countries with rich biodiversity in matters of prior informed consent, fair and equitable sharing of benefits and in-situ conservation in lands and territories used by indigenous and local communities embodying traditional life styles relevant for the conservation and sustainable use of biological diversity.²²⁵

Significant aquatic biodiversity (freshwater and marine)

Indonesia is one of the global centres of megadiversity, harbouring 47 ecosystem types. Approximately 17% of the total number of species in the world are found in Indonesia: at least 15% of all amphibians and reptiles and at least 37% of the world's fish.²¹⁶

In Indonesia, 116 small islands and groups of small islands are ecologically susceptible, particularly to global warming and natural disasters. Small islands typically have large numbers of endemic species, and high levels of biodiversity consisting of valuable and protected species.²¹⁶

Present and planned uses of aquatic biodiversity

Indonesia was the second highest producer of shrimp in Southeast Asia in 1995, when the eastern hemisphere produced an estimated 78% of the world's farm-raised shrimp, 558 000 mt (live weight), down almost 5% from 585 000 t in 1994.⁸

Historically, the abundant fishery resources of the South East Asia Seas have been harvested in inshore and coastal waters with a variety of traditional fishing gears and have been an important source of food, animal protein and employment for many of the region's coastal populations. Whole market and barter systems with networks extending to the interior are based on these fisheries. The early mechanized fishing efforts of Japan in the region have been joined in recent years by fishing fleets from Taiwan and South Korea.¹⁹²

Internationally, Indonesian boats fish the Southern Oceans for bluefin tuna using longlines.¹³⁴

Threats to aquatic biodiversity

Threats common to the Southeast Asian Seas are overfishing, pollution, sewage discharges, coastal development, eutrophication, and destructive fishing methods using chemicals and explosives. Recent surveys in Indonesia show that only 7% of coral reefs are in excellent condition, 33% in good condition, 46% in poor condition and 14% in critical condition (BAPPENAS, the National Development Planning Agency, 1992). Trawlers have intensified pressure on coastal fish stocks and increased potential for conflicts with local traditional fishermen. Although trawlers have been banned completely from Indonesian waters since 1984, enforcement has been ineffective. Important spawning and nursery grounds of many valued species have been lost to increased coastal pollution and the widespread development of coastal lands.¹⁹²

In Indonesia's fifth Five-Year Development Plan, much development takes place in coastal areas. Population growth, export demand, and *per capita* consumption have increased the

use of coastal and marine resources. In 1992, fish production was 3.5 million tons, or 53% of the maximum sustainable yield (MSY) of 6.6 million tons. It was predicted that by 2000 this would increase to 4.25 million tons, and by 2020 to 6.04 million tons. On the other hand, this will increase pollution. Waters off the Surabaya coast have large volumes of domestic and industrial waste, and the water quality is reported to be the second most polluted in Indonesia after Jakarta Bay.²¹⁶

Foreign container ships and fishing boats frequently navigate Indonesian waters. Law enforcers face problems in preventing ship traffic, which is protected by agreements. Relatively weak control in eastern Indonesia creates other problems in dealing with the frequent violations, such as disposal of toxic and hazardous waste and trespassing in the catchment zone. This situation requires better management of coastal and marine areas, especially institutional integration and competence, so that resources in these areas can become prime products in the future development of Indonesia.²¹⁶

Protected areas face pressures such as low local community participation, an inadequate management framework for identifying and controlling resource use, inadequate manpower, excessive centralization in management and lack of funding. The total number of existing and proposed parks, reserves and protected areas is over 700, including marine areas. Of these, 79 are of priority in terms of biodiversity protection, but only 31 have clear management plans, and not all have been implemented (World Bank, 1994). A large part of the 368 established protected areas at present have not been surveyed, mapped or given clear boundaries (ADB, 1995).²¹⁶

Furthermore, there is a conflict of interest at the national, provincial and local levels. Although the Directorate General of Forest Protection and Nature Conservation (PHPA) of the Ministry of Forestry (MoF) is given the mandate to plan and manage conservation areas, in many cases the authority of PHPA overlaps the authority of provincial or local government agencies/officials. Sectoral conflicts are also a serious issue in which oil and mining exploration in conservation areas is often conducted without an environmental impact assessment.

Another important issue is PHPA's capacity for managing conservation areas. PHPA's funding and expertise are inadequate, particularly in terms of the plan to expand protected areas in the year 2000. At present when protected areas include marine and wetlands ecosystems, PHPA does not have sufficient experts since, in the past, protected areas covered mostly forests.²¹⁶

These drawbacks have been somewhat realized, which prompted BAPPENAS to compile the National Biodiversity Action Plan in which one of the main elements is *in situ* conservation in protected areas, covering terrestrial ecosystems, marine ecosystems and protected forests. However, this Plan has not been fully implemented, although effective management of protected areas is very important in the future, given the tremendous pressures on natural habitats outside protected areas. Indonesia hopes to overcome all these problems through national programs and international cooperation under the CBD as well as Agenda 21. (Source: Agenda 21 Indonesia, Chapter 16).²¹⁶

Coastal communities have not gained any significant benefit from development in their areas. The development of coastal villages should therefore pay more attention to regional social, economic, cultural and environmental conditions. In overcoming rural poverty, especially among farmers and fishermen, poor communities should be given just and equal access to, and facilities to take advantage of, natural resources.²¹⁶

Measures taken to manage fisheries for biodiversity

Indonesia is one of the few countries in the region to have a strategy, a country study and an action plan on biodiversity. In 1992, the Office of State Minister for Population and Environment compiled a country study prior to the Earth Summit. In 1993, the National Strategy on Management of Biological Diversity was also compiled by the State Ministry of Environment. The strategy is based on three elements: use of science and technology, diversification of use and integrated management of biological diversity.²¹⁶

The Ministry of Environment, as national coordinator for the management of environment, is working on strengthening institutional mechanisms in the management of biological diversity, completing a National Strategy in the Management of Wetland Ecosystem, and forming Working Groups to address main issues of CBD and COP decisions.

Regarding the implementation of Article 6, the *National Strategy for the Management of Biodiversity* and *Biodiversity Action Plan for Indonesia* has been established. Another document relevant to the implementation of this article is the *National Strategy and Action Plan for the Management of Indonesian Wetlands*.

Efforts are now being launched to mitigate destructive fishing methods through training and education, law enforcement and by establishing community seawatch in certain critical coastal waters.¹⁹² Indonesia has also protected 15 marine species by law.²¹⁶

The following Program Areas for protection of marine waters are being discussed: Integrated Planning and Resource Development in Coastal Zones; Monitoring and Protecting Coastal and Marine Environments; Sustainable Utilization of Marine Resources; Strengthening and Empowering Coastal Communities; Sustainable Development of Small Islands; Maintaining Security of the Exclusive Economic Zone (EEZ); and Managing the impacts of Climate Change and Tidal Waves.²¹⁶

Indonesia has so far established 34 national parks covering 10.1 million hectares. Of these, five are marine national parks, covering 2.2 million ha. Ujung Kulon and Komodo National Parks, certified by the IUCN as World Heritage Sites, were given priority in management. Gunung Gede, Tanjung Puting, Lore Lindu, Leuser National Parks, designated by the UNESCO as Biosphere Reserves, are maintained to the maximum possible. Berbak National Park and Danau Sentarum Wildlife Reserve, designated as Ramsar sites, are given special attention. Three conservation areas, Wasur National Park, in Irian Jaya Province, among them, are being proposed as Ramsar sites.²¹⁶

Conservation areas have been established or designated on major islands and island groups to cover all major habitats. The goal of REPELITA VI (*Rencana Pembangunan Lima Tahun*, The Five-Year Development Programme) is to officially gazette 18.7 million ha of protected forest or 60% of the target of 30 million ha. Another goal is to effectively develop 354 units of conservation area covering 18.7 million ha (75% of the targeted conservation area) and 31 units of national park covering 7.9 million ha. This includes marine zones, where 8 units of marine natural reserve covering 253 780 ha have been established. The government's target is to expand protected areas to 10% of Indonesia's land area by the end of REPELITA VI. By the year 2000 the goal is to establish 20 million ha of marine protected areas, 19 million ha of protected land areas and 30 million ha of protected forests (PHPA, 1995).²¹⁶

Although gazetted protected areas in Indonesia cover major biogeographical regions, mangroves and wetlands are not well represented.²¹⁶

Ujung Kulon and Komodo National Parks have been certified by the IUCN as World Heritage Sites. In 1994 and 1995, Komodo National Park received funds from the World Heritage Fund to purchase equipment, to train personnel and to undertake rural appraisals of the socio-economic needs of people living in and around the Park. The Fund also provided help to Ujung Kulon National Park for improvements in the eastern part of the Park and for water development projects in the buffer zone. The Government has also sought the cooperation of UNESCO and IUCN to improve monitoring systems to further protect these World Heritage Sites.²¹⁶

At the request of the Minister of Forestry, the Asian Wetland Bureau (AWB) recently made an inventory of existing protected areas and priorities for expanding the network of protected wetland areas; including 676 992 ha of mangroves, 295 166 ha of lakes, and almost two million ha of other wetlands, comprising primarily freshwater and peat swamp forests and marshes.

A project to establish Biological Diversity Inventory and develop a User Advisory Group Information System by 1999 has been underway since October 1994. The program was established under the Indonesian Sciences Institute (LIPI) with support from the Global Environment Fund (GEF) through the World Bank.²¹⁶

Research efforts or goals

No information found.

Priorities for national action

Management of the country's biodiversity is approached with the following priorities: fulfilling basic human needs, especially food, shelter and medicines (health), source of income, and, lastly, usefulness for the environment.

Given Indonesia's strong economic prospects, national priorities include continued political and economic stability, more deregulation and less bureaucracy, continued development of social and physical infrastructure and the implementation of sustainable and environmentally sound development.²¹⁶

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

The national government has appointed the Ministry of State for Environment as the national focal point for the implementation of the Convention.

The National Strategy on Management of Biological Diversity proposes forming the National Commission on Biological Diversity to stimulate cooperation between agencies and organizations. In 1993, the Biodiversity Action Plan for Indonesia was compiled by the Ministry of National Development Planning and BAPPENAS (the National Development Planning Agency). This document provides plans for the *in-situ* and *ex-situ* conservation of biodiversity. It also proposes the expansion of data and information on Indonesia's biodiversity, the dissemination of information to policy-makers and the public, and the promotion of sustainable uses of biological resources. Plans are underway to review and revise the Biodiversity Action Plan to suit present and future needs, in accordance with developments at the national and international level.²¹⁶

Indonesia has also implemented various programs in sustainable management and conservation of biodiversity. In the wetlands sector, successful integrated planning has already been set at the local and provincial level. An example of this is the development of an Environmental Profile of the Coastal Wetland Areas of the Jambi province, which laid the basis for buffer zone development planning for the Berbak National Park, Indonesia's first Ramsar Site. The exercise involved all relevant government agencies at the provincial level, as well as intensive community consultation. Similar projects have been started by PHPA in consultation with the Asian Wetland Bureau (AWB) in South Kalimantan, South Sumatra, and South Sulawesi, and plans have been developed for similar projects in Riau and West, Central, and East Kalimantan. Indonesia has also declared Danau Sentarum Wildlife Reserve in West Kalimantan as the second Ramsar site.²¹⁶

In 1987, Indonesia became the first Asian country to publish a national wetland inventory, which covered 231 important wetland sites. The Directorate General of Forest Protection and Nature Conservation (PHPA) under the Ministry of Forestry plans to propose appropriate areas outside conservation areas as Ramsar Sites. Priority areas are wetlands with high conservation value under development pressure from increasing population and the perceived need for further habitat modification.²¹⁶

Most of the national sectoral programmes developed or planned according to the *Garis-garis Besar Haluan Negara* (GBHN – State Guidelines for National Development) and REPELITA guidelines are in accordance with the provisions of the Convention. The implementation of the CBD at national level has to be based on those two guidelines.

