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SECOND GLOBAL BIODIVERSITY OUTLOOK: DRAFT

Note by the Executive Secretary

The Conference of the Parties, in paragraph 6 (a) of decision VII/30, requested SBSTTA, *inter alia*, to review a draft of the second Global Biodiversity Outlook and report on the results to the Conference of the Parties at its eight meeting. In paragraph 8 (a) of the same decision, the Conference of the Parties requested the Executive Secretary, with the assistance of the World Conservation Monitoring Centre of the United Nations Environment Programme (UNEP-WCMC) and other relevant international organizations, to prepare the second Global Biodiversity Outlook for publication prior to the eighth meeting of the Conference of the Parties following peer-review and review by SBSTTA at its tenth or eleventh meeting.

Annexed to the present note is the draft of the second Global Biodiversity Outlook, prepared by the Executive Secretary, with the assistance of UNEP-WCMC and other relevant international organizations in response to these requests, and taking into account the guidance provided through SBSTTA recommendation X/6. The executive summary of this document is contained in document UNEP/CBD/SBSTTA/11/6. At the same time as the executive summary and the complete document are being made available to SBSTTA, they are also being subjected to expert and government review.

In accordance with decision VII/30, the Subsidiary Body may wish to review the draft Global Biodiversity Outlook and provide any guidance on its finalization, with a view to its publication prior to the eighth meeting of the Conference of the Parties.

* UNEP/CBD/SBSTTA/11/1.

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SECTION I - BIODIVERSITY IN THE BROADER POLICY CONTEXT

Main Messages

- The Convention on Biological Diversity is one of the most all-encompassing international agreements ever adopted, seeking both to conserve the diversity of life on Earth, and to ensure that this diversity continues to maintain the planet's natural life support systems for the benefit of people and nature alike.
- Parties to the CBD have unequivocally committed themselves to achieve by 2010 a significant reduction in the rate of biodiversity loss at the global, regional and national levels, as a contribution to poverty alleviation and to the benefit of all life on Earth.
- The benefits that people derive from biodiversity and functioning ecosystems are both diverse and valuable, and this is increasingly evident as biodiversity and ecosystems are further studied.
- People are having a major and growing impact on biodiversity.

I.1. Introduction

Two key landmarks in the conservation and use of biodiversity were the adoption of the Convention on Biological Diversity in 1992, and the adoption ten years later, in 2002, of a Strategic Plan for the Convention, which set an ambitious target of achieving a significant reduction in the rate of biodiversity loss by the year 2010. The second Global Biodiversity Outlook – GBO2 - seeks to assess progress towards this ambitious target, using indicators selected by the Convention, and to consider the promising options available for achieving such a target, by 2010 or beyond. This, the first section of GBO2, introduces the Convention on Biological Diversity and its Strategic Plan, in the context of current trends in biodiversity, and the benefits that people the world over derive from the diversity of life on Earth.

I.2. The Convention on Biological Diversity

The final text of the Convention on Biological Diversity (CBD) was inevitably a compromise, resulting from negotiation amongst stakeholder groups with divergent priorities ranging from strict nature conservation to the sharing of benefits from the use of genetic resources. However, the final result was a landmark in conservation and sustainable development, as the negotiation resulted in the promotion of a cross-sectoral and more holistic approach to the conservation and sustainable use of biodiversity.

Today the CBD is still one of the most all-encompassing international agreements ever adopted, seeking both to conserve the diversity of life on Earth and to ensure that this diversity continues to maintain the planet's natural life support systems. The agreement acknowledges that identifying social and economic goals for use of biological resources and the benefits derived from them is central to ensuring sustainable development, and in turn supports conservation goals. Fundamentally, the Convention stresses that while the conservation of biodiversity is a common concern of humankind, nations have sovereign rights over their own biological resources, and should address this concern in the national context of sustainable economic and social development and poverty eradication.

The CBD establishes three main objectives: the conservation of biological diversity; the sustainable use of its components; and the fair and equitable sharing of the benefits arising from their use. The Convention does not list species or places of particular conservation concern. Instead the themes, principles and activities of the CBD encourage countries party to the Convention to, for example, find ways to deal with biodiversity concerns during development planning, to promote transboundary cooperation, and to involve indigenous peoples and local communities in ecosystem management.

The CBD recognises that the causes of biodiversity loss are diffuse and complex in nature, and mostly arise as a secondary consequence of activities in a range of economic sectors. Dealing with economic and institutional factors is therefore key to achieving the Convention's objectives. As a result, management objectives for biodiversity must incorporate the needs and concerns of all stakeholders, and a traditional regulatory approach is therefore not appropriate. The provisions of the CBD are expressed as overall goals, and work programmes and guidelines for policy integration and development. Specific action for implementation is to be developed by each Contracting Party, in accordance with its own circumstances and capabilities.

There are two main kinds of obligation under the Convention. The first concerns national-level implementation of various articles and the subsequent decisions of the Conferences of the Parties which interpret them, beginning with the development of national strategies, plans or programmes for the conservation and sustainable use of biodiversity, or the adaptation of existing plans or programmes for this purpose. This may require a new planning process, or a review of existing environmental management or other national plans, and there is an expectation that there will be wide stakeholder involvement. The second set of obligations concerns relations between Parties, primarily in terms of provision by developed countries of new and additional resources (financial, capacity-building, technology transfer, etc.) to developing countries to enable them to fulfil their obligations.

I.3. The CBD Strategic Plan

In 2002, ten years after the Convention was opened for signature during the Earth Summit in Rio de Janeiro, Parties adopted a Strategic Plan to guide further implementation of the Convention at national, regional and global levels. The primary purpose was to effectively halt the loss of biodiversity so as to secure the continuity of its beneficial uses. During the first ten years of the CBD's life much time was spent in formulating policies and establishing work programmes. Now, the Strategic Plan is established as the foundation of a new emphasis on implementation, with the establishment of a clear mission coupled with a range of strategic goals and objectives addressing key tasks that need to be undertaken.

In the mission statement, Parties unequivocally commit themselves to achieve by 2010 a significant reduction in the rate of biodiversity loss at the global, regional and national levels, as a contribution to poverty alleviation and to the benefit of all life on Earth. It was significant that this mission was adopted in the same year as the World Summit on Sustainable Development (WSSD) took place in Johannesburg, South Africa. During that meeting world leaders implicitly endorsed the 2010 target in their Plan of Implementation, also identifying the Convention as the focal instrument for coordinating the response to biodiversity loss.

The CBD Strategic Plan is focussed on four goals, ensuring that:

- the Convention is fulfilling its leadership role in international biodiversity issues;
- Parties have improved financial, human, scientific, technical and technological capacity to implement the Convention;
- national biodiversity strategies and action plans and the integration of biodiversity concerns into relevant sectors serve as an effective framework for the implementation of the objectives of the convention; and
- there is better understanding of the importance of biodiversity and of the Convention, and this has led to broader engagement across society in implementation.

The Strategic Plan is based on four key tenets that underlie not only the Convention but also the WSSD Plan of Implementation and much of the work of the Convention over the past decade – including response to the Millennium Development Goals:

- biodiversity is the living foundation for sustainable development;

- the rate of loss of biodiversity is still accelerating;
- the threats to biodiversity must be addressed; and
- the Convention is an essential instrument for addressing these threats and achieving sustainable development.

I.4. Importance of biodiversity

For all our special features of mind, spirit and society, humans are organic beings who evolved within and remain an integral part of the natural world. Our existence is dependent upon the many ecosystems in the biosphere, which comprise vast numbers and many kinds of organisms. These living organisms enable the functioning of ecosystems, and make the planet habitable, generate the food that we need, cycle minerals and nutrients, and moderate climate. Such ecosystems operate at a range of scales from that of the small-holding to that of the continent or ocean, but all contain the same basic elements of energy and material cycles, organic growth and decomposition, and living organisms. The biodiversity of an ecosystem at any scale is the total variety of living things that it contains, considered at the genetic, individual, population, species and whole-ecosystem level.

Many of our direct needs are provided by highly modified systems (such as cultivated lands), although these are still very much alive, and also dependent on other life forms too, as integral parts of the biosphere. Natural and semi-natural systems also provide a wide range of goods and services and meet many material and non-material needs, including through the supply of materials and goods such as vegetable foods and food additives, animal prey, medicines, structural wood and fibre; through to the provision of ecosystem services such as the moderation of water supply to limit floods and droughts, pollination, pest control and bioremediation.