Implementing the Five-Year Development Programme is sectorally assigned to all government organisations and institutions, the private sector, various communities and other organisations. The national strategy and biodiversity action plan reflects this institutional arrangement.

Resources for meeting obligations and recommendations

In the development of the national strategy (1993), it was estimated that the annual budget for the management of the country's biodiversity came to US\$ 1 million.

Capacity-building measures for developing and implementing plans

In 1994, with support from USAID, the Indonesian Biodiversity Foundation was established as a non-government body to provide funding and technical help to biodiversity conservation efforts and research by various institutions, particularly those in the non-government sector. In accordance with provisions of the CBD, Indonesia established the National Clearing House on Biodiversity at the Ministry of Environment. The clearinghouse has several working groups, such as bio-safety, intellectual property rights, access to genetic resources and agricultural biodiversity. Discussions are underway to form the National Coordinating Body on Biodiversity to supervise and plan all activities related to the conservation and sustainable use of biodiversity.²¹⁶

Existing wetlands data is readily accessible at the offices of both PHPA and Wetlands International. There is also a fully computerized Indonesian Wetland Database (WDB), developed by Wetlands International - Indonesia Program (WI/IP) and operated at its offices in Bogor and Jakarta. Agencies, experts and students use these facilities, and there are plans to install more WDB stations at the National Institute of Sciences (LIPI), the Ministry of Public Works and the Ministry of State for the Environment. Under the ongoing UK-Indonesia Tropical Forestry Management Project, a Geographical Information System (GIS) facility is also being developed to help mapping, monitoring and data analysis of Indonesia's wetlands and forestry areas. The development of a link between WDB and GIS is being researched.

Current state and priorities for expanding the ecological network

No information found.

Legislation or legislative framework for aquatic biodiversity

The country is fully committed to the Convention provisions, and ratified the Convention through the highest possible legal instrument in the country after the national constitution, i.e by an act (Act No. 5, 1994), passed by the National People's Assembly/Parliament.

Protection of the country's fishery biodiversity is legally instrumented by Act No. 9 of 1985, concerning Fisheries.

In 1990, Indonesia promulgated Act No.5 on the Conservation of Natural Resources and their Ecosystems. This Act encompasses policies on protection of biological diversity in accordance with the various treaties. Indonesia ratified CITES in 1978, the World Heritage Convention in 1989, and the Ramsar Convention in 1991. As a follow-up to the ratification of Ramsar, Government Regulation PP No.27 of 1991 on Wetlands was issued to address the use of wetlands for development purposes, and includes a regulation on the protection of deep peat swamps as water resource areas.²¹⁶

Cooperative mechanisms among authorities, NGOs etc. to ensure integration

The involvement of public and private entities is still considered low. This is due to the lack of awareness of and support for the importance of biodiversity to the welfare of the people and the security of the nation. The main actors and key players are therefore mainly the government organisations and some NGOs.

Environmental NGOs have been active in providing input to the government on sustainable development issues particularly in sustainable resource management and community participation. They have been particularly active in the planning and implementation of activities related to CBD such as sustainable management of national parks, formulation of regulations on biosafety and marine resources conservation. In anticipating the fifth anniversary of the Earth Summit, NGOs have provided an outlook of conditions for Indonesia's sustainable development and country assessment on the implementation of the Earth Summit commitments.²¹⁶

Transboundary concerns

In 1989, out of 974 foreign vessels operating in the Indonesian EEZ, 354 were Thai.¹⁹²

The Southeast Asian Fisheries Development Center (SEAFDEC) was founded in 1967 as a regional technical body for training and research in fisheries. Although Indonesia participated in the program, Indonesia is not member of SEAFDEC. The ASEAN Fisheries Forum, an association of private sectors on fisheries in ASEAN and the SEAPOL (Southeast Asia Programme in Ocean Law, Policy and Management) is another regional body.¹⁹²

In the last three years Indonesia has begun a series of informal Workshops on South China Sea. The primary aim of these Workshops is to resolve overlapping claims by States around the South China Sea through developing regional cooperation for mutual benefits; this model was successfully developed between Indonesia and Australia in the Timor Gap area. Two political regional cooperations have been agreed upon in the South China Sea, on 'Marine Scientific Research' and 'Resource Inventory and Assessment'. The implementation of these agreements may be slow, since China, Vietnam, Malaysia, and the Philippines are maintaining and in some cases strengthening their military presence in the South China Sea.¹⁹²

To prevent and combat pollution there is one GEF (Global Environment Facilities) supported program entitled Regional Programme for the Prevention and Management of Marine Pollution in the East Asian Seas. This program is implemented by UNDP/IMO (United Nations Development Programme/International Maritime Organization) from its Manila office in the Philippines.¹⁹²

While only two Southeast Asian countries (Indonesia and the Philippines), have ratified the UNCLOS Convention (Third United Nations Conference on the Law of the Sea (UNCLOS III), there is a strong regional interest in this issue (MATICS, 1994).¹⁹²

Negotiations, fishing agreements, joint ventures and licencing are some ways to minimize intra-regional conflicts. Indonesia has established joint ventures with Taiwan to catch tuna in the EEZ, in the Indian Ocean, south of Java; with Thailand for mackerel in the Natuna Sea (southern part of the South China Sea); with Japan for shrimp fisheries in Java Sea, Arafura and the Mollucca Seas.¹⁹²

Significant aquatic biodiversity (freshwater and marine)

With two of the world's most arid deserts, Dasht-e-Kavir and Dasht-e-Lut covering nearly one third of the country, Iran is one of the most arid regions of the world. Marine living resources play an important role in the nation's food security. Iranian seas are two distinct water bodies: the Caspian to the north, and the Persian Gulf and the Sea of Oman to the south.

The Caspian, the largest lake in the world, covers about 422 000 km² with 6397 km of coastline, of which more than 900 km are on the Iranian side. About 128 large and small rivers flow into the Caspian from Iran, the four largest being Sefidrood, Shalman, Shafarood, and Tonekabon. In the southern Caspian there are over 120 species of commercial fish, commercially divided into sturgeons and bony fishes. The bony fishes are further divided into kilka (small fish of the family Clupeidae) and other species. The main commercial sturgeon species are Beluga (*Huso huso*), Russian sturgeon (*Acipenser guldenstadti*), Iranian sturgeon (*A. persicus*), and Sevruga (*A. stellatus*). Iranian caviar is produced by these species. The main commercial species of kilkas are *Clupeonella delicatula*, *C. engrauliformis*, and *C. grimmi*.

Other bony fishes include Kutum (*Rutilus frisii kutum*), Mulletts (*Mugil auratus* and *M. saliens*), Carp (*Cuprinus carpio*), Bream (*Abramis brama*), Pike-perch (*Lucioperca lucioperca*), Roach (*Rutilus rutilus*) and Salmon (*Salmo trutta caspius*.)

The Persian Gulf covers 232 850 sq km, stretching 930 km from the Arvandrood River to the Sea of Oman. The Gulf is one of the warmest areas in Asia, and its salinity is higher than that of the open sea. The water temperature of the Sea of Oman, surrounded by Iran in the north, the Indian Ocean in the east, and Oman in the southeast, is lower than that of the Persian Gulf, because of the water depth and its connection to the open sea. Different species of marine mammals are observed in these southern waters, including the blue whale (*Sibbaldus musculus*), the fin whale (*Balaenoptera physalus*), the sperm whale (*Physeter catodon*), the humpback whale (*Megaptera musculus*), the common dolphin (*Delphinus delphis*), the black finless porpoise (*Neomeris phocaenoides*), and the dugong (*Dugong dugon*). The Persian Gulf has the second largest population of dugong in the world, thought to number from 5 000 to 6 000.¹⁸

Iran has more than 3 450 rivers (including seasonal flows). Within the six main watersheds lie 37 major river basins. The most important (with their average annual flow) are:

- Karoun River (Persian Gulf) 14 619 million m³;
- Dez (Persian Gulf) 8 825 million m³;

- Sefidrood (Caspian) 6 491 million m³;
- Aras (Caspian) 2 317 million m³;
- Zayandehrood (Markazi) 1 473 million m³;
- Atrak (Sarakhs) 877 million m³;
- Hirmand (Hamoun) 142 million m³;
- inflow to Lake Uroomiyeh (from all rivers) is 5 971 million m³.

These figures show clearly that the head of the Persian Gulf and the Caspian receive the highest flows, while the other four watersheds receive relatively low inflow.

Marine turtles in Iranian waters include the Green Turtle *Chelonia mydas*, Leatherback Turtle *Dermochelys coriacea*, Olive Ridley Turtle *Lepidochelys olivacea*, Loggerhead Turtle *Caretta caretta*, Hawksbill Turtle *Eretmochelys imbricata*, and Black Turtle *Chelonia aqaziz* (recently reported for the first time).

Large populations of migratory birds winter at Iranian wetlands or use them on their way to and from wintering areas in Africa or the Indian Sub-continent. The marshes of the south Caspian lowlands in Iran's northwest are particularly important for over 20 species of ducks and geese while the mud flats of the Persian Gulf coast are of critical importance for shore birds, gulls and terns.

Present and planned uses of aquatic biodiversity

Sturgeon catches are controlled exclusively by Shilat. Kilka, however, have been mainly exploited by the Industrial Fisheries Company (IFCO), a body affiliated to Shilat, operating six vessels equipped with conical nets and lights. Recently, the private sector has also begun to exploit kilka.⁷²

The southern waters are fished by the Industrial Fishing Company, Fishermen's Cooperations, and the private sector. Of the nearly 336 fish species in the area, more than 150 are marketable within Iran; however, at present, only about 35 to 40 commercial species are distributed. The total catch in southern waters was 265 000 tons in 1996.

More than 70% of the fish catch is consumed fresh; 15% is processed (mainly frozen and canned; small quantities are smoked or salted); the remaining 15% is converted into fishmeal (mostly kilka, sardines and canning factory by-product are used). Caviar accounted for nearly 60% of Iranian fishery exports in 1994. Nearly half the estimated US\$ 76 million worth of imports were of fishmeal.⁷²

Inland fisheries extend over 1.5 million hectares. Rivers, natural lakes, artificial reservoirs, irrigation canals, aqueducts and ponds are used for fish culture, which is organised in fish farms. The most popular species are sturgeon, white fish, pike-perch, salmon, rainbow trout, and carp.⁷²

Since 1968, when the first hatchery was established, significant progress has been made in aquaculture development. Every year about 141 million fingerlings are released into the water bodies. In 1996, the fish production reached about 59 000 tons.⁷²

Unlike fishing, catching shrimps is very localized and most of the catch is in three areas: Bushehr-Dayyer, Bandar Abbas-Kolahi, and Deylam-Mahshahr, all on the Persian Gulf within the main inter-tidal zones and sea-grass areas.

Shrimp culture (*Penaeus semisulcatus*, *P.indicus*, *Metap. affinis* and *M.rosenbergii*) started in 1995 on 4 500 ha in four southern provinces. In order to provide post-larvae for shrimp culture some modern hatcheries have been constructed.⁷²

Many new aquaculture projects and feasibility studies are begun each year. Sturgeon (cold- and warm-water species), trout and shrimp culture are emphasised. Between 1994 and 1995, production of sturgeon larvae increased by 45%.⁷²

Threats to aquatic biodiversity

Coastal habitats and water resources are being degraded by oil, industrial and agricultural pollution and overfishing. In addition, large tracts of wetlands (called 'hoor'), devastated during the eight years of war with Iraq, require restoration.