While the entire human population is ultimately dependent on a functioning biosphere, those who are most directly reliant on the integrity of ecosystems at a local level are rural people, and particularly the rural poor. Globally, a high proportion of the rural poor are dependent on energy and nutrients from the local ecosystem in which they live, and manage it using only their own power and that of their livestock. By contrast richer and more urban people typically make use of resources drawn from a far wider area – often the whole world – and make far greater use of machines. Urban dwellers are to a large extent removed from and relatively unaffected by events in any particular small-scale ecosystem. These people include both the relatively rich, as well as the increasing numbers of urban poor – slum dwellers who are the fastest growing sector of the global population. While many rural people do not necessarily live in poverty, since healthy ecosystems and appropriate local technologies can meet their needs without the need for cash, the assumption of poverty prevailing among such people is becoming steadily more realistic as more and more local ecosystems are degraded to the point where they can no longer meet the needs of local populations. In many such cases, poverty can become entrenched as there may be few ways for local people to obtain substitutes for the services provided by ecosystems – bottled water, or canned fish, for example.

Biodiversity is a key environmental resource, and the basis of all natural capital. Its use can enhance security by yielding a range of income and other benefit streams that protect people from uncertainty. It is the diversity of life that allows ecosystems to maintain an adaptive response to changing conditions (e.g. global warming) and human needs (e.g. the changing demands of consumption), and provides an ability to buffer and aid recovery from unexpected stresses and shocks (e.g. droughts, floods, fires, habitat degradation). It is only with a diversity of life that ecosystems maintain their capacity to supply the full variety of ecosystem services, from goods such as food, through regulating services such as waste processing and the regulation of natural hazards, cultural services such as recreation, and supporting services such as pollination and nutrient cycling. These attributes of biodiversity and ecosystems allow predictable returns on long-

term investment in biodiversity at all social levels, including the poorest and most vulnerable. The biodiversity resource in any place or ecosystem may include any or all of the following:

- Wild species with particular functional characteristics, such as microbes that detoxify and process waste in wetlands by removing heavy metals from the water; plants in an urban area that reduce air pollution by absorbing and processing pollutants; mammals in a forest, on which malarial mosquitos feed thereby reducing the chance of human infection; or fungi associated with plant roots, that allow plants to tolerate droughts and acquire nutrients.
- Domesticated and traditional varieties of crop plants and livestock, that are adapted to local conditions (e.g. rice in Samar island in the Philippines, or the Kelabit Highlands of Sarawak, Malaysian Borneo) and may have a comparative advantage to others used elsewhere on the grounds of nutrition (e.g. wing-beans), flavour (e.g. durians), texture (e.g. bush mango), or structural versatility (e.g. rattan).
- Wild species that have distinctive local uses, such as medicines, materials for construction, fibres, and foods. Wild relatives of crop plants and livestock can introduce useful attributes to cultivated or domesticated species. For example the perennial maize plants from the Sierra de Manantlán, México, were used to transfer several important disease resistances to regular maize, estimated to add some US$4.4 billion annually to the value of the global maize crop.
- Areas of habitat that provide opportunities for cultural experiences or income generation, such as sacred groves, savannahs containing game species supporting wildlife tourism, coral reefs providing fisheries and tourism opportunities, and areas of forest generating revenue from carbon trading schemes.
- Areas of habitat that regulate the local environment, for example by providing protection from floods, or moderating the local climate.

The benefits that people derive from biodiversity and functioning ecosystems are both diverse and valuable, and this is being increasingly realised as biodiversity and ecosystems are further studied.

I.5. Human impact on biodiversity

People are having a major and growing impact on the biosphere, the long-term consequences of which are feared by many but are in fact not at all well understood. There are currently well over six billion people on the planet, and the human population is expected to reach nine billion by mid-century, probably making humans the most abundant large animal ever to have existed on Earth. Each human has the right to expect adequate food, clean water, safe shelter and energy, all of which have profound ecological implications. Food must be grown on land or in water, water must be clean to drink, shelter must be constructed from materials derived from ecosystems, and energy must be generated somehow. These minimum needs multiplied by growing numbers mean increasing demands on the planet overall, but this effect is massively amplified by wasteful consumption of many resources that are demanded not just to meet basic human needs, but to provide luxuries beyond the equitable share available to some of the global population in a high-technology global economy.

It is estimated that perhaps as much as 40% of global net primary productivity is now diverted to meet human needs; agricultural land now covers approximately a third of the terrestrial surface of the planet; 70% of marine fish stocks are fully exploited or over-exploited; atmospheric carbon dioxide levels are increasing by 10% every 20 years. Nitrogen deposition from fertiliser run-off is rapidly increasing and becoming an important degrader of ecological integrity. These various impacts are manifested in changing extent and quality of ecosystems, changing populations of species, escalating species extinctions, and the likely erosion of the genetic basis of biodiversity. These impacts are further discussed in section II. The true extent of these changes is difficult to

gauge, however, because of the lack of systematic monitoring of different components of biodiversity.

I.6. Responses to human impacts

Local and national responses

Husbanding of natural resources has a long history, rooted in the capacity of people to recognise the harvestable limits of their environments. The Penan people of Borneo, for example, have a term – *molong* – that means 'to conserve some for later', and routinely harvest only part of, say, a clump of hill sago palm, lest this key starch source dies out. In other cultures, traditionally the focus is on protecting or limiting the use of particular areas, and control over access to different resources. Historically much of this was to do with the regulation of resource exploitation, but protection of natural phenomena (landscapes, places, species, etc.) for non-material reasons also began early on in the form of sacred groves, and later in the early establishment of protected areas in different parts of the world.

Major civil society engagement in organised conservation activities can be traced back to the late nineteenth century, for example with the founding in the United Kingdom of the Royal Society for the Protection of Birds in 1889 and in the United States the Sierra Club in 1892. Meanwhile, the first national parks were being established: for example, in 1872 Yellowstone, the first in the Americas, and in 1925 Virunga, the first in Africa. Driven largely by national lobbies acting on national governments, the world's protected area system has expanded from 1 million km^2 in 1948 (when IUCN was founded), to 2 million km^2 in 1961 (when WWF was founded), to 5 million km^2 in 1972 (when UNEP was founded) to 12 million km^2 in 1992 (at the time of the Rio Earth Summit), and to 18 million km^2 in 2002 (at the time of the Johannesburg WSSD) (see also chapter III.2.1).

There is now broad consensus that legally-constituted and government-managed protected areas are central to the conservation of biodiversity at national and global level, although there is increasing willingness to encourage partnerships with civil society (local people, NGOs and private companies) to manage them effectively, to promote complementary forms of protection (such as community-owned and privately-owned reserves) and measures for sustainable use outside the protected area system. Such advances have been matched by significant increments in budgetary investment and social mobilisation by governmental and non-governmental institutions and the general public in almost all countries.

International responses

When the United Nations was established immediately after the Second World War, its principal aim was securing peace, so little attention was paid by its founders to environmental issues, with UN institutions lagging behind civil society in addressing environmental concerns. The founding of IUCN in 1948 was essentially an environmental response to this weakness in the fledgling UN, and IUCN remains institutionally unique in terms of international conservation organisations, since it has both governmental and non-governmental membership. The UN became much more involved from 1972, when the Stockholm Conference led to the founding of UNEP, and with the creation around that time of a series of multilateral environmental agreements (MEAs), including the Convention on Wetlands (Ramsar, 1971), the World Heritage Convention (Paris, 1972), the Convention on International Trade in Endangered Species (Washington, 1973), and the Convention on Migratory Species (Bonn, 1979).

During the 1970s and 80s the pace of environmental damage accelerated dramatically, while humanity's response to it became steadily more sophisticated. The 1980s saw the drawing up of the World Conservation Strategy by IUCN, WWF and UNEP, and the emergence of 'biodiversity' as a concept. The Brundtland Commission established the conceptual link between biodiversity and sustainable development, reflecting a process of thought and international dialogue that led to the

UN Conference on Environment and Development in Rio de Janeiro in 1992. The 'Rio Earth Summit' was the first global attempt to put environment centre-stage in international affairs, motivated by the recognition that maintaining environmental integrity was fundamental to sustainable development. The meeting yielded further MEAs and non-binding statements of intent, including Agenda 21, the UN Framework Convention on Climate Change, and the Convention on Biological Diversity.

More recent signs of the emerging consensus that biodiversity conservation and sustainable development are inextricably linked include the acceptance by the Johannesburg World Summit on Sustainable Development of the target of achieving a significant reduction in the rate of biodiversity loss by 2010. This has been reinforced by an increasing understanding of the role of biodiversity, ecosystems and ecosystem services in the anti-poverty agenda, including achieving the Millennium Development Goals.