Many infrastructure facilities, such as harbors and power plants, lie along the coasts.

The Caspian is especially vulnerable to industrial pollution from the Volga and from canals that connect it to the Baltic. Oil exploration by the Caspian littoral countries has increased in the past decade, and international plans to move oil and gas through pipelines under the Caspian will certainly harm marine and coastal ecosystems.

Lack of regulations on shrimp culture site selection and effluent along the southern coasts is a concern.

Domestically, coastal ecosystems are threatened by development of coastal communities, release of sewage into coastal waters and polluted rivers. Rivers are stressed by human population increase. Dam construction throughout Iran has changed the biological characteristics of many rivers, and many man-made water reservoirs without fishways have closed the migration routes of fishes from the sea. In highly populated areas, communities living along riverbanks destroy vegetation and habitat. The biological diversity in many such river areas has fallen sharply. Population increase and unemployment in the region also increase illegal fishing.

Major fishing grounds in southern waters are near oil production areas and transportation routes. Destruction of spawning grounds and nurseries is one of the major threats in the Persian Gulf and the Sea of Oman. Overfishing and illegal fishing by international vessels is another major concern. Shrimp are still taken by limited bottom trawling, which seriously threatens seabed habitats.

Measures taken to manage fisheries for biodiversity

At present only protected areas reliably protect Iran's biodiversity.

The Iranian Fisheries Organization ('Shilat') has tried to increase the production of commercially valuable species. Concentrated efforts began in the 1980's. By 1992, fish production in inland water bodies and fish farms was about 12% of total fishery production. One recent activity of Shilat is shrimp culture along the southern coasts, as well as hatcheries to produce shrimp larvae such as *Penaeus merguensis* and *P. semisulcatus*.

In order to protect Persian Gulf resources, the Government has launched in recent years a buy-back scheme for trawlers, substantially reducing their number. In addition, only one month is allowed for shrimp fishing.⁷²

Preventive measures were also taken for the Caspian Sea. Large investments have been made to ban gillnet fishing, which has been identified as especially destructive towards sturgeon.⁷²

Fish propagation centres produce millions of fingerlings of *Rutilus frisii kutum*, Acipenseridae (sturgeons) and *Abramis brama* annually for release in the Caspian and for sale to hatcheries. These centers contribute substantially to research on fish breeding and to the feasibility of introducing new aquatic species to inland waters and the coastal environment.

Aquaria, which are relatively new in Iran, are mostly established by municipalities as urban recreation centers. A large Aquarium Center being constructed by the private sector in Kish Island as a tourist attraction will also contain laboratories for research on conservation of ornamental fishes.

UNEP-GEF projects include 'Conservation and Integrated Management of Major Wetlands of Iran', whose objective is to prepare a PDF B project brief, and 'Conservation and Management of Major Wetlands of Iran', whose project brief will ensure that activities of the full-scale project are technically, economically and environmentally feasible, yet consistent with social and political constraints.²²⁵

Research efforts or goals

No information found.

Priorities for national action

Four strategies are to be incorporated into the next three National Socio-Economic Five-Year Plans, from 2000 to 2015. The first aims at the promotion of public participation, the second relates to the formation of biodiversity information and monitoring systems, and the third includes reorganization of institutional structures for sustainable use. The fourth strategy deals with systematic management of biodiversity resources. A series of Action Plans will be developed for the implementation of these strategies.

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

Shilat, in line with the Government's countrywide 25-year plan, has developed the early draft of a long-term development plan for fisheries. Goals are three: increasing fish production, consumption, and export of fish and fishery products.

Iran concluded its first five-year Development Plan and is now implementing the second in all sectors including fisheries. Public participation, aquaculture development, resource exploitation and conservation, infrastructure establishment, research and training, and increasing fish consumption have been among the major objectives determined for both plans, which have been successful so far.⁷²

Resources for meeting obligations and recommendations

No information found.

Capacity-building measures for developing and implementing plans

The Iranian Fisheries Research and Training Organization (IFRTO) has seven affiliated centres in the north and southern coastal provinces. Each centre has facilities for marine investigations and relatively well-equipped laboratories. Research concentrates on stock assessment, biological studies, selective catching methods, hydrology, fish-processing and fish diseases.⁸⁶

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

The Caspian. Caspian Sea boundaries are not yet determined among Azerbaijan, Iran, Kazakhstan, Russia, and Turkmenistan.⁵⁶

Examples of transboundary cooperation

Following a scientific and technical co-operation agreement signed between the governments of Iran and the former Soviet Union (1971), conclusive bilateral meetings were held to discuss problems and find solutions to the environmental problems of the Caspian. Since the collapse of the Soviet government, the Caspian littoral republics and Iran have agreed on the Caspian Environmental Program (CEP). Iran has bilateral environmental cooperation with the governments or research institutions of many countries.

Significant aquatic biodiversity (freshwater and marine)

The coastline of almost 30 000 km has a shelf area is approximately 233 000 km², and an EEZ of about 4 050 000 km².⁷³

About 200 species of freshwater fishes inhabit Japanese waters.

Wetlands occupy a very small percentage of Japan. There are two types: moorland of aquatic mosses fed only by rainfall, and moorland mainly of ditch reeds, which is distributed in the middle and lower reaches of rivers.

Present and planned uses of aquatic biodiversity

Gross value of fisheries output in 1998 (at ex-vessel prices, including marine culture sector) was US\$ 16 910 million. The *per capita* consumption of fish was almost 64 kg.⁷³

In 1998, nearly a quarter of the Japanese catch was for industrial use, including fishmeal for livestock and aquaculture. Annual exports of fish and products, particularly canned mackerel and sardine, were between 260 000 t and 425 000 t liveweight in 1993 - 1998. About 77% of the total domestic catch was available for the domestic market.⁷³

Mariculture produced 1 277 000 t in 1998 (worth ¥ 546 400 million), mainly of seaweeds, oysters, scallops, yellowtail and seabream. After peaking in 1994, production has stagnated in the last few years due to the limited capacity of farms and the excessive supply of cultured fish.⁷³

The largest fishing companies are generally part of integrated food manufacturing enterprises. Most of these companies have withdrawn from distant-waters fishing vessels to concentrate on sea-food manufacturing.⁷³

Apart from the growth in the total demand for fish, rising income levels are likely to reinforce the trend toward luxury products such as prawn, tuna, etc., with slower growth or decline in consumption of abundant species, such as sardine and mackerel, etc.⁷³

Threats to aquatic biodiversity

Fishery resources are declining in surrounding waters and catches are falling as a result of deteriorating oceanic environments and depression in the industry. In addition, the number of fishermen is decreasing and their average age is increasing, affecting the production structure and being closely linked to the sustainable use of fishery resources and a stable fish supply.

Sport fishing catches are reaching a substantial level and conflicts between professional and recreational fishermen are becoming more apparent. There were around 39 million person-

days of sports fishery at sea in 1998, and the total amount of fish caught was estimated to be some 30 000 t in 1997. In 1993 action was taken to enact a law regulating sport-fishing boats.⁷³

Damages to birds from fishing lines and hooks or dumping of waste from fishing boats persist. Edification to improve manners is being promoted.

The National Survey of 1993 shows that 38% of the coastlines of four main islands are artificial, built up with structures for shore protection at the intertidal zones. The decrease of natural coastlines is continuing. Many tidal flats are located along inland seas and inner bays where a high concentration of population and economic activities are evident and are thus disappearing. The National Survey (1989 and 1991), show 51 433 ha of tidal flats in Japan, down by 3 877 since 1978.

The mainly ditch-reed moorland, distributed in the middle and lower reaches of rivers, has been affected by man. World Heritage (Natural Heritage) Shiragami-sanchi and Yakushima are listed in the World Heritage List. Total area is about 28 000 ha as of April 1997.

Many rivers have suffered from human activities. In the Fourth National Survey of 1992, fishes were able to swim to the uppermost reaches in 27 of 74 main streams, or to swim up to over 80% of total length in the 37 streams covered under that survey. Within 79 tributary streams where the upstream-swimming has been recognized, fishes were able to swim from the river-mouth of the main stream up to the uppermost reaches in 7 rivers, or to swim over 80% of total length from the river-mouth in 22 rivers.

Measures taken to manage fisheries for biodiversity

After ratifying the United Nations Convention of the Law of the Sea in 1996, an EEZ of 200 nautical miles was established. Within this EEZ, the total allowable catch (TAC) system has been introduced to establish a framework for the conservation and sustainable use of fishery resources.⁷³

For a second meeting of National Focal Points convened by UNEP in Beijing, 1992, to consider the regional overview and a draft Action Plan prepared by UNEP, national reports were to be prepared by the National Focal Points and submitted to UNEP. The following information was to be included:

- (1) the present state of the marine and coastal environment;
- (2) national policies, measures, and relevant activities dealing with marine pollution problems;
- (3) proposals on ways and means to resolve the differences regarding the contents of the Action Plan.

The National Focal Point of Japan submitted the first two parts to its national report, but not the last, related to proposals on ways and means to resolve the differences regarding the Action Plan contents. Japan also insisted that the section of the Action Plan on Biodiversity and Ecological Resources be deleted except for the material on wetland reserves and genetic resources.²²⁶

Aquatic areas suitable for fish farming, growing of fry etc., or designated as Protected Waters total 2 200 km of rivers, 240 ha of lakes and 3 000 ha of sea surface (as of April 1997). A 'resources management-oriented fishery' is to be enhanced, and fish ranching is to be promoted.

Deteriorated habitats have been designated Protected Water Surfaces by the central and local governments, and in such waters harvesting, holding or selling of fish is being restricted or prohibited according to the extent of deterioration. Some Prefectures are trying to restrict exotic species immigration, especially illegally-released black bass (including large mouth bass, small mouth bass, etc.). Fishermen are being educated against wide-spread illegal releases and the cooperative system is being strengthened.

'Environmental coexistence ports (eco-ports)' preserving shallow seas, tidal flats, selecting shape and structure (*ed note: of installations*) having less influence on tidal currents and water quality, removing sludge and creating shores have been carried out.

'Nature-harmonization oriented ports', including shores where aquatic life can live and grow, have been prepared. At harbors, measures for creating suitable coastal environment such as the development of harbor environment plans, dredging of sludge, sand-turning or preparation of artificial shores are to be executed.

'Fertile nature-type river preparation' including preserving torrents and deep pools, preserving and creating shore environments suitable for aquatic life, has been implemented. A study on the preparation and conservation of river habitats will be carried out.

Regarding dammed lakes, biotope and fishways for maintaining good habitat are being installed and projects to restore denuded torrents and breeding sites for maintaining and creating good fish habitats or projects to prepare fishways are to be enforced.

Ten areas registered in the Ramsar List total about 83 500 ha (April 1997). These include irrigation channels, copses and irrigation ponds. Animals and plants are being surveyed periodically, and basic plans for river environment such as zoning are being developed.

Aquatic areas suitable for aquaculture and designated as Protected Waters total 2 200 km of rivers, 240 ha of lakes and 3 000 ha of sea surface. (April 1997) Aquatic areas to be protected or cultivated for fishery animals and plants will also be designated.

Research efforts or goals

Japan is surveying coastal areas as a part of basic research.

A vegetation map (scale of 1:50 000 covering all of Japan) as well as data on distribution of important plant communities, seaweed beds, tidal flats, coral reefs and the modification extent of rivers and coastlines has been prepared. Since the aquatic life along shores has not been systematically studied (with the exception of some valuable fish species), the distribution of species whose numbers are remarkably decreasing or whose existence is under threat is being surveyed.

Japanese fisheries research facilities are extensive and comprehensive. Nine national research institutes are involved in

- Developing a simple automatic survey mechanism for fishing grounds,
- Establishing a green belt in shallow coastal areas to facilitate the establishment of algae and seaweed grounds,
- Establishing a multi-purpose coastal marine zone to expedite the vertical use of waters,
- Developing methods to estimate the size of fish schools, using a fish finder,
- Elaborating an early warning system and preventive methods for red tides,
- Developing environmentally-friendly fishing gear, methods and vessels, such as for purse seining and bottom trawling,
- Introducing new approaches through application of biotechnology, such as creation of improved fish species (e.g., trout) through applying biotechnology in fish culture, and
- Exploiting the potential of satellite-based remote-sensing technology, including surveillance of fishing vessel operations to detect illegal fishing.⁷³

Through surveys such as the National Survey on the Natural Environment Japan will continue to study the present state of forests, rivers, wetlands, and coastal areas. Japan will promote projects for the rehabilitation and restoration of habitats, including watersides. It will also promote gene banking, and the accumulation and updating of information on ecosystems such as rivers, marshes, lakes, tidelands and coral reefs.

Japan will accumulate information on ecosystems not yet the subject of such surveys, including those in wetlands and shallow ocean areas. Japan has been collecting information in each water area on aquatic life forms other than those species covered by the above-mentioned surveys, and will continue to promote the development of methods for grasping the state of aquatic ecosystems. Japan will collect information on rivers with the cooperation of monitors for river environment conservation.

Japan will continue to promote basic data collection and improvement, through selection and monitoring of superb ecosystems, including representative and typical ones and those that harbour endangered species.

To prepare infrastructure for conservation of marine biological diversity, Japan is taking part in the World Ocean Circulation Experience (WOCE). To clarify the impacts on the marine environment by nutrient salts, Japan is executing the international joint study useful for clarifying the material circulation mechanism in peripheral seas.

Priorities for national action

Japan promises to require EIAs for coastal developments, fishing ports, or the conservation and restoration of environments influenced by development as part of efforts to secure good fishing grounds. When fishing ports and harbors are prepared, various activities useful in conserving coastal ecosystems, such as securing the exchange and purification function of seawater, securing marine wildlife habitats, and preserving and restoring seaweed beds, tidal flats, etc. in the periphery, are to be carried out.

Fisheries management should be strengthened to widen regulatory measures to cover wide-ranging migratory species and to improve control methods for multi-species and multi-gear fishing. It is also important to evaluate the effects of fish farming on wide-ranging migratory species to maintain and increase fish resources. Currently, a key objective in national policies is to implement responsible fisheries to conserve and manage fisheries resources on the basis of scientific evidence. It is important that the government play an important role in conserving and managing fish resources in international waters.⁷³

Recovery of stocks migrating through the domestic EEZ, effective use of the domestic EEZ, specific restrictions on production and distribution, improvement in working conditions and positive publicity for the industry would be crucial for a regeneration of future prospects for the Japanese fishing industry.⁷³

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

No information found.

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

In addition to promoting research to get an understanding of the present state of all coastal areas, Japan will promote the conservation of habitat areas of marine living resources, through designation and appropriate management of national parks and quasi national parks, based on the Natural Parks Law, as well as the designation and appropriate management of nature conservation areas, based on the Nature Conservation Law.

Other laws are the Fisheries Law, Fishery Resources Protection Law, and the Aquatic Resources Protection Law. Based on the Aquatic Resources Protection Law, Japan will adopt regulatory measures on the capturing and transacting of wildlife.

Cooperative mechanisms among authorities, NGOs etc. to ensure integration

Japan will establish national strategies and plans which contribute to conservation and sustainable use of biological diversity and will improve their details. Japan will continue to try to ensure the integration of conservation and sustainable use of biological diversity into various national plans.

Vulnerable transboundary aquatic systems

Ongoing negotiations over the fisheries accord with South Korea have reportedly been stalled over the disputed Takeshima/Tokdo group of islets. While agreeing that the seas around the islands should be declared neutral, Japan and Korea differ over the size of the neutral zone.²⁴⁰

In 1998, Australia banned Japanese boats from Australian waters after the Japanese failed to agree to lower catch quotas for dwindling stocks of southern bluefin tuna.²⁴⁰

Examples of transboundary cooperation

Although the countries fishing the Sea of Japan have acted unilaterally to regulate foreign fishing in their coastal waters, no regulatory regime includes all coastal or fishing nations, nor is any state a party to all agreements. Claims overlap and boundaries are unresolved. None of the bilateral agreements take into account the whole geographical region. Thus, no forum exists for all Sea-fishing nations to discuss distribution of catches.²²⁶

Despite shortcomings, the Japan-Russia and Japan-ROK fisheries regimes have provided some stability. Negotiations between government representatives have managed to produce mutually acceptable agreements and the process has forced the governments to coordinate to some degree their respective policies.²²⁶

Japan has added the conservation of coral reefs to the Japan-U.S. Common Agenda and is promoting 'the International Coral Reef Initiative (ICRI)'. Japan is donating the second largest amount (after the World Bank) to the Consultative Group on International Agricultural Research (CGIAR), which will carry out studies related to fisheries in developing countries.

Japan is cooperating in the protection and management of World Natural Heritage areas in Indonesia, the conservation and management plan for coral reefs in Philippines, capacity-building and training on coral reefs conservation in developing countries, and so on. Japan will continue to seek a balance between sustainable use of marine living resources and the conservation of biological diversity.

In late 1997 the Russian Federation and Japan agreed upon intergovernmental arrangement concerning Japanese fishing near the Southern Kurils. It was agreed that Japanese authorities, not Russian, would investigate and punish Japanese vessels caught poaching there. However, the poachers would remain the pursuit of the RF Border Guards and the RF Fishing Inspectorate. In return Japan is to get 2 200 tons of octopi and other sea products quota, paying 20 million yen in compensation and supplying some 15 million yen worth of fishing equipment to the Russian Federation.¹⁸⁷

According to the Keizai Shimbun, Malaysia has agreed to support a consortium of Japanese and other Asian companies to build a US\$ 2 billion pipeline across the Malaysian peninsula. The project, to be completed by 2002, will be capable of carrying two million barrels of crude oil a day, 190 km between Alor Star in Malaysia and Sai Buri in Thailand. The pipeline's reported aim is to ease heavy maritime traffic and reduce pollution in the Straits of Malacca, the main shipping route of Middle East crude oil to East Asia.²⁰⁴

In 1997 Japan was planning to call for a secret ballot at the International Whaling Commission's annual general meeting to be held October 20-24 in Monte Carlo. However, only seven of the 39 participating countries support whaling. Furthermore, Ireland, until recently neutral on the topic, was expected to propose that whaling for research purposes also be banned and that the sanctuary be expanded to include all open seas outside 200-nautical-mile economic zones.²³⁹

Priority given to transboundary cooperation affecting aquatic biodiversity

Mark Valencia reports that 'Japan opposes a regional forum composed solely of officials of environmental agencies, because it feels economic ministries must also be involved. Further, Japan is concerned that any regional environmental cooperative body not become just another channel for its largesse. Rather it should spawn concrete projects involving sharing of domestic experiences, monitoring of the regional state of the environment, and transfrontier pollution. Such projects should not duplicate Japan's existing bilateral and multilateral help projects, including the existing UNEP Environmental Technology Centers in Osaka and Shiga.'²²⁶

Significant aquatic biodiversity (freshwater and marine)

Freshwater and saline ecosystems cover about 8% of Kenya's area and include rivers, lakes and wetlands. These are important areas in terms of biodiversity conservation, food production, hydrological stability, mineral cycling and socioeconomic development.

Lake Naivasha is unique in that it is the only freshwater ecosystem in an otherwise soda-lake series in Eastern Rift Valley. It was designated a Ramsar site in 1995.¹⁹⁷

Adequate species lists exist for fish, but complete data on distribution is not available for many species. Threatened species include some fish species.

The Kenya coast, stretching for about 608 km from its northern border with Somalia to the southern border with Tanzania, is famous for its palm-fringed sandy beaches and the colourful diversity of marine life within a unique series of fringe coral reefs.

Approximately 53 000 hectares of mangrove forests are left on the Kenya coast. Many fish species spend their larval and sub adult stages in the mangroves where they find shelter, breeding and feeding grounds.

Monitoring of the coastal environment and marine resources is currently a major focus of a number of national and regional initiatives. International conservation organisations such as the World Wildlife Fund and World Conservation Union (IUCN) are working with local communities to monitor wetland resources and mitigate against land-based threats to inland and marine aquatic biodiversity. National and community-based NGOs play a vital role in conserving aquatic biodiversity in Kenya. Their effectiveness, however, is constrained by lack of adequate technical and financial resources.

Present and planned uses of aquatic biodiversity

The biodiversity values of Kenya's inland waters are largely based on their capacity to support fisheries and wildlife, particularly birds. Freshwater lakes, such as Naivasha, constitute a significant life support for local communities who extract water and fish from the lakes. Wetlands are breeding grounds for fish and birds, and provide a wide variety of products and environmental services to riparian communities.

Threats to aquatic biodiversity

Water is a prime natural resource that attracts development activities including human settlements and industries. The status of the Kenya water resources has in the past received greater attention than the biodiversity associated with the water. Conflicting and sometimes competing water issues have put aquatic biodiversity at serious risk.

The Kenya Wildlife Service has warned that rare species of sea turtle on the country's coast are facing extinction following increased environmental pollution and illegal trawling. Indiscriminate fishing methods and a thriving black market for turtle shells and leather products are threatening the already depleted turtle population, the report states. Similar concerns have reportedly been raised by other environmental groups.¹⁹⁹

Measures taken to manage fisheries for biodiversity

Since 1992, Kenya has made concerted efforts to protect aquatic biodiversity by, among other strategies, developing legal and policy guidelines and promoting community participation in management. The Kenya Water Master Plan was begun by government to ensure rational management of the national water resources.

The Panafrican News Agency reported in February 2001 that the Kenya government had prohibited the use of trawlers and trawling in the lake in an effort to save fingerlings. The ban was one of the measures the government is putting in place to safeguard fish exports, especially to Kenya's key market in the European Union, the article stated.¹⁷²

In February 2001 the Kenyan government was also reported to have imposed a ban on fishery activities in Lake Naivasha following a decline in fish stocks and alarms over rising pollution from the expanding flower and horticultural industry around the lake which had harmed its biodiversity.¹⁹⁷

Research efforts or goals

No information found.

Priorities for national action

The National Environment Action Plan (NEAP) report proposed the following strategic actions to be taken immediately:

- Formulating a biodiversity strategy to maintain, use and preserve Kenya's remarkable biodiversity;
- Treating biodiversity conservation and economic development as integral aspects of the same process of sustainable development;
- Measuring the value of genetic resources and especially biodiversity in economic terms;
- Establishing incentives and disincentives;
- Acting urgently to conserve areas of outstanding biodiversity value (of critical importance are sites with unique species of plants, animals and microorganisms, such as L. Magadi, river gorges of Nz dovuni among others); and

- Incorporating traditional values and knowledge systems into biodiversity conservation programs.