I.7. Modern context of CBD activities

Over the last few years, the global community has not only adopted the 2010 biodiversity target, but also a range of goals and targets in the context of the Millennium Development Goals encapsulated in the UN Millennium Declaration, including to ensure environmental sustainability. While these goals and targets are valuable tools in helping to focus attention on international priorities, they also require countries to make choices and value-judgements based on national needs. For example, finding a balance between conservation and sustainable use on the one hand, and moving beyond traditional models of economic development to ensure principles of environmental sustainability are incorporated into development strategies on the other. There are new solutions to be found and potential trade-offs to be made between the need to achieve the Millennium Development Goals, especially on poverty, and the need to reduce biodiversity loss, given that many of the ways that modern societies generate wealth involve impacts on ecosystems and hence on biodiversity.

Answers to this conundrum are being sought in finding new and better ways to distribute wealth in favour of the poor, and of generating wealth using more environmentally-benign technology. However, governments, organisations and institutions operate in a wide and complex international context, often involving competing actors. The World Trade Organisation, the World Intellectual Property Organisation, other agencies, programmes and funds address a wide range of human activities and interests, many of which are contradictory in approach, relatively short-term in focus, and are driven by intense political or ideological agendas that do not encompass considerations of biodiversity.

I.8. Current approaches under the CBD and structure of GBO2

Two years after adopting the Strategic Plan incorporating the 2010 target, Parties considered ways in which the Convention could assess the extent to which the world community was being successful in reducing the rate of biodiversity loss. At the same time Parties gave further consideration to what exactly they needed to do to reduce the rate of loss, identifying further targets and objectives relevant at both the national level and within the Convention's various programmes of work. Parties recognize that a great deal needs to be done if there is any hope of meeting the 2010 target, and have identified seven interlinked focal areas (decision VII/30) where efforts should be concentrated, namely:

- Reducing the rate of loss of the components of biological diversity
- Maintaining ecosystem integrity and the provision of goods and services
- Addressing the major threats to biodiversity
- Promoting sustainable use of biodiversity

- Protecting traditional knowledge, innovations and practices
- Ensuring the fair and equitable sharing of benefits
- Mobilising financial and technical resources

Parties have identified provisional goals and targets for each of these focal areas (see box 1), and in addition, have identified a range of subject areas where indicators might be developed for assessing progress towards the 2010 target (see table 1). The coverage of material in GBO2 relating to each of the selected indicators for these subjects can be seen in table 1. Each of these subjects relates to at least one of the seven focal areas. Some clearly apply most directly to one – for example measures of official development assistance are most relevant to any discussion of the mobilising of financial and technical resources. Others may be applicable in equal measure to two or more focal areas: the marine trophic index is directly relevant to the focal areas concerning the sustainable use of biodiversity, maintaining ecosystem integrity and reducing the rate of loss of the components of biological diversity. Even those subjects that relate most directly to one focal area are more widely relevant: to achieve the 2010 target, it is important that official development assistance is used, for example, both to address the major threats to biodiversity and to help maintain ecosystem integrity. Most of the indicators also have relevance to all the biome-related divisions recognized under the CBD. The exceptions are the water quality index, which is only applicable in aquatic ecosystems, and the marine trophic index. However, the usefulness and practicability of the different indicators may vary from biome to biome, as is discussed in Section II.

INSERT Box I.1. Provisional framework for goals and targets of the CBD

INSERT Table I.1. Coverage of material in GBO2 for each of the 2010 indicators

Structure of GBO2

After this introduction, ***Section II*** then addresses the status and trends in biodiversity, and relates this to the framework developed by Parties in 2004 for evaluating achievements and progress in implementation of the Strategic Plan.

Over the years the Convention and the Parties implementing it have developed and adopted various mechanisms to support the conservation and sustainable use of biological diversity. These mechanisms range from national tools such as national biodiversity strategies and action plans to programmes of work adopted by the Convention. Parties have developed guidelines on a range of cross-cutting issues, and various processes have supported the development of the Clearing-House Mechanism at national and international levels. ***Section III*** addresses many of these tools, and additionally reviews their relationship with a range of other international conventions and programmes, but highlighting the importance of national action.

Section IV further considers the implications of biodiversity loss, and provides an outlook on biodiversity, through 2010 to the longer term. It considers the obstacles to reducing the rate of loss of biodiversity, and the likely role of the CBD into the future in helping to overcome these obstacles.

Boxes and Tables Section 1

Box I.1 - Provisional framework for goals and targets of the CBD

(From decision VII/30)

Focal area 1: Protect the components of biodiversity

Goal 1. Promote the conservation of the biological diversity of ecosystems, habitats and biomes

Target 1.1: At least 10% of each of the world's ecological regions effectively conserved.

Target 1.2: Areas of particular importance to biodiversity protected

Goal 2. Promote the conservation of species diversity

Target 2.1: Restore, maintain, or reduce the decline of populations of species of selected taxonomic groups

Target 2.2: Status of threatened species improved.

Goal 3. Promote the conservation of genetic diversity

Target 3.1: Genetic diversity of crops, livestock, and of harvested species of trees, fish and wildlife and other valuable species conserved, and associated indigenous and local knowledge maintained.

Focal area 2: Promote sustainable use

Goal 4. Promote sustainable use and consumption.

Target 4.1: Biodiversity-based products derived from sources that are sustainably managed, and Production areas managed consistent with the conservation of biodiversity.

Target 4.2 Unsustainable consumption, of biological resources, or that impacts upon biodiversity, reduced

Target 4.3: No species of wild flora or fauna endangered by international trade

Focal area 3: Address threats to biodiversity

Goal 5. Pressures from habitat loss, land use change and degradation, and unsustainable water use, reduced.

Target 5.1: Rate of loss and degradation of natural habitats decreased

Goal 6. Control threats from invasive alien species

Target 6.1: Pathways for major potential alien invasive species controlled.

Target 6. 2: Management plans in place for major alien species that threaten ecosystems, habitats or species.

Goal 7. Address challenges to biodiversity from climate change, and pollution

Target 7.1: Maintain and enhance resilience of the components of biodiversity to adapt to climate change

Target 7.2: Reduce pollution and its impacts on biodiversity

Focal area 4: Maintain goods and services from biodiversity to support human well-being

Goal 8. Maintain capacity of ecosystems to deliver goods and services and support livelihoods

Target 8.1: Capacity of ecosystems to deliver goods and services maintained.

Target 8.2: Biological resources that support sustainable livelihoods, local food security and health care, especially of poor people maintained

Focal area 5: Protect traditional knowledge, innovations and practices

Goal 9 Maintain socio-cultural diversity of indigenous and local communities

Target 9.1 Protect traditional knowledge, innovations and practices

Target 9.2:	Protect the rights of indigenous and local communities over their traditional knowledge, innovations and practices, including their rights to benefit sharing
Focal area 6: Ensure the fair and equitable sharing of benefits arising out of the use of genetic resources	
Goal 10. Ensure the fair and equitable sharing of benefits arising out of the use of genetic resources	
Target 10.1:	All transfers of genetic resources are in line with the Convention on Biological Diversity, the International Treaty on Plant Genetic Resources for Food and Agriculture and other applicable agreements.
Target 10.2:	Benefits arising from the commercial and other utilization of genetic resources shared with the countries providing such resources
Focal area 7: Ensure provision of adequate resources	
Goal 11: Parties have improved financial, human, scientific, technical and technological capacity to implement the Convention	
Target 11.1:	New and additional financial resources are transferred to developing country Parties, to allow for the effective implementation of their commitments under the Convention, in accordance with Article 20.
Target 11.2:	Technology is transferred to developing country Parties, to allow for the effective implementation of their commitments under the Convention, in accordance with its Article 20, paragraph 4.

Table I.1. Coverage of material in GBO2 relating to the 2010 indicators

Focal Area	Headline Indicators Indicator for immediate testing and use *Possible indicator for development*	Coverage in GBO2 Section/sub-sections where material relevant to the indicator can be found.
Status and Trends of the Components of Biological Diversity	Trends in extent of selected biomes, ecosystems, and habitats	**II.2** Also: III.2.1, III.3.3
	Trends in abundance and distribution of selected species	**II.3** Also: III.2.1, III.3.3
	Coverage of protected areas	**III.2.1** Also: III.3.3
	Change in status of threatened species	**II.3.2** Also: III.2.2, III.3.1, III.3.3
	Trends in genetic diversity of domesticated animals, cultivated plants, and fish species of major socioeconomic importance	**II.4** Also: III.2.2, III.3.1, III.3.3
Sustainable Use	Area of forest, agricultural and aquaculture ecosystems under sustainable management	**III.2.2** Also: III.3.3
	Proportion of products derived from sustainable sources	**III.2.2** Also: III.3.3
	Ecological footprint and related concepts	**II.5**
Threats to Biodiversity	Nitrogen deposition	**II.8.4** Also: III.2.3, III.3.3
	Trends in invasive alien species	**II.8.3** Also: III.2.3, III.3.3
Ecosystem Integrity and ecosystem goods and services	Marine Trophic Index	**II.2.5** Also: III.2.3
	Connectivity / fragmentation of ecosystems	**II.2.2, II.2.4** Also: III.2.1, III.3.3
	Trophic integrity of other ecosystems	III.2.4, III.3.3
	Water quality of freshwater ecosystems	**II.2.4** Also III.2.3
	Incidence of human-induced ecosystem failure	**II.2.4, II.2.5** Also: III.2.4, III.3.3
	Health and well-being of communities who depend directly on local ecosystem goods and services	**III.2.6, IV.2** Also: III.2.4, III.3.3
	Biodiversity for food and medicine	**I.4, III.2.4** Also: III.3.3
Status of Traditional Knowledge, innovations and Practices	Status and trends of linguistic diversity and numbers of speakers of indigenous languages	**II.6**
	Other indicator of the status of indigenous and traditional knowledge	**II.6** Also III.2.5
Status of Access and	Indicator of access and benefit-sharing to be developed.	**III.2.6** Also: III.3.3

Focal Area	**Headline Indicators** Indicator for immediate testing and use *Possible indicator for development*	**Coverage in GBO2** Section/sub-sections where material relevant to the indicator can be found.
Benefit Sharing		
Status of Resources Transfers	Official development assistance provided in support of the Convention	**III.2.7** Also: IV.3
	Indicator of technology transfer to be developed	**III.2.7, III.3.2**

1

SECTION II – STATUS AND TRENDS OF BIODIVERSITY

Main Messages

- Biodiversity is being lost at global, regional and national levels in most parts of the world, and across most habitats. Changes in important components of biodiversity have been more rapid in the last 50 years than at any time in human history.
- Biodiversity indicators selected by Parties to the CBD show that most components of biodiversity that can be measured are continuing to decline, and that there are few signs of any reduction in the rate of decline of biodiversity, highlighting the difficulty of achieving the 2010 target:
    - Most habitats in most parts of the world are declining in extent, and most terrestrial and aquatic ecosystems are becoming increasingly fragmented.
    - The number of human-induced ecosystem failures is increasing in terrestrial, inland water, coastal and marine systems.
    - Most species are being reduced in abundance and distribution, and although some species recovery programmes have been very successful, most threatened species are continuing to decline.
    - Many components of biodiversity have been overexploited for the collection of food and medicines, and as a result there has been a slight decline in the trophic level of harvested marine species, and dramatic increases in the number of fish stocks that are being overexploited. Little is known about the trophic integrity of non-fisheries systems.
    - It is likely that the genetic variety of cultivated species is declining.
- The drivers causing biodiversity loss are either steady, show no evidence of declining, or are increasing in intensity in most biomes:
    - Human activity has doubled the rate of creation of reactive nitrogen on the planet's surface.
    - The number and rate of spread of alien species is increasing in all continents and all ecosystem types.
    - Most parts of the world are likely suffering from declines in water quality, although quality in some areas has improved.
    - Although in certain regions the rate of growth of regional and national ecological footprints is declining, the global footprint is growing.
- A large number of minority languages are believed in danger of disappearing, and linguistic diversity and the use and communication of indigenous and traditional knowledge is likely declining.
- Difficulties in quantifying trends in access and benefit sharing, and in technology transfer, have prevented developing indicators on these issues to date.

II.1 Getting a Grip on Biodiversity

Biodiversity is an extremely wide-ranging concept, in its broadest interpretation effectively embracing all life on earth. At this level it is very difficult to quantify and to assess what is happening to it. To make quantification easier, biodiversity can be thought of as operating at different levels. Under the Convention on Biological Diversity three main levels are recognised: ecosystems, species and genes. Any assessment of changes in the state of biodiversity should try to look at each of these three levels. The levels are, of course, inextricably linked: the diversity of species, and heritable variation within species, is determined by genetic diversity, while ecosystems are essentially the product of populations of different species interacting with each other and with the physical environment in a particular location. Nevertheless, each level has its own particular focus and, to some extent at least, can be regarded independently.

The essence of biodiversity is its variability, both in space and in time. No two parts of the world are identical in their biodiversity, nor is biodiversity in any place ever static. Individuals grow, multiply and die. Populations expand and contract and species appear and disappear, sometimes temporarily, sometimes permanently. This variability plays a vital role in determining how the biosphere functions, how natural systems deliver goods and services of value to humans and how such systems respond to human impacts. Many different ways have been devised of trying to describe and measure it systematically. Some of these measures are simple and some very complicated. Different measures are appropriate at different scales and for different purposes. Often confusion arises because attempts are made to apply particular measures in inappropriate contexts. Some measures, for example, are much more useful for comparing different areas than they are for monitoring or assessing changes. A typical case is the number or proportion of endemic or unique species in a given site or region. This is extremely variable and is a very useful measure for assessing the importance of that site or region, and particularly what contribution it makes to global biodiversity when measured at the species level. It is, however, much less useful for monitoring changes in biodiversity over time as it can be expected to change only slowly in most cases. Generally the more complex a measure is, the more difficult it is to track over large areas or to monitor systematically through time. Thus, complicated measures of, for example, habitat structure and integrity, or species-abundance indices may be useful at site level for particular highly specific scientific or management purposes, but are of very limited use for assessing change over large areas. Conversely, measures that are applicable over large areas are almost always, of necessity, simplified ones. These provide a general picture but may lose detail that is of importance at more local scales.

In choosing indicators for assessing progress towards the 2010 target, the Parties to the Convention have adopted a pragmatic approach, emphasising measures that can be applied at a range of scales and for which extensive information is known or believed likely to be available.

The Parties to the Convention have also decided that the ecosystem level should be the primary focus for actions to be taken to meet the Convention's objectives. To this end they have recognised a series of major ecosystem- or biome-related divisions to serve as a way of organising such actions. These are not mutually exclusive categories, but rather a pragmatic way of making the enormous scope of the Convention more manageable.

Each is the subject of major thematic work programmes under the Convention. They are:

- Forests
- Dry and sub-humid lands
- Inland waters
- Marine and coastal systems
- Islands

- Mountains
- Agricultural systems

This section summarises our knowledge of the current state of biodiversity, focusing on these divisions, but also discussing in brief the species and genetic levels of diversity.

II.2 What is Happening to Biodiversity at the Ecosystem Level?

II.2.1 Measuring extent and condition

Assessment of the state of biodiversity at higher levels of organisation, that is in terms of biomes, ecosystems or habitats essentially involves consideration of two factors: the extent of any given system, that is **how much** of it there is, and its **condition**, that is what state it is in. The latter is the reflection of the integrity of an ecosystem and its capacity to deliver various kinds of goods and services. The former is conceptually simpler and theoretically easier to assess than the idea of 'conditions', although still presents formidable problems in monitoring and assessment. Each of the different biome types recognised under the CBD as the focus for a specific work programme (forests, dry and sub-humid lands, inland waters, marine and coastal systems, islands, mountains and agricultural systems) presents different issues and responds to the various drivers of change in somewhat different ways.

II.2.2 Forests

Like much in the natural world, the idea of a forest is easy to grasp in principle but difficult to give a precise definition of in practice. A forest is, most simply, an area of land where trees are the dominant form of cover. However, there is not even any settled definition of a tree, let alone any agreement as to how dense tree cover must be before an area can be considered forest rather than savannah, say, or open woodland. Different definitions of forest will give rise to different estimates of extent of forest cover in any given area. This is a major reason why figures from different sources are often highly divergent. Application of different definitions of what constitutes forest can also change estimates of forest loss: the effects of, for example, heavy selective logging in significantly reducing canopy cover may count as deforestation under some definitions but not under others. Self-evidently, when assessing changes over time, it is vital that definitions of forest and forest types are used consistently.

However they are defined, forests encompass a wide range of ecosystems with a great variety of different characteristics, particularly with regard to the composition and diversity of species that they contain. A single hectare of tropical moist forests may have as many as 300 different tree species growing in it, while thousands of square kilometres of northern boreal forest may be entirely dominated by a mere one or two species. For the purposes of global assessment, five or six forest types are normally recognised, although some classification systems recognise tens or even hundreds of different forest formations. While these detailed systems may be very useful for management of forest resources and conservation planning at local or national level, they are generally too complex to be easily applicable at broader scales.