Priority activities of NEAP are to:

- Survey and document species composition, distribution, structure and functions, use and value of the genetics in various ecosystems;
- Assess causes of threats to biodiversity including vulnerability of populations of certain species and introduction of alien species;
- Control and reverse loss of biodiversity, and take measures to protect genes, species, habitats and ecosystems, on site whenever possible and where necessary; and
- Promote the use of native species, establish realistic harvest levels of wild species, including plantations and regulatory mechanisms, and explore new markets for wild products.

Given the high ecological and economic significance of marine and inland water ecosystems there is a great need to develop and implement appropriate measures to minimize loss of biodiversity and deterioration of water quality.

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

Planning for biodiversity conservation and use is heavily sectoral. So long as this remains so, the several institutions responsible for managing aquatic resources will continue to have limited capacity to reduce biodiversity loss in aquatic systems. The Fisheries Department is responsible for the conservation and management of fisheries resources while Kenya Wildlife Service is responsible for conservation and use of other aquatic biological resources. The Water Department is responsible for water development and conservation and so has an indirect role in ensuring rational use of water resources. Institutions mandated to assess, document and monitor aquatic biodiversity include national research institutions such as Kenya Marine and Fisheries Research Institute, National Museums of Kenya, National Universities and regional authorities such as Lake Basin Development Authority, Coast Development Authority and Tana and Athi River Development Authority.

Resources for meeting obligations and recommendations

No information found.

Capacity-building measures for developing and implementing plans

Capacity-building, including training and institutional support, has been undertaken, largely through FAO/UNDP/GEF Capacity-building for the Protection of East Africa Biodiversity project.

State and priorities for expanding the ecological network

No information found.

Legislation or legislative framework for aquatic biodiversity

More than 77 statutes relate to conservation and management of biodiversity and environment in Kenya. These laws are inadequately enforced, owing to:

- Lack of provisions to specify standards of performance;
- Inadequate deterrent and incentives;
- General low awareness among most of the population;
- Preference for short-term gains at the expense of sustainable alternatives in policy-making and planning;
- Gaps and overlaps in institutional responsibilities making enforcement difficult;
- Poverty that promotes the unsustainable use of resources; and
- Lack of a comprehensive land use policy.

The Water Act was enacted to reserve the water catchment areas in perpetuity. The Act protects water catchment areas from deforestation and gives power to allow or prohibit specified activities. A significant conflict with the Forest Act is that the Forest Department has no power to protect catchment areas outside gazetted areas.

Kenyan aquatic biodiversity is protected by a number of policies and statutes. The Wildlife and Conservation Act (Cap 376 of Laws of Kenya) mandates the Kenya Wildlife Service to protect fauna and flora by creating protected areas.

Cooperative mechanisms among authorities, NGOs etc. to ensure integration

Coordination of sectoral activities relating to aquatic biodiversity assessment, conservation and use has considerably increased however since 1992. NES has gradually taken up the coordinatory role through the Inter-Ministerial Committees on Environment. The sub-committee on biodiversity is actively involved in developing policy framework on aquatic sub-sector as well as coordinating initiatives on aquatic biodiversity conservation at national

and regional levels. Three major initiatives which have been approved for funding by GEF are the Tana River Primate National Reserve, Sustainable Use of Biodiversity in the Gregory Rift Valley Lakes and the on-going Lake Victoria Environment Management Programme.

Many NGOs are making significant contributions to natural resource conservation not only in Kenya but in East Africa as a whole and contributing to the well being of the local populations. There is, however, the need for a coordinating mechanism to avoid duplication or sometimes triplication of efforts. Unless these efforts are coordinated, there is even a greater danger of inter-agency competition for scarce resources.

International and Non-governmental organisations have continued to play a vital role in the development of marine biodiversity conservation initiatives besides local government institutions. Various NGOs are involved in the implementation of the CBD at national level. These include WWF, ACC, KENGO, ACTS, EAWLS, IUCN. Their activities include protecting sacred sites and species and rehabilitating degraded areas. WWF is one of the organizations closely collaborating with the Government of Kenya in implementing the CBD. Recently, DANIDA funded a project through WWF to promote implementation of the CBD in various countries, including Kenya.

Vulnerable transboundary aquatic systems

No information found.

Examples of transboundary cooperation

Countries benefiting from Lake Victoria through the East Africa Community have formed the Lake Victoria Basin Region Local Authority Co-operation (LVLAC) to set up rules and laws governing the use of the lake, which is being polluted with toxic industrial waste.¹⁹⁸

Kenya has signed the Ramsar Convention.

Global Environmental Facility (GEF) projects on biodiversity include, among others:

- ‘Institutional Support for Protection of East African Biodiversity’ funded through UNDP and executed by FAO; the project started in October 1992 and ended in 1996.
- Lake Victoria Environmental Management programme involving Kenya, Uganda and Tanzania.
- Assistance in Building Biodiversity Data Management Capacity and Networking Biodiversity Information in Kenya (BDM) scheduled to end in April 1998.
- Reducing Biodiversity Loss at Cross Border Sites.
- Support for conservation and local communities in Tana River District. (Several small projects funded by the GEF small grants programme.)

- ‘Conservation and Sustainable Use of Biodiversity in the Eastern Rift Valley Lakes.’ The goal of the proposed project is to support the three East African countries to enhance biodiversity conservation and sustainable use within the Gregory Rift Valley lakes and wetlands through the development and implementation of a Strategic Action Programme (SAP). This will entail two major components, (i) establish and strengthen systems of conservation areas or ecosystems at risk, and (ii) sustainable use by combining goals of biodiversity conservation, production goals and promoting various forms of multiple use.²²⁵

A major goal of some of projects is integrated activity between institutions at both national and regional levels. While most activities are national in nature, the merits of developing and maintaining strong regional ties, through some integration of training and research activity, have been recognized.

Priority given to transboundary cooperation affecting aquatic biodiversity

‘New approaches to reducing biodiversity loss at cross-border sites in East Africa.’ The objective of the project to be developed through this PDF is to test and demonstrate new district level approaches to reducing the rate of biodiversity loss at selected cross-border biodiversity hotspots in East Africa.²²⁵

‘Reformulation Kenya Wetlands Programme.’ Kenya has lost about 15% of its coastal wetlands and 9% of its inland wetlands during the last decade. The main actor involved with the use, management and conservation of wetlands is the parastatal Kenya Wildlife Services (KWS), whose activities related to wetlands are supported by the KWS-Netherlands Wetlands Conservation and Training Programme. Early 1999, two major changes took place which would affect this programme.

Firstly, the Dutch Government decided to bring back the number of countries with whom it maintains structural bilateral relations, reducing the availability of resources to Kenya.

Secondly, the KWS decided to focus on its core activities, which could eventually affect its willingness to invest in biodiversity areas outside the Protected Areas (in surface terms, 80% of the wetlands are located outside Protected Areas).

Consequently, the NEI was invited to head a project with two objectives: to identify suitable modalities to consolidate achievements of the Kenya Wildlife Society/Netherlands Wetlands Conservation & Training Programme, and to formulate a proposal for extending the Wetlands Programme by two years. Specific tasks included identifying achievements worth pursuing; appraising existing institutional and human resources capacity within KWS; appraising the KWS policy framework; and appraising opportunities for establishing and supporting a Kenya Wetlands Forum.

Interviews were held with all relevant stakeholders and key informants at the central and field level, including international donors and NGO’s. Alternative implementation scenarios were then elaborated, and tested through further feedback interviews. Finally, the objectives

of the Kenya Wetlands Programme were reformulated, and the programme began operating independently by 2000.⁹

⁹ See <http://www.nwp.nl/> (Keyword search necessary.)

Significant aquatic biodiversity (freshwater and marine)

Coastal and marine biodiversity of Madagascar has been listed in a more or less complete way by various studies between 1960-1970. On the other hand, the biology, ecology, stocks and current evolution on the island as a whole are not yet well defined, except for certain species and in well-defined zones, in particular for the coastal shrimps in the northwestern coast. Some studies were undertaken on a number of species but relate only to certain sites. The results are partial and do not cover the principal parameters that would allow one to characterize the studied species.

Present and planned uses of aquatic biodiversity

No information found.

Threats to aquatic biodiversity

Threats to biodiversity are still poorly known. They are estimated through observation of illicit or accidental fishing of certain marine mammals and reptiles (tortoises) and of the fall in captures, or by the observed degradation of the coastal and marine ecosystems. Shrimp fishing is responsible for much destruction of by-catch. Moreover, during trawling, scraping the seafloor tears off the algae and plants which provide oxygen. In the lobster fishery, intensified fishing effort had led to overexploitation. The legal capture size is not respected, nor is the prohibition on the capture of egg-bearing females.

The principal causes of biodiversity loss are itinerant burning of forests; uncontrolled slash-and-burn fires; bush fires; illicit tree-cutting for sawlogs, charcoal or firewood; mining; and exploiting natural resources unsustainably.

After habitat loss, international trade constitutes the second 'engine' of *in situ* biodiversity loss. Pharmaceutical industries require ever more medicinal plants, both in quantity and variety, and the market for decorative plants is always seeking out rare and original plants prized by collectors. The essential oils industry is seeking to diversify its line of goods, flavours and perfumes for beauty care, or the agro-food business. The international demand for medicinal and decorative plants stimulates collection by the peasants and collectors for export. Lastly, sales on the international market of the products resulting from deforestation considerably stimulates their production by the peasants, thus accelerating forest clearing.

These causes are reinforced by a socio-economic, cultural and ecological context. Poverty, associated with the low level of schooling and cultural resistance, leads to irrational exploitation of biodiversity. The absence of exchange between the Madagascar peasants and the other bordering populations is another negative factor. The interests of certain economic operators and State administrators do not always encourage rational exploitation of natural

resources, and go against conservation of biodiversity. The fragility of the Malagasy natural ecosystems accelerates the degradation by man.

Malagasy aquatic plants are threatened by bush fires, causing erosion and the drying out of the wetlands and leading, in particular, to the loss of immersed plants. Poor regional planning is also one of the great causes of disappearing wetlands.

A world decline of amphibians has been noted in the last years. In Madagascar, the principal cause is commercial exports.

Measures taken to manage fisheries for biodiversity

While preparing the Environmental Program II, begun in 1994, Madagascar adopted a participatory process to establish conservation priorities for biodiversity, taking account of the scientific conclusions of the experts and the priorities of the actors and local users of the resources. The results were to lead to the tender by the Malagasy government of a proposal for a request for financial support with the FEM, for the activities of the EP II related to the problems of biodiversity.

The general tendency of the first phase of the PAE (1991-1996) was to integrate all priority activities in a single program (EP I). The biodiversity component emphasises protected areas, linked with integrated development of their peripheral zones, and with the fight against deforestation on the basins' priority slopes.

During EP I the so-called 'time-out' strategy is being implemented in parallel with efforts to develop the rural zone and areas of regional growth to reduce man-made pressure on protected areas and sensitive regions. The second phase of PAE will lead to more decentralization, emphasizing the synergy between the activity of EP II with various other programs for rural development where the population pressure will be stronger.

On the ground, the program itself will largely call upon local actors to take part in managing the environment and natural resources. Lastly, the conservation and the sustainable management of biodiversity are no longer regarded as separate components because they cover all activities, and are taken into account in the various components of the EP II, which also includes the marine and coastal environment.

Management strategy for the environment is based on developing a regional and local approach to the conservation and use of biodiversity and other natural resources.

Pilot projects within the framework of the regional program Environment (PRE- COI) include adapting lobster net techniques to preserve young, and encouraging the participation of communities in stock management at the local level.