Under natural conditions, about half of the Earth's land surface would be expected to be covered with forest and woodland. Under human influence this proportion has been reduced to around one quarter. Forest loss continues, notably in the tropics, where it is estimated that some 120,000 square kilometres of forest have disappeared annually over the past two decades. Net global forest loss is somewhat less than this, as temperate forests have overall actually been increasing in extent (by around 30,000 square kilometres per year between 1990 and 2000). Rates of change vary considerably between regions and between forest types with some temperate forests decreasing in extent and, in a very small number of cases, tropical forests increasing.

Insert TABLE II.1 Forest area by region 2000

Insert FIGURE II.1 Regional forest changes

(Note: A Figure on natural forest area in 1990, 200, and 2005 will be inserted once the 2005 FAO Forest Resources Assessment is released)

Insert FIGURE II.2 Countries and forests with high net change

As well as natural reforestation occurring in temperate regions, and in a few areas in the tropics, plantation forests are also growing rapidly in extent. FAO estimate that in 2000 forest plantations covered just under 1.8 million square kilometres, an increase of around 50% over the area estimated in 1995. Some 45,000 square kilometres were being planted annually, virtually all in Asia and South America. Such forests supply a number of useful goods, such as timber and wood-pulp, and can also provide significant ecosystem services such as control of soil erosion and amelioration of local climatic conditions. However, their value to biodiversity in the larger sense is usually limited, particularly if they are single-species plantations of non-native species. Replacement of existing natural forest with plantation almost always entails a significant loss of biodiversity value.

The great advances in remote sensing techniques in recent years mean that it is much easier than before to monitor deforestation. Assessing changes in forest condition or quality over large areas remains much more problematic. Changes in condition are associated with: a) changes in the configuration of forests, particularly the degree of fragmentation, with changes in the physical condition of the forest itself (for example in the age and size distribution of trees, the ratio of live to dead trees and the degree of canopy cover), and b) with changes in species composition, chiefly in terms of the relative abundance of different species, both of trees and other groups of organisms present. These factors can play a very important role in determining the value of any given area of forest in maintaining biodiversity and in its capacity to deliver ecosystem goods and services. Some of these changes, notably fragmentation but also those associated with gross changes in physical condition, for example where a high proportion of standing trees are killed by disease or fire, are amenable to assessment over large areas. Others are not – for example, the loss or reduction in population of animal species through overhunting is widely recognized as a major problem in many tropical forest areas. There are many examples of observed local population declines, but it is difficult to obtain systematic, long-term data over large areas.

Insert FIGURE II.3 Global map of forest fragmentation

II.2.3 Dry and sub-humid lands

Drylands, or arid and semi-arid lands, are areas where productivity is limited by a shortage of water, either seasonally or year-round. Such areas generally do not have continuous forest cover, although only the very driest or coldest can support no trees at all. They are, therefore, conveniently thought of as the complement to forest areas – that is, they are those parts of the world that under natural conditions would not be forested (although polar regions, including tundra, and those at very high altitude with permanent snow and ice cover are generally excluded). Around 40% of the world's land surface (excluding polar regions) is dryland.

As with forests, dryland areas can be classified in many different ways, and divided into an almost infinite number of categories. A very broad, though useful, level of categorisation is into: deserts and semi-deserts; tropical grasslands and savannahs; temperate grasslands; and Mediterranean-type ecosystems. Some of these categories, notably savannahs and Mediterranean-type ecosystems, blur into or overlap with forest categories.

Diversity in these areas is highly variable: the driest desert areas have very low species diversity, although those organisms that can survive there show remarkable adaptations to extreme environments, while Mediterranean-type systems have among the highest plant diversity anywhere, rivalling or exceeding that of tropical moist forests. Some groups of organisms, such as cacti (family Cactaceae) and antelopes and their allies (family Bovidae) reach their highest diversity in dry and sub-humid lands.

Just as different kinds of dryland vary greatly in their characteristics, so do the factors that affect them. Mediterranean and temperate grassland areas have been subject to very large scale habitat conversion, both to various kinds of cropland – rain-fed and irrigated – and for building purposes. Many people regard the Mediterranean climate as perhaps the world's most congenial, so that such areas are often both densely settled and subject to very high visitor numbers, with concomitant intensive development. In drier areas, most agriculture is irrigated and covers, proportionately, a much smaller area. It therefore has a lesser impact on dryland habitats, although does have a large and often catastrophic impact on inland waters within these areas. Overall, croplands are estimated to cover around one-quarter of dryland areas.

Other changes in drylands are more difficult to quantify than outright habitat conversion. The most extensive use of such areas is for the rearing of livestock – dryland rangelands support around half of the world's livestock. Livestock-rearing can have major, though highly variable, impacts on ecosystems, either directly through the effects of grazing animals or indirectly through the imposition of particular management regimes, such as applying fertilizer to increase productivity (typical in temperate areas) and regular burning to encourage new growth (predominant in the tropics). Other factors that may have serious impacts on particular ecosystems include fuelwood collection and charcoal production, unsustainable hunting, invasive species and mining and other forms of mineral extraction.

Deleterious forms of land-use, such as overstocking and imposition of inappropriate fire regimes, can lead to land degradation, which may sometimes be very difficult to reverse. The vegetation in arid areas is usually slow growing and if any existing vegetation cover is destroyed, soils can quickly erode through the action of wind or from flash-flooding.

For the purposes of large scale assessment and monitoring, complete conversion of land to other purposes can theoretically be measured through remote-sensing, although where conversion is piecemeal (as, for example, much tourist development in coastal parts of areas with Mediterranean climates), it can be difficult to quantify.

Land degradation and other changes in ecosystem integrity are much harder to quantify or to assess consistently over large areas, although in some circumstances remote sensing can be used to measure changes in productivity associated with land degradation. In many parts of the world problems of assessment of degradation are compounded by the fact that human impacts of various kinds have been so pervasive for so long that it is difficult to know what the natural condition should be. In some cases, high diversity habitats actually appear to require human intervention to be maintained. This is the case, for example, with traditional management of meadowlands in many temperate parts of Eurasia and with fire management by Australian Aboriginals of some habitats in arid and semi-arid parts of Australia. In other cases, domestic livestock appears to have taken the place of wild ungulates and other grazing animals that have been either completely extirpated or seriously reduced in numbers. Although a true systematic assessment is lacking, it is estimated that between 10% and 20% of the world's dryland areas are moderately or severely degraded.

Insert FIGURE II.4 Areas of rapid land cover change in the past few decades

II.2.4 Inland waters

Inland waters make up a minute proportion (much less than a hundredth of one percent) of the world's water resource. Nevertheless, they encompass a wide range of habitat types and are very

important for biodiversity. Freshwater is a vital resource for human survival and one that is in increasingly short supply, and often of diminished quality, in large parts of the world. Many uses of inland waters place inland water ecosystems under great pressure, with adverse consequences for their biodiversity.

Inland waters encompass ecosystems as varied as the world's great rivers, lakes, groundwater aquifers, wetlands, small streams and ponds, temporary puddles, thermal springs and even the tiny pools of water that collect in leaf axils of some plants, for example bromeliads, and which support their own unique fauna. Chemically they range from almost pure water to highly concentrated solutions of mineral salts, toxic to all but a few specialised organisms.

There is no rigid dividing line between an inland aquatic habitat and a terrestrial or marine habitat. Periodically inundated areas, such as river floodplains, are hybrid or intermediary systems, and there are many areas that consist of shifting mosaics of land and shallow water, or areas of saturated vegetation, such as sphagnum moss bogs, that are strictly neither land nor water. Similarly, estuaries and river deltas are transitional between marine and inland water systems, and groundwaters are entirely encompassed within terrestrial habitats.

The physical configuration of inland water ecosystems can be affected by a range of factors, such as: abstraction of water for other purposes, principally crop irrigation; drainage and land reclamation; diversion of watercourses and canalization; and creation of impoundments. Shallow wetlands, such as marshes and swamps, are particularly prone to drainage and land reclamation, while abstraction of water, canalization and creation of impoundments principally affects river systems and, sometimes, the inland water bodies that they feed (the Aral sea, for example). Deep lakes, of which there are relatively few in the world but that contain a large proportion of available freshwater, are generally less affected by these activities, so that their physical extent tends to vary little. Human actions generally result in a decrease in the extent of inland water ecosystems. However, the creation of impoundments to form reservoirs, either for water storage or to generate hydroelectric power, can lead to significant increases in the extent of inland water bodies, at the expense of terrestrial systems, and at the expense of increased fragmentation of inland waterways (see Figure 5).

Insert FIGURE II.5 Global map of river fragmentation

Monitoring and assessing changes in the extent of inland water systems is not straightforward. Shallow wetlands – the inland water bodies that are most susceptible to human-induced changes in area – are difficult to map accurately as they usually have indistinct boundaries and often vary naturally in area, seasonally or over longer timescales. Rivers, when viewed at broad scales, are essentially linear features for which the concept of area or extent has limited application. It is more meaningful to consider either flows, that is the total volume of water passing a given point at a given time, or the proportion of a river system, measured linearly, that remains essentially physically unaltered. However, flow rates only give one aspect of the physical state of a river system, and other measurements of the physical state of a river system, such as substratum quality and riverbank stability, are difficult to obtain over large areas. Moreover, all river systems vary greatly in physical and ecological characteristics over their length, so that changes in one part of system do not necessarily correspond to changes in another.

Many of the factors that affect the extent of inland water ecosystems also have effects on their ecological integrity. Reductions in extent of shallow water bodies can compromise their ability to support populations of important species, such as migratory waterfowl, while reductions in depth can affect temperature and oxygenation regimes with far-reaching impacts on the resident aquatic biota. Dams have a major impact on flow regimes in rivers and can also catastrophically disrupt the life cycles of species that migrate up and down them.

The difficulty of measuring the extent of most inland water ecosystems, and the absence of historical data, mean that it is impossible to know with certainty how much has been lost, and very hard to measure current rates of change. However, it is speculated that the area of such ecosystems (excluding large lakes) has perhaps halved since the beginning of the twentieth century. In addition, some 60% of the world's large river systems have been fragmented by dams and other large infrastructure.

Other major impacts on inland water systems include pollution, sedimentation, introduced species, harvest of freshwater resources and climate change. The most important kinds of freshwater pollutant are organic nutrients that lead to eutrophication, found mainly in agricultural runoff and in sewage, various kinds of persistent organic pollutants (POPs), such as organochlorine pesticides, heavy metals (e.g. mercury, arsenic), pathogens, and sometimes radioactive contaminants.

One useful general measure of organic pollution and eutrophication is biological oxygen demand (BOD), which measures the concentration of biodegradable organic matter in a sample of water. Although BOD varies seasonally in most water bodies under natural conditions, it is possible to assess average trends in BOD over extensive areas (see Figure 6). However, performing BOD analysis is a time-consuming exercise and systematic testing tends to be limited to waters required for human use, particularly as drinking water, so that data sets are limited.

Insert FIGURE II.6 Mean BOD (mg/l O2) in surface waters by selected region, 1979–90 and 1991–99

Consideration of water quality normally entails consideration of both dissolved pollutants and of particles suspended in the water. The latter are normal features of most aquatic ecosystems in that all moving waters carry at least some suspended material originating in runoff from slopes within their catchment. Under natural conditions there is considerable variation in the amount carried in different places and at different times. Sediment runoff is altered by almost any human activity that affects soils and landcover within the catchment, including removal or extension of forest cover, agriculture, urbanization, road construction and mining.

Quantifying changes in water quality is not straightforward, chiefly because the concept is open to different interpretations and cannot be described in a single metric – there is, for example, no agreed way of equating a given increase in heavy metal concentrations with a given increase in sediment load, or nitrate levels, or BOD. Moreover, the composition of inland waters is highly variable in time and in space, with human changes superimposed on this variation so that it can be difficult to disentangle one from the other.

One approach to assessing water quality is to estimate or measure how far from a natural condition the water body in question has deviated. However, this entails knowledge of or at least persuasive hypotheses about historical (pre-disturbance) conditions which is often lacking. A more practical, though far less precise, approach entails aggregation of qualitative assessments of water quality and changes in that quality over time. Even as simple an assessment as one which judges whether quality has improved, declined or remained the same over a given time period can provide useful guidance on general trends if a large enough sample is assessed (see Figure 7).

Insert FIGURE II.7 Changes in condition of freshwater lakes

Most introduced species are unlikely to have a direct effect on water quality. Nevertheless, they may have a major impact on inland water ecosystems and their constituent species. They may feed on native species, outcompete them, spread disease to them or alter their physical environment. They have been implicated in a number of extinctions of inland water species – the introduction some 30 years ago of Nile Perch (*Lates* spp.) into Lake Victoria, for example, is believed to be the

major factor contributing to the near certain extinction of a significant proportion of the extremely diverse cichlid fish fauna (originally over 300 species) of the lake. Introduced aquatic species may also cause significant economic problems: introduction of north American crayfish into European inland waters in the 19th century, in an attempt to boost harvests, led to the introduction of crayfish plague (a fungus *Aphanomyces astaci*) which has devastated native stocks, with major economic impact on fishers. Invasive plants such as the water hyacinth *Eichhornia crassipes* and the water fern *Azolla pinnata* clog waterways, interfering with river transport, fishing and recreational activities. Trends in the number of inland water fish introductions can be seen in Figure 8.

Insert FIGURE II.8 Inland water fish introductions

The harvest of living resources from inland waters is an important source of revenue for many people and may play a significant role in food security, particularly for poor people in rural areas. The dispersed and informal nature of most inland water fisheries means that it is almost impossible to gather systematic data on its magnitude, or indeed on its impact on the resources harvested. FAO data indicate a global capture fishery of around 8 million tonnes annually but it is widely believed that the true amount harvested may be twice or even three times that. A similar amount, roughly 20 million tonnes per year, is reported produced by various aquaculture systems. Although there are relatively few data on the impacts of inland water fisheries, there is reasonable agreement that most stocks are fully exploited and some over-exploited – among the latter, for example, are many freshwater turtle species in South-east and East Asia, and a number of sturgeon stocks, the management of which has largely collapsed following the break-up of the Soviet Union. In other cases – often in rivers – where harvested stocks appear to be declining, this appears frequently to be as much a result of other human-induced changes as it is of the harvest itself.

II.2.5 Marine and coastal ecosystems

The seas cover just over 70% of the planet's surface. They are somewhat under four kilometres in average depth and have an overall volume of about 1400 million square kilometres. The whole of this volume is theoretically capable of supporting life, so that the marine part of the biosphere is far larger than the terrestrial part. However, as on land, life in the oceans is very unevenly distributed: some parts are astonishingly productive and diverse while other parts are virtually barren.

While our knowledge of the functioning of the marine biosphere has grown a great deal in the past few decades, the marine realm still remains overall far less well known than the terrestrial part of the globe, largely because so much of it remains inaccessible.

There are several fundamental differences between marine ecosystems and terrestrial ones. First, the former are physically much more uniform: the composition of sea-water varies relatively little across the globe and temperature variations within the sea are much smaller than on land, particularly at depth. Second, most marine ecosystems lack the macroscopic physical complexity of terrestrial ones. In particular, open water systems, that is those away from the sea floor or coastline and which comprise the vast majority of the marine biosphere, essentially lack permanent large-scale physical features. With few exceptions these systems are very largely based on microscopic photosynthesising organisms (bacteria and various kinds of algae) and a wide range of larger organisms, mostly animals, that feed on them and each other. Even on the sea-floor or in very shallow waters where physical structure is more important, there are no real equivalents of the forests that form the most diverse terrestrial ecosystems. The nearest approximations are coral reefs and so-called kelp forests. However, the former are generally on a smaller scale and the latter are structurally much simpler than most terrestrial forests and, because they are bathed in a uniform medium, they do not allow for the creation of as many diverse physical niches as forests on land. The nature of marine ecosystems and the physical configuration of the world's oceans also means that there are in general far fewer physical barriers to dispersion for marine organisms than there are for terrestrial ones.

All these factors, and the fact that humans do not live permanently in the sea, mean that human impacts on marine ecosystems are different from those on terrestrial ones, both in terms of which activities are most important and the ways in which they are manifested. This applies particularly to open-water systems. In these it is not meaningful to talk about habitat conversion or destruction. Sea floor habitats in the deep waters that lie beyond the continental shelf are at present also not affected by large-scale physical disruption from human activities. This is because they are effectively inaccessible at present, although powerful economic incentives, for example for exploitation of mineral deposits on the deep-sea floor, could conceivably drive the technological innovation to change this. In addition, oceanic open-water and deep-sea environments are less affected by land-based activities, because of their distance from land and the diluting and buffering effects of the vast volume of sea-water. The picture is very different for coastal and inshore, shallow-water ecosystems. These are much more accessible to humans and are subject to a wide range of direct pressures and influence from land-based activities, exacerbated by the fact that a significant proportion of the world's human population now lives within the coastal zone.