The Ministry for Fishing and Aquaculture has worked on equitably distributing and limiting fishing effort for shrimps according to exploitable potential of zones; and on closing fishing annually for stock recovery. For the lobster fishery, the Ministry has worked on limiting the

number of authorized fishers in the high-risk zone, closing fishing annually for stock recovery, and on a Control and Monitoring Committee for applying legal measurements.

Sensitizing the public has been carried out since 1992 by the WWF, involving 50 schools, 30 NGOs and 30 Vintsy clubs, and including sensitization to biodiversity conservation from the scientific and economic point of view. Ecological niches were reconstituted through school afforestation, creating school reserves in rural areas, and so on. Audio-visual supports (films, posters etc.) were produced, as were teaching materials and radio broadcasts.

The Madagascar Environment Programme Support GEF-funded project will lay the groundwork for new approaches addressing root causes of biodiversity loss in Madagascar, including deforestation. It will build integral components of biodiversity conservation into revitalized forestry institutions and strengthen the administration of protected areas. Finally and most importantly, it will build consideration of biodiversity into on-going national programmes aimed at decentralizing the management of natural resources.²²⁵

The 'Priority setting and strategic identification and design of interventions for biodiversity conservation' project will use a participatory process for determining scientific and conservation priorities, leading to the design of a GEF initiative in Madagascar.²²⁵

'Conservation of Important Bird Areas in Madagascar through Community-based Management of Wetlands'. Madagascar has many wetlands of global importance for biodiversity with a high level of endemism for birds and primates unprecedented elsewhere in Africa. Recent studies have shown that the traditional management systems of these wetlands tend to break down under increasing competition for scarce resources because of recent immigration or population growth.²²⁵

Research efforts or goals

Investment in research programmes seeking alternatives and studying the biology of the threatened species and the ecosystems that shelter them has been reduced.

Priorities for national action

General provisions and measurements accompanying research and inventory of biological diversity include:

- installing two Ramsar sites (in progress);
- modifying regulations for lobster nets: closing down fishing from November-October and March-April;
- creating protected zones;
- adhering to regional and international conventions;

- improving and developing legislation and regulations;
- reinforcing the information system;
- instituting technical norms for fishing and aquaculture;
- updating the technical standards and the standards for exploitation of the resources;
- improving the knowledge of the environment:
- making an inventory of the aquatic flora and fauna, and an inventory of the biodiversity of the Great Reef of the southwestern and eastern Malagasy coast;
- studying the mangroves;
- identifying marine mammals;
- studying the state of the Dugong;
- conservation of water birds;
- ecological and biological study of aquatic animals; and
- continuing research into specific topics of algoculture (Euchems, Spiruline, pisciculture, crevetticulture, artémi-culture, biomass in the saltworks of Antsiranana, inventory control of holothuries, study of the species of marine tortoises of the South East of Madagascar).

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

During the first phase of the Environmental Action plan, technical and legal measurements were introduced to integrate six sectoral policies. This work started with an assessment of the environmental impact of activities on natural resources and biodiversity. The sectoral persons in charge and those representing environmental interests held discussions, the final objective being to make safeguarding the environment an acquired reflex for any action of economic and social development.

The objective of ecologically sustainable aquaculture and fisheries policy is sustainable management of marine resources, and integration of environmental impact assessments (EIE). Measures taken include resource studies; installing a system of follow-up and control; a control project for marine pollution; a project to create protected areas; and regulating exploitation of mangroves.

Strategies currently consist of legal measures and economic tools aimed at a rational use of the resources of biodiversity, freshwater, marine, coastal and terrestrial. Implementation of

these measures requires knowledge of potentials and stocks in hand. Thus this activity, carried out by several institutions and organizations, will be the object of phase 2 of the PAE, the building of a network related to a vast programme of Environmental Information system that will contribute to the development of a Centre for Exchanges.

Policy orientation for the Fishes and Aquaculture sector generally aims at the sustainable management of resources which requires, in addition to knowing aquatic potential before any sustainable management, a control and follow-up system. Marine protected areas are also to be created.

Resources for meeting obligations and recommendations

No information found.

Capacity-building measures for developing and implementing plans

Both Madagascar and the European Union have been implementing a mandatory satellite monitoring system for their own fishing fleets. Under EU legislation, all fishing boats exceeding 20 metres between perpendiculars or 24 metres of overall length are subject to satellite monitoring wherever they operate.

The novelty of the agreement is that the EU and Madagascar have agreed that ‘satellite monitoring will be applicable in a non-discriminatory way to all their vessels fishing in Madagascar waters.’ They have also reaffirmed the principle of responsibility of the flag State to monitor the activities of its fishing fleet and to transfer relevant data to Madagascar surveillance authorities, according to the EU statement. The implementation rules for satellite monitoring entered into force at the same time as the new protocol to the EU/Madagascar Fisheries Agreement, which covers the period from 21 May 2001 to 20 May 2004. This agreement concerns tuna fisheries and provides fishing opportunities for 80 vessels, mainly from Spain and France as well as from Italy and Portugal.³

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

No information found.

Priority given to transboundary cooperation affecting aquatic biodiversity

No information found.

Significant aquatic biodiversity (freshwater and marine)

Freshwater fish species total 449.

There are more than 100 river systems in Peninsular Malaysia and more than 50 river systems in Sabah and Sarawak. River systems on the whole, with and without impounding reservoirs, are estimated to contribute about 97% of the raw water supply.

Present and planned uses of aquatic biodiversity

Agriculture, forestry and fisheries have contributed much to national wealth. Together they made up 13.6% of the national gross domestic product in 1995, and accounted for 16% of total employment and 12.1% of total export earnings.

About 20 million metric tons of freshwater fish are produced annually, a 31% increase over the preceding ten years. Of these, 12.6 million are from aquaculture, an increase of 234% over the preceding ten years.²³⁴

The marine fisheries of Malaysia, based on territorial waters of 47 000 square nautical miles and an EEZ of 113 000 square nautical miles, support about 93 000 fishermen, or 1.7% of the total labour force. Overall an estimated 421 800 tonnes of demersal and pelagic fish resources are available in the offshore area beyond 12 nautical miles from shore. From acoustic surveys a total potential of 255 000 tonnes of pelagic and semi-pelagic species has been estimated. Sarawak has the highest potential, of 108 000 tonnes, followed by the eastern coast of Peninsular Malaysia, with a potential of 67 000 tonnes, and Sabah with 54 000 tonnes. Over and above these, there was another estimated 50 000 tonnes of tuna available.

The total marine catch (wild and aquaculture) was around 651 000 tons in 1993, a decline of 8% from a peak in 1983. The marine aquaculture catch in 1993 was 2 600 tons.²³⁴

Fish is an important source of protein for the nation, and mangrove swamps, the feeding and nursery grounds for fisheries, are habitats of the nation's several commercial fishes and shrimps.

Malaysian rivers exhibit very diverse riverine fisheries resources that support artisanal inland fisheries, especially in remote rural areas. The production of riverine fish is small compared to marine fish, amounting to about 5 000 tonnes annually in Peninsular Malaysia, 17 000 tonnes in Sabah and 15 000 tonnes in Sarawak. The exploitation of riverine fish is mainly by riverine populations who catch fish primarily for subsistence, fish being their principal source of animal protein.

The aquaculture industry in Malaysia is divided into freshwater and brackish water. Total annual aquaculture production grew 118% between 1990 and 1994, with freshwater aquaculture production growing 91% and brackish water aquaculture production increasing by 124%.

The dipterocarp forests are of vital economic and ecological importance to the country. Mangrove forests are managed for the sustained yield of forest produce in the form of poles and firewood and for the manufacture of charcoal. They also have an important ecological role in coastal protection and the conservation of coastal ecosystems for fisheries.

Threats to aquatic biodiversity

The main causes of biodiversity loss in Malaysia are habitat destruction, over-harvesting and pollution.²¹⁷ Environmental concerns are air pollution from industrial and vehicular emissions, water pollution from raw sewage, and deforestation.²³⁴

Marine pollution and environmental degradation threatens fishery resources. The Straits of Malacca, which supports half of Malaysia's fishing population and yields half of its catch (including the bulk of its prawns) is subjected to very heavy traffic of sea-going vessels, including oil tankers. Accidents have damaged the environment and inshore fisheries. There is also concern over potential effects of offshore oil exploration and production. Though there is no immediate conflict with fishing activity, the possible effects of oil pollution are taken carefully into account in implementing oil exploration and production offshore.

With an annual rainfall averaging 2500 mm coupled with favourable topography, Malaysia also has considerable hydropower potential, the bulk of which is in Sarawak (69%), with 17% in Sabah and the remaining 14% in Peninsular Malaysia. In 1990, about 15% of the electricity supply was from hydropower.

The Malaysian government was reported in 1998 to be continuing work on some components of the controversial Bakun hydroelectric dam project, including a river diversion tunnel and relocation of villagers, despite deferment of the project. The government, which scrapped plans due to financial and feasibility constraints in late 1997, gave no further information on the extent and timing of the project.²⁰²

Common marine and terrestrial biological resources (e.g., in transboundary areas) lack adequate regional and international cooperation in their conservation and management.

Measures taken to manage fisheries for biodiversity

Just over 29% of the natural forest is protected. The current network of protected areas on land includes 2.12 million hectares of National and State Parks, Wildlife Sanctuaries, Turtle Sanctuaries and Wildlife Reserves. Another 3.43 million hectares are protected as water catchment areas. However, wetlands such as mangrove forests, peat swamps and freshwater swamps are inadequately protected.

Conservation efforts of individual species are targeted towards large animals, and to some extent birds. Little emphasis is placed on conserving individual species of plants, insects or fish (marine and freshwater), due mainly to the lack of knowledge.

The establishment of marine parks in Peninsular Malaysia focuses on aquatic considerations. Additional attention must be paid to the adjoining land, as this too, if unduly disturbed, will harm the marine ecosystem.

In 1997 Malaysia agreed to support a consortium of Japanese and other Asian companies' efforts to build a US\$ 2 billion pipeline across the Malaysian peninsula. The project, to be completed by 2002, will be capable of carrying two million barrels of crude oil a day, and will stretch for 190 km between Alor Star in Malaysia and Sai Buri in Thailand. The pipeline's reported aim is to ease heavy maritime traffic and thereby reduce pollution in the Straits of Malacca, the main shipping route of Middle East crude oil to East Asia.²⁰⁴

A campaign was launched in 1993 to improve awareness among the general public and school children on the need to preserve rivers. This was a joint effort by government agencies, NGOs, the private sector and the general public (including school children). The campaign included river adoption, river watch, river expeditions, educational talks, river beautification and an international symposium. Various media campaigns are also held on water conservation. River restoration projects are being undertaken to rehabilitate polluted rivers, including the ten-year programme started in 1992 to clean the Klang River, which runs through the most urbanised part of the country.²¹⁷

It was expected in 1997 that almost the entire population would be equipped with acceptable centralized sewerage systems by the year 2000.²¹⁷

Despite increasing stresses on fishery resources, the government is pursuing efforts to increase fish catches of coastal fisherfolk. According to a Star report of 1997, the Malaysian government planned to spend RM 2.5 million on fish-attracting devices to boost yield for fishers working within five nautical miles of shore. The Malaysian Fisheries Development Board reported that 378 such devices were in use at that time.²⁰¹

UNDP-GEF projects include 'Conservation and Sustainable Use of Tropical Peat Swamp Forest and Associated Wetland Ecosystems'. Malaysia's tropical peat swamp forests (PSFs) are highly significant globally, both for their diverse and threatened species, and as representative unique ecosystems. They are under threat from a variety of activities, including conversion, drainage and unsustainable logging. The project's goal is to ensure the conservation and sustainable use of globally significant biodiversity within Malaysia's PSF areas by demonstrating inter-sectoral planning and by applying these plans, and by strengthening institutions. The global biodiversity values found in Malaysia's tropical PSF ecosystems are exemplified by the three sites selected, each of which represents a distinct PSF ecosystem complex in Malaysia.²²⁵

The goal of the 'Conservation of Biodiversity in Marine Park Islands in Malaysia' project is to work in selected marine park islands to improve protection of marine and coastal protected

area management. The sites will be selected based on existing literature identifying the globally significant marine biodiversity, but will also be selected for how well they can be used to illustrate how different types of threats may be overcome.²²⁵

Research efforts or goals

The Fisheries Research Institute covers three major areas: aquaculture (oyster, prawn, crab, shrimp, etc.), resources (tuna fisheries, shrimp, demersal fish, lobster), and aquatic ecology (artificial reefs, mangrove ecosystems, leatherback turtles, aquatic pollution). The Planning and Research Division undertakes research in the management and conservation of fish stocks and the regulation of commercial fishing activities. Ecological activities include the development of artificial reefs to support fish and other marine life, and the study of mangrove ecosystems and their contribution to highly productive coastal fisheries. The Institute also provides technical support for the aquaculture industry.