By far the most important and pervasive immediate human impact on marine ecosystems in general is through the exploitation – increasingly the overexploitation – of aquatic living resources. Overfishing is now a chronic problem for accessible fishery stocks throughout the world. Most forms of fishing also have a serious collateral impact on non-target species, chiefly through by-catch but also by disrupting food-chains, while various kinds of inshore fishery such as bottom trawling, explosives, chemicals or *muro-ami* (coral-breaking) techniques can cause serious habitat disruption or destruction.

One way of assessing long-term impacts of fisheries on marine ecosystems is through the marine trophic level index. This essentially measures how far up the food chain, on average, the animals in a catch are. In marine ecosystems, species and individuals that are higher up the food chain (that is top predators that feed largely on other carnivorous species) tend to be larger than those lower down (plankton feeders, and species that feed directly on plankton feeders). They also tend to be more valuable in fisheries and therefore more highly sought-after and more intensively fished. If fisheries are not sustainable in the long term, it may be expected that these high-trophic level populations will be depleted first and that fisheries will turn increasingly to lower trophic level populations, showing an overall decline in the mean trophic level of the catch. Analysis of data for the North Atlantic and for coastal fisheries worldwide demonstrates this phenomenon quite clearly. Global fish catches, however, show an initial decline in mean trophic level in the 1960s but no overall trend since then. This may be because changes in the overall index are dominated by wide fluctuations in small pelagic stocks, such as anchovetta, which mask underlying trends, and because technological innovations have increased access to new fish stocks, particularly those in deeper waters.

Insert FIGURE II.9 Tropic level changes in marine and coastal areas

Insert FIGURE II.10 Total fisheries catch

Insert FIGURE II.11 Mean depth of fish catches

Insert FIGURE II.12 Global trends in the status of world fisheries stocks since 1974

Aside from overharvest, the major impacts on coastal ecosystems arise from the direct effects of coastal development, through land-reclamation, creation of features such as groynes and jetties, dredging, and sand- and coral-mining, and from runoff in rivers and streams of sediment and various kinds of pollutants. The role of nutrient enrichment, mostly in the form of biologically-

active nitrogen, in creating anoxic zones in estuarine regions, particularly in semi-enclosed waters, is well established. Such zones are apparently becoming more frequent and often growing in extent, although no truly systematic global assessment has yet been carried out.

Climate change may be expected to have a significant impact on marine ecosystems. Relatively small increases in surface water temperature have, for example, been associated with increased incidence of coral bleaching. Larger increases may have unpredictable and conceivably catastrophic impacts: it has been hypothesised, for example, that increased melting of Arctic ice-sheets, particularly around Greenland, could eventually halt the sinking of cold water there that is the most important engine driving the large scale circulation of deep-water oceanic currents around the world. These currents (known collectively as the great conveyor) themselves generate fisheries-rich upwelling areas and warm surface currents, such as the Gulf Stream, that play an enormous role in climate amelioration in some temperate regions. Disruption of this current could conceivably create drastic changes in oceanic ecosystems and terrestrial climates.

II.2.6 Mountains

As with so many natural features, mountains are easy to recognize but hard to define in any systematic way. One useful approach to defining mountains recognises all areas above a certain altitude (2500 m is commonly adopted) as montane as well as areas at lower altitudes if their average slopes are sufficiently great[1]. Using this definition, some 27 percent of the world's land surface (including Antarctica, almost all of which is mountainous) can be classified as mountains.

Mountain ecosystems are characterized by altitudinal belts of vegetation (and associated animal species), largely determined by the changing climatic conditions associated with increasing elevation. Different aspects (compass directions) on a mountain add to climatic and ecological variation. Thus many different ecosystems can be represented on a single mountain or over relatively short distances. In general species richness decreases with increasing altitude, but this may be compensated for by high levels of endemism, as many mountain habitats are isolated, even from adjacent mountains, by deeper valleys with different ecosystems, allowing for highly localized patterns of species divergence.

Under natural conditions the bases of most mountains are dominated by various kinds of forest – even in arid regions, the rapid increase in elevation on mountain slopes causes an increase in rainfall, at least on the windward side, normally creating conditions that allow forest to develop. Forest composition and appearance changes with altitude. In the humid tropics and sub-tropics higher regions are often dominated by bamboos, while at highest altitudes, in zones of persistent cloud-cover, are often found highly distinctive montane cloud forests, also known as mossy, dwarf, or elfin forests, or a host of local or regional names. The treeline –the zone above which trees no longer naturally grow – occurs at varying elevations depending on latitude, aspect, and exposure. In the Central Andes, trees of *Polylepis* are found at up to 5 000 m, the highest in the world.

Above the treeline is the zone of alpine grasses, herbs, shrubs, and tall rosette plants. Many alpine meadows are also important wetland habitats. At the highest elevations barren ground occurs, with scattered cushion, tuft, and rosette plants, and then permanent snow, ice, or bare rock. Even these zones are not devoid of plant and animal life. In addition, at different elevations are topographically dependent freshwater ecosystems, such as tarns, ponds, and lakes.

While the most rugged mountain terrain and the highest altitudes are generally inhospitable to humans and have little if any permanent human settlement, other montane areas are subject to

[1] Lower altitude areas are included based on the following criteria: elevations between 1 500 and 2 500 m where the slope $\geq 2^{o}$, elevations between 1 500 and 1 000 m where the slope $\geq 5^{o}$ or the local elevation range (7 km radius) >300 m; elevations between 300 and 1 000 m where the local elevation range (7 km radius) >300 m; isolated inner basins <25 km2 that are surrounded by mountains.

intense use and may support substantial human populations. This is the case in many parts of the humid tropics, such as New Guinea, mountainous areas around the Rift Valley and Albertine Rift areas of eastern Africa, and the central and northern Andes in South America, where mid or high altitude areas have traditionally supported greater human population densities than adjacent lowlands. In the past 150 years, mountain regions, originally mostly in Europe and North America but increasingly elsewhere, have also established themselves as major recreational areas, particularly for hiking and skiing.

Steep terrain often affords ecosystems a measure of natural protection in mountain regions through making them inaccessible. However, where slopes are accessible they are often very vulnerable to disturbance, particularly in the form of erosion if vegetation cover is removed. Such erosion may take catastrophic forms such as avalanches and mudslides. Once steep slopes have been reduced to bedrock recovery may be extremely slow, if it takes place at all. This is compounded at high altitude by the fact that plants that grow at such altitudes are almost invariably very slow growing, so that even if chronic erosion has not occurred, regeneration after any kind of disturbance (e.g. trampling, harvesting, or fire) will be correspondingly slow.

Montane areas are some of the first to be noticeably affected by climate change – the retreat of glaciers and snowfields is now a visible and widespread phenomenon. Warming climates can be expected to alter the altitudinal distribution of different species and ecosystems. While species adapted to conditions at lower altitudes are likely to be able to adapt through vertical migration, those at the highest levels may not as they will have literally nowhere to go. High alpine plants and animals may therefore be at particularly high risk of extinction from climate change.

Insert FIGURE II.13 Integrated assessment of six pressures in mountain regions.

II.2.7 Islands

There are tens of thousands of islands in the world, ranging in size from a few square metres to millions of square kilometres, in the case of Greenland, the world's largest island. In many ways islands are essentially no different from continental lands, in that they support fundamentally the same kinds of ecosystem and are susceptible to the same climatic and environmental influences. However, two features of islands – their size and their isolation – give their biota distinct characteristics and greatly influence the ways that these respond to human impacts. Islands or island groups that have never been connected to continental areas, or that have long been isolated, evolve unique, endemic species. Overall, such islands make an important contribution to global species diversity, very disproportionate to their size. However, many island species appear to be peculiarly vulnerable to extinction through direct or indirect human agency. They are, for example, often very susceptible to introduced predators or herbivores, or to fire, having evolved no adaptations or defences to cope with these. Moreover, on small islands natural ecosystems are of limited extent and species necessarily have highly circumscribed ranges. Adverse factors are very likely to affect the entire ecosystem or species population, making extinction on small islands a likely event. In contrast, on continental areas (and in the seas) species typically, though by no means always, have wider ranges often divided into a number of sub-populations so that even if some of these are extirpated, there is a good chance that others will survive.

From a human perspective, terrestrial resources (including freshwater) are often limited on small islands and are thus placed under particular pressure. Small islands, particularly those in the tropics and sub-tropics, are also susceptible to natural disasters such as cyclones and tsunamis, while low-lying ones, most notably coral atolls, are very vulnerable to climate change through rising sea-levels.

Given all this, and the intrinsic vulnerability of many island species, it is not surprising that a disproportionately high number of recorded recent extinctions have been on islands, and that a disproportionately high percentage of currently threatened species are found on them.