The emphasis at the Universiti Malaysia Sabah is on marine biodiversity as well as on arthropods, amphibians and lower plants on land. Among others, the Universiti Putra Malaysia has interests in Agriculture, Fisheries and Marine Sciences, Forestry and Animal Science.

Water resources assessment and monitoring programmes are generally in place. Surface and groundwater resources have been fully identified and quantified and various programmes (at the national and state levels) are in place for their protection. Water quality criteria for all water bodies have been developed, but not as yet promulgated into law.²¹⁷

However, a more comprehensive and detailed monitoring system for catchment areas is needed.

A network of stations exists for monitoring rainfall and stream flow. This system is being automated progressively.²¹⁷

Priorities for national action

The only activity of those described in Agenda 21 (considered by the appropriate coordinating mechanism for integrated management and sustainable development of coastal and marine areas and their resources) deemed to rank three stars in priority that was also at a three-star level of implementation was 'Prior environmental impact assessment, systematic observation and follow-up of major projects, including systematic incorporation of results in decision-making.'²¹⁷

Other activities deemed to rank three stars in priority that were at a two-star level of implementation were:

- preparing and implementing land and water use and siting policies;

- implementing integrated coastal and marine management and sustainable development plans and programmes at appropriate levels; and
- preparing coastal profiles identifying critical areas including eroded zones, physical processes, development patterns, user conflicts and specific priorities for management.²¹⁷

Activities ranking two stars in priority that were at a two-star level of implementation were:

- contingency plans for human induced and natural disasters;
- improving coastal human settlements, especially in housing, drinking water and treatment and disposal of sewage, solid wastes and industrial effluents;
- periodically assessing the impacts of external factors and phenomena to ensure that the objectives of integrated management and sustainable development of coastal areas and marine environment are met;
- conserving and restoring critical habitats;
- integrating sectoral programmes on sustainable development for settlements, agriculture, tourism, fishing, ports and industries affecting the coastal areas;
- Infrastructure adaptation and alternative employment;
- Developing and training human resources;
- Public education, awareness and information programmes;
- promoting environmentally sound technology and sustainable practices; and
- developing and simultaneously implementing environmental quality criteria.²¹⁷

Of those activities described in Agenda 21 that were considered by the appropriate coordinating mechanism for marine technology, there were only two activities ranked at three stars of importance, and each of these was at a two-star level of implementation:

- applying preventive, precautionary and anticipatory approaches to avoid degradation of the marine environment, as well as to reduce the risk of long-term or irreversible adverse effects upon it; and
- improving the living standards of coastal populations, particularly in developing countries, to help reduce coastal and marine degradation.²¹⁷

The only activity in this marine technology sector ranking two stars of importance and graded at two stars of implementation was ensuring prior assessment of activities that may have significant adverse impacts upon the marine environment.

Activities ranked two stars of importance and graded at one star of implementation were

- integrating protection of the marine environment into relevant general environmental, social and economic development policies;
- developing economic incentives, where appropriate, to apply clean technologies and other means consistent with the internalization of environmental costs, such as the polluter pays principle; and
- effective monitoring and surveillance within the EEZ of fish harvesting and transportation of toxic and other hazardous materials.²¹⁷

On sewage-related issues, there was only one activity ranked at three stars of importance, and this was at a two-star level of implementation: whether the Government promotes primary treatment of municipal sewage discharged to rivers, estuaries and the sea, or other solutions appropriate to specific sites. The remainder of the activities were ranked at two stars of importance and two stars for implementation:

- considering sewage-related problems when formulating or reviewing coastal development plans, including human development plans;
- building sewage treatment facilities in accordance with national policies;
- locating coastal outfalls to maintain acceptable level of environmental quality and to avoid exposing shell fisheries, water intakes and bathing areas to pathogens; and
- supporting the establishment and improvement of local, national, sub-regional and regional regulatory and monitoring programmes to control effluent discharge, and whether minimum sewage effluent guidelines and water quality criteria are in use.²¹⁷

On other sources of marine pollution, no activities were deemed to merit three stars of importance. All were ranked at two stars.

Of these, those graded at two stars of implementation were whether the government has:

- established or improved upon regulatory and monitoring programmes to control emissions, including recycling technologies;
- promoted risk and environmental impact assessments to help ensure an acceptable level of environmental quality;

- promoted assessment and cooperation at the regional level, where appropriate, with respect to the input of point source pollutants from the marine environment; promoted controls over anthropogenic inputs of nitrogen and phosphorous that enter coastal waters where such problems as eutrophication threaten the marine environment or its resources;
- taken steps to develop and implement environmentally sound land-use techniques and practices to reduce run-off to water courses and estuaries which would cause pollution or degradation of the marine environment;
- promoted the use of environmentally less harmful pesticides and fertilizers and alternative methods for pest control, and considered the prohibition of those found to be environmentally unsound; and
- taken steps to control and prevent coastal erosion and siltation from land-use and construction techniques and practices.²¹⁷

Activities in this sector ranked at two stars of importance and only one star of implementation were:

- whether the government has taken steps to eliminate emissions or discharges of organohalogen compounds from the marine environment;
- taken steps to eliminate/reduce emissions or discharges or other synthetic organic compounds from the marine environment; or
- adopted new national, subregional and regional initiatives for controlling the input of non-point source pollutants that require broad changes in sewage and waste management, agricultural practices, mining, construction and transportation.²¹⁷

Regarding the addressing of critical uncertainties for the management of the marine environment and climate change, no activities ranked three stars of importance. Activities ranking two stars of importance and two stars of implementation were:

- coordinating national and regional observation programmes for coastal and near-shore phenomena related to climate change and for research parameters essential for marine and coastal management in all regions;
- providing improved forecasts of marine conditions for the safety of inhabitants of coastal areas and for the efficiency of marine operations; and
- identifying ongoing and planned programmes of systematic observation of the marine environment, with a view to integrating activities and establishing priorities to address critical uncertainties for oceans and all seas.²¹⁷

Activities ranking two stars of importance and only one star of implementation were:

- adopting special measures to cope with and adapt to potential climate change and sea-level rise;
- participating in coastal vulnerability assessment, modeling and response strategies particularly for priority areas, such as small islands and low-lying and critical coastal areas;
- research to determine the marine biological effects of increased levels of ultraviolet rays due to the depletion of the stratospheric ozone layer; and
- analyzing, assessing and systematically observing the role of oceans as a carbon sink.²¹⁷

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

National policies in Malaysia, including those on biological diversity, are sectoral in nature. Recognising this, the Malaysian delegation to the pre-Earth Summit negotiating meetings of the CBD recommended to Government that a national policy on biological diversity be developed. In addition to addressing biological diversity issues across sectors, it was also felt that national strategies, plans or programmes for the conservation and sustainable use of biological diversity could be housed under the umbrella of a national policy.

The limited scope of various enactments on biological diversity conservation has led to no integrative cross-sectoral approach. Consideration of the overall objectives of biological diversity conservation is also lacking. The result is a dearth of comprehensive coverage of biological diversity issues.

The *Fisheries Department* under the MOA (Ministry of Agriculture) is responsible for the overall management and protection of fisheries and related matters. Its primary objectives are to increase fish production to meet domestic needs; to increase export of fishery products; to sustain the level of production from inshore fishery resources; to expand deep-sea fishing; to accelerate the growth of aquaculture; and to increase the value of fishery products. The Department also develops, administers and manages the waters of the 38 gazetted marine parks in Malaysia.

Resources for meeting obligations and recommendations

The budget allocation for environmental conservation in 1998 was half of what it had been in 1997. It was feared that the cut in funding would stall growing efforts to strengthen enforcement, monitoring, and education of the general public about the environment.²⁰⁰

While financial resources are generally adequate for the development of the water supply network, large dams for power generation and flood control require foreign help. The federal

government finances most water development projects. Four current projects benefit from foreign aid, although the federal government is reducing its reliance on such aid.²¹⁷

Capacity-building measures for developing and implementing plans

Environment-related agencies under ministries, government research institutions, universities, NGOs and networks, committees and councils are involved in conservation and sustainable use of biological diversity. A comprehensive account is given in the document entitled Assessment of Biological Diversity in Malaysia appended to the National Report.

Privatizing water management is considered an important means of capacity-building, taking advantage of the flexibility and expertise of the private sector and relieving government of training and manpower constraints.²¹⁷

Training agencies are being encouraged to increase conduct training within Malaysia (as opposed to overseas training courses). The DID cooperates with the International Irrigation Management Institute in Sri Lanka in irrigation management training. The Public Works Department has regional training centres and also sends staff for overseas training (e.g., in water treatment, dam safety design and treatment plant design). NGOs participate in capacity-building activities such as seminars, training courses and international conferences. Information technology is emphasized with respect to technology transfer and capacity-building.²¹⁷

Key activities being undertaken at the national level include strengthening government ministries and departments and research institutes through increased staffing and training.²¹⁷

Manpower and training are the areas in which international cooperation and financial help are most needed.²¹⁷

Current state and priorities for expanding the ecological network

NGOs active in conservation and sustainable use of biological diversity include the Malaysian Nature Society (MNS), the Institute of Strategic and International Studies (ISIS), the World Wildlife Fund (WWF) Malaysia, Wetlands International-Asia Pacific, Friends of the Earth-Sahabat Alam Malaysia (SAM) and Environmental Protection Society of Malaysia (EPSM). While some of these work to influence policy and legislative decisions, others have full-time staff and work on projects, including awareness programmes.

Networks, Committees and Councils include those made up of NGOs only, for example, the Malaysian Environment and Conservation Network and the Third World Network, or may be a combination of both government agencies as well as NGOs. Examples are the National Advisory Council for Marine Parks and Marine Resources and the National Steering Committee on the RAMSAR Convention.

Legislation or legislative framework for aquatic biodiversity

The Fishery Resources Management and Development Division administers and enforces the Fisheries Act 1985 and EEZ Act 1984 for the proper management and conservation of inshore and deep-sea resources.

The conservation of rivers and seas resources is spelled out clearly in the Fisheries Act. The state authority or Minister regulates the conservation, enhancement, management and supervision of turtles and freshwater fish, while sea gardens or sea reserves can be created in Malaysian fishing waters through the Government Gazette. Meanwhile, the Continental Shelf Act 1972 and the Exclusive Economic Zone Act 1984 prohibit any person from damaging or exploiting natural resources in areas covered by the legislation.

From the viewpoint of effective conservation and management of biological diversity the current legislative framework creates some restrictions, causing deficiencies.

No single comprehensive legislation in Malaysia takes in biological diversity conservation and management as a whole. Much of the legislation is sector-based; the Fisheries Act 1985 deals mainly with the conservation and management of fisheries resources, the Protection of Wild Life Act 1972 deals with the protection of wildlife, and the National Forestry Act 1984 deals with the management and use of forests alone. Some were legislated without specific consideration given to the issue of biological diversity. The legislation is also inadequate in that species endangered by habitat destruction are not protected by a national law for endangered species.

A provision under the Constitution states that if any state law is inconsistent with a federal law, the federal law shall prevail. A further provision enables the parliament, under special circumstances, to make laws in respect to matters in the state list. This is seldom practised.

To the extent that some laws are federal legislation and some are state enactments, not all legislation enacted will apply to the whole of Peninsular Malaysia, Sabah and Sarawak. Since this is the constitutional position, the question of how uniformity of laws may be promoted, particularly in respect of matters which may fall under State jurisdiction alone, needs to be properly addressed.

Cooperative mechanisms among authorities, NGOs etc. to ensure integration

States are responsible for land use and water resources. Managing water resources is becoming increasingly complicated due to inter-State commitments to the production, transfer and sale of water. The federal government plays an advisory role, which may be enhanced by a National Water Council, whose formation is being refined.

Local communities participate in the conservation of biological and genetic resources by highlighting for the government any illegal and unsustainable development carried out at sites known to contain valuable biological resources.²¹⁷

Examples of transboundary cooperation

The UN Convention on the Law of the Sea was signed in 1982 and ratified in 1996.²¹⁷

Malaysia ratified in 1994 the RAMSAR Convention, which came into force in 1995. Other biodiversity-related international conventions or agreements ratified by Malaysia include the Basel Convention on Transboundary Shipment of Hazardous Wastes, CITES, the Convention on the Continental Shelf, and the Framework Convention on Climate Change.

Significant aquatic biodiversity (freshwater and marine)

Although the Maritime area of the country's EEZ amounts to more than 1 000 000 km², the dry land area, estimated on the basis of inadequate admiralty surveys, does not exceed 0.001% of the total area of the country. This makes the country one of the most watery nations on the face of the planet. Fisheries are seasonal, dictated mainly by the monsoons.⁷⁴

Maldives is rich in marine biodiversity: 250 species of hermatypic corals in 41 genera from the north and 55 from the south, over 1 200 reef fish, 5 000 different species of shells, 100-200 species of sponges, over 1 000 species of marine crustaceans, and over 100 species of echinoderms may be found along the Maldivian reefs. Some 21 species of Cyanophyceae (blue-green), 163 Rhodophyceae (red), 83 (green) and 18 phaeophyceae (brown) marine algae are currently recorded. There are also 5 species of turtles, all endangered.

The reef fish catch has increased considerably in response to the demand of overseas markets and tourists visiting the Maldives. Substantial fisheries have developed for tropical aquarium fish, grouper, bêche-de-mer and giant clam.⁷⁴

There is no aquaculture and no inland fisheries in Maldives. Fishing takes place in off-shore, coastal and reef waters. However, efforts are underway to experiment with the culture of seaweed, pearl, giant clam, spiny lobster, bêche-de-mer and groupers. The potential for using mangrove areas for crab culture is also being investigated.⁷⁴

Present and planned uses of aquatic biodiversity

Major economic activities such as tourism and fishing are both based on the coastal and marine environment

Fishing has always been central to Maldivian society as the main source of food and export. Fish provides the principal source of animal protein for the population, and almost half of the catch is consumed locally.⁷⁴

Fish catches have gone up dramatically in recent years, exceeding 103 000 t in 1996. There are more mechanised and motorised boats, fish aggregating devices, and improved infrastructure. A considerable growth in demand nationally and for export, mainly for canned tuna and exotic reef fish varieties, have encouraged fishermen to increase fishing effort. Fisheries' share in the national GDP is around 15%, having averaged 3.4% annual growth in GDP from 1986 to 1996. The catch was largely of skipjack tuna and other tuna varieties (85%) while the remainder was mainly reef fish. Most of the catch is exported fresh, canned, salted, dried and frozen. In 1995, fisheries products accounted for almost 74% of the value of Maldivian exports.⁷⁴

Considerable potential may exist for tuna species other than skipjack, such as yellowfin, especially in deeper waters. Reef fish and demersal species also can sustain considerable increases in exploitation. However, exploitation is constrained by the local demand for such species and by lack of local infrastructure for storing and transporting fish.⁷⁴

Traditionally, demand existed mainly for skipjack, an essential ingredient in the Maldivian diet. With the development of tourism and more access to Southeast Asian markets, species other than tuna are increasingly in demand.⁷⁴

Around 100 species of small reef fishes are collected for the aquarium trade. Some marine invertebrates such as the larger anemones, *Radianthus* and *Stoichactis* together with their symbiotic clown fish, and smaller starfish such as *Linckia* and *Fromia*, are also exported. In recent years, certain corals, sponges and other reef constituents have been identified as having medicinal values.

Threats to aquatic biodiversity

The current population growth rate of 2.75% per annum would double the population of the Maldives, to more than 400 000 people before 2010. Such rapid growth has brought the environmental problems of the island to a crisis. At present 25.7% of the total population live in Male', in less than two square kilometres. The population density for Male' is among the highest in Asia.

Due to the small size, isolation and vulnerability of the Maldives' ecosystem, the biological diversity is amongst the most threatened globally.

Measures taken to manage fisheries for biodiversity

Management measures, including a complete ban on giant clam exports, have been introduced to avoid overexploitation. It appears that demand for high-value fish will continue to increase, requiring additional management efforts to avoid excessive harvesting.⁷⁴

Fourteen Marine Protected Areas (MPAs) have recently been designated in the central atolls of Maldives, covering approximately 12.55 km². These areas are protected mainly due to their outstanding diversity of corals, reef fish, sharks, rays, eels and other organisms, ranging from sponges to mollusks and bivalves. All anthropogenic activities such as coral and sand mining, fishing, collecting, netting, and anchoring are also banned from these areas. Baitfish fishing is allowed, as it is important for the local tuna fishery. Baitfish can only be collected in these areas by methods that do not damage any living organism.

Under the Fisheries Law, many species have been protected from exploitation, trade or export. These include Baitfish, Bigeye Scad, Parrot fish, Puffer fish, Dolphins, Whales, Rays, Eels and Sea Turtles.

Maldivians have traditionally mined live coral as a major source for construction of houses, buildings and other structures. Growth in the tourism industry has led to an increased coral

mining of around 20%. However, the government is currently taking appropriate measures to minimise coral mining activities by reducing tariffs on imported building material as well as developing building aggregates.

Research efforts or goals

The Ministry of Fisheries and Agriculture is responsible for exploratory tuna fishing, investigating reef fish, cataloguing fishing gear, establishing a tuna database and analysing statistics and socio-economic surveys. With the aid of bilateral and multilateral donors, research focuses on assessing tuna stocks, reef fish and other marine resources and on managing these resources sustainably.⁷⁴

The Marine Research Section (MRS) of the MFA undertakes mainly research work relating to marine natural resources, sustainable use and management and protection of vulnerable and threatened marine species. MRS have worked on the coral reef resources and gained much experience in the field. The MFA works in close collaboration with MPHRE particularly in issues relating to the natural resources and protection of the environment.

Priorities for national action

The major activities identified by the Second NEAP (National Environment Action Plan) that need implementing are stocktaking and assessment based on existing information. The major thematic areas for assessment and stocktaking are:

- biodiversity and biological resources cross-sectoral issues,
- policy and regulatory frameworks,
- institutional and human capacity,
- causes of biodiversity loss,
- technologies for conservation and sustainable use,
- activities resulting in adverse impacts,
- existing measures and programmes,
- preliminary statement of objectives for biodiversity conservation,
- identification of gaps, and
- assessment of existing needs

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

In the First National Environment Action Plan (NEAP) in 1989 the government committed to sustainable use and is seeking appropriate mechanisms. During the first NEAP, although the Biodiversity Convention was not formalised some activities (such as coral reef monitoring) were undertaken. In 1997 (the CBD having been ratified in 1992) the National Environment Action Plan was reviewed. Sustainable resource use, environmental management and biodiversity protection and conservation strategies and action measures were elaborated, and provisions of the CBD were incorporated.

The two major government bodies dealing with biodiversity are the Ministry of Planning, Human Resources and Environment (responsible for implementing the Environmental Act and CBD as well as managing and coordinating all environment-related activities) and the Ministry of Fisheries and Agriculture, responsible for implementing the Fisheries Law.

Ministry of Fisheries and Agriculture (MFA) is also responsible for regulations and for developing sectoral policies for fisheries development.

Resources for meeting obligations and recommendations

As there is a general lack of human resources and technical manpower dealing with biodiversity issues, much work remains to be done.

National activities for future biodiversity protection and conservation are planned in the Second National Environment Action Plan and in other projects such as GEF, AUSAID, and BMZ project. Activities include Development of National Biodiversity Strategy, Action Plan, First Report to the COP, Establishment of Protected Areas, Conservation of Coral Reefs and Strengthening of Biodiversity Awareness. As there is lack of local financial resources for implementation of CBD, finance from donor agencies is required.

Capacity-building measures for developing and implementing plans

The ‘Conservation and Sustainable Management of Coral Reefs-Maldives Protected Areas’ GEF-funded project aims to develop a full project document for the Conservation and Sustainable Use of Coral Reefs in Maldives. The goal is to build the required capacity in the concerned Government agency for monitoring and regulating the sustainable use of coral reefs.²²⁵

State and priorities for expanding the ecological network

No information found.

Legislation or legislative framework for aquatic biodiversity

After ratifying the CBD in November 1992 Maldives formulated its Environmental Protection and Preservation Act in 1993. The Act covers the main areas for environmental protection, guidelines, sustainable resource use, pollution control and EIAs.

The official conservation efforts in the country began in the 1970s after the approval of Fisheries Law by the Citizen's Majilis. As the fishery industry grew to become one of the most important economic activities in the country, the Fisheries Law was reformulated in the mid 80s to emphasise conservation of living marine resources, and to give the Ministry of Fisheries the right to prohibit fishing or to establish special sanctuaries. Under this law, the Ministry of Fisheries and Agriculture has developed regulations and enforcements to protect marine resources such as turtles, whales, dolphins and certain fish.

Cooperative mechanisms among authorities, NGOs etc. to ensure integration

No information found.

Vulnerable transboundary aquatic systems

No information found.

Examples of transboundary cooperation

The bulk of foreign support is directed towards the post-harvest sector. The Kuwait Fund has contributed to setting up tuna processing facilities, and the Asian Development Bank to improve cold storage facilities. Help has also been provided by Organization of Petroleum Exporting Countries (OPEC), World Bank and International Fund for Agricultural Development (IFAD).⁷⁴

The FAO Bay of Bengal Programme is assisting the Government in exploratory fishing for tuna and reef fish, and is supporting the setting up a fisheries management system. The United Kingdom is supporting investigation of tuna stocks, research into deep-water coral mining, the rehabilitation of coral reefs and new possibilities in fish marketing.⁷⁴

Canada is assisting in the development of marine surveillance facilities and in coral reef research.⁷⁴

Priority given to transboundary cooperation affecting aquatic biodiversity

No information found.

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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 %. ¹⁰
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

¹⁰ See 'Trade Environment Database Case studies, Shrimp and Sea Turtle' at <http://www.american.edu/projects/mandala/TED/SHRIMP.HTM>