Not all islands are equally susceptible to these influences. Islands that have recently (that is, during the Pleistocene) been part of continental areas, particularly large ones such as the Sunda Islands in South-east Asia and New Guinea in Australasia, are much more similar to continents both in their ecology and in the way that they respond to human impacts.

Although islands face particular problems, they can also be important refuges, particularly for conserving threatened species: small islands can be quite successfully managed (for example, through eradication programmes for predators or invasive species) in ways that are much less easy on continents or larger islands. Island refuges have played a vital role in preventing the extinction of a significant number of species, particularly in Australia and New Zealand, but also elsewhere.

II.2.8 Agricultural systems

Agricultural systems are the dominant form of land-use on around 30% of the world's land surface. They are profoundly different from the other systems considered here, in that they are by definition created by human agency and managed for one major end: the production of food and fibre necessary for human well-being. Biodiversity considerations therefore take on a somewhat different complexion here from elsewhere. The central question is how to maximise human benefits from such systems in a sustainable fashion while minimising negative impacts on other systems. Such negative impacts include conversion to agricultural systems as well as collateral impacts of agricultural practices through, for example, pollutants from runoff and invasion by introduced species.

Insert FIGURE II.14: Global distribution of predominantly agricultural lands

Within agricultural systems, or rather within landscapes dominated by such systems, three distinct aspects of biodiversity can be distinguished. The first is crop and livestock diversity, both in terms of the range of different species kept and the variability within each of those species. The second is the diversity that supports the productive system, for example symbiotic soil micro-organisms and pollinators. The third is the wild species occurring in predominantly agricultural landscapes that do not directly play a role in agricultural production. These species may or may not be themselves directly exploited resources. Any assessment of the state of agricultural biodiversity should address all three. Variation within crop and livestock species is considered under trends in genetic diversity below.

Assessment of the state of the supporting systems necessary to maintain agricultural output is possible through a variety of avenues. One approach is through monitoring the rate of degradation of agricultural land, caused by factors such as salinisation, soil compaction and crusting, and erosion. Another is to monitor inputs required to maintain constant yields – if these are increasing, this would imply a deterioration in the agricultural system. Similarly, decreasing inputs and sustained yields through, for example, the use of integrated pest management techniques, would indicate an improvement in the system.

Areas dominated by agricultural systems often support significant populations of wild species that are not directly part of the production system. These may include economically valuable species, such as game animals and medicinal plants, as well as a surprising number of rare and threatened ones. These species may make use of the production system itself, that is may live in orchards, or meadows or rice-paddies, or may be found in natural remnants – for example forest patches, streams or ponds – or may use both. Agricultural intensification often leads to the simplification or homogenisation of production systems (from multi-crop systems to monocultures, from species-rich unimproved grassland to species-poor high nutrient pasture) and to the removal of remnant habitats. In combination, these tend to cause widespread reduction in many associated wild species.

Insert FIGURE II.15a & b, UK farmland bird indicator

II.2.9 Other biomes

The one major gap in the treatment of biomes under the CBD is polar systems – that is areas at high-latitude that are frozen for all or most of the year. These include ice-caps, tundra and polar deserts. A large proportion is underlain by permafrost. While the Antarctic continent is isolated from other land areas and has effectively no permanent human habitation, much of the terrestrial Arctic comprises the northern part of two major landmasses (Eurasia and North America) and is permanently settled by humans, albeit at a low overall population density. Overall diversity of polar ecosystems, measured by species richness, for example, is low. However, productivity can be high during the short summer months, especially in Arctic tundra regions, and animal biomass can become substantial.

Traditionally, polar systems have been regarded as some of the least disturbed of all ecosystems. They are unsuitable for cultivation and do not support trees, so present no opportunities for logging. However, there is significant harvest of animal resources, both marine and terrestrial, and this has had substantial impact on some species. In addition, oil, gas and mineral exploration and extraction can be important factors affecting ecosystems in limited areas.

Climate change may be expected to have significant effects on polar regions – a relatively small increase in temperature could lead to major changes in the spatial and temporal pattern of thawing and freezing that is a dominating force in these systems. Exactly what effect this will have on ecosystems and their constituent species is, however, largely unclear.

II.3 What is Happening to Biodiversity at the Species Level?

II.3.1 Decline and extinction

The extinction of a species is, at least with our current biotechnological capability, an irreversible event. An extinction caused by human agency therefore represents one of the most fundamental impacts that humans can have on biodiversity, perhaps the most fundamental. Although it is apparently the fate of all species ultimately to become extinct, the fossil record indicates that under natural conditions the extinction of a species is quite a rare event – that is, most species tend to persist for a long period. There is overwhelming evidence that humans have already hugely increased the rate of extinction above what might be considered normal, with a significant number of catalogued extinctions amongst well known groups of organisms (particularly vertebrates and plants) in the past few thousand years, especially in the last two or three centuries. Populations of an increasing number of other species have been reduced to a level at which their chances of survival may be considered seriously impaired.

The amount by which humans have increased the extinction rate is difficult to quantify for two main reasons. First, it is hard to monitor current extinctions (many species undoubtedly disappear without our knowing about them, while conversely some species may be thought extinct while actually persisting undetected, usually in very low numbers). Second, extinction rates as shown in the fossil record are difficult to estimate with any precision and have in any event evidently varied considerably through geological time. Nevertheless, the best available information, based on documented extinctions in the past few hundred years, indicates that current extinction rates are, conservatively, around 100 times greater than background rates in the fossil record. Other estimates, based on models of extinction, indicate current and projected future rates up to 1000 or even 10,000 times the rates recorded among fossil lineages. Recorded extinctions over the past few hundred years are concentrated on islands (including Australia) and in inland water systems. Earlier extinctions, chiefly of large animals, that can very plausibly be attributed to human agency are recorded on continents as well as on islands.

II.3.2 Threatened species

Species that are currently threatened with extinction occur amongst virtually all groups of organisms and in all parts of the world. Patterns of extinction risk vary between different groups of species and from place to place. Discerning overall patterns is not easy, however, because our knowledge of threatened species is very incomplete: assessing the extinction risk of species is laborious and time-consuming and there is in any case little information on the status of very many species in the wild. Fewer than 10% of species have been comprehensively assessed following the criteria of the IUCN Red List of Threatened Species, the most widely used international system. Only a small number of major taxonomic groups have been comprehensively assessed, and only the birds more than once.

Among major taxonomic groups that are reasonably well documented, the proportion of species identified as threatened with extinction varies from around 12% (around 1200 out of roughly 10,000 bird species) to just over half in the case of cycads. Mammals, amphibians and conifers lie between the two. If all these groups taken together are representative of all species, then it is plausible that around one-quarter of all species are currently threatened with extinction according to the IUCN criteria. Among animals, the largest numbers of threatened species are found in the tropics, where overall species numbers are highest, where many species have small ranges and where rates of habitat conversion are currently high.

The inventory of globally threatened species, even if very incomplete, provides a sobering indication of the current state of biodiversity. However, the picture it presents is essentially a static one. Only by monitoring changes in threatened species listings over time can we hope to assess actual changes in the state of biodiversity. To do this, a set of species needs to have been comprehensively and consistently assessed at least twice. Birds are currently the only group for which this has been done – four global assessments have been completed. These results can be represented in the form of an index showing the change between each successive assessment. The index clearly demonstrates a continuing decline in the status of threatened species between 1988 and 2004. There appears to be a slight reduction in the rate of decline between 2000 and 2004 (the most recent assessment) but this is likely to be an artefact of the time-lag between changes in the status of species, and those changes being reported and incorporated into the index.

Examining the changes in more detail shows that the deterioration in the status of birds has taken place in all major ecosystems in all parts of the world.

Insert FIGURE II.16 Red List Index for birds by region, 1988-2004

Insert FIGURE II.17 Density distribution of globally threatened bird species

II.3.3 General species population trends

Monitoring the status of threatened species is clearly extremely important in conservation planning to slow down or halt irreversible biodiversity loss. However, because threatened species comprise only a relatively small minority of all species, knowledge of their status, and changes in it, provides only limited information on overall trends in biodiversity at the species level. In other words, it might be argued that threatened species are a special case, and not representative of wider biodiversity. However, more general assessments of trends in populations or range sizes of a number of groups of species confirms the declines observed in threatened species.

The Living Planet Index, an aggregate indicator that uses published data on changes in wild populations of a range of species to identify overall trends, shows a consistent decline in average species abundance over the three decades from 1970 to 2000. The overall index fell by some 40% in this period, with inland water species declining most (by around 50%), and marine and terrestrial species both declining by around 30%. The index draws on data from around the world although,

because of limitations in data availability, species-rich tropical areas (particularly forests) are under-represented. Inferences from other data, particularly on habitat changes and changes in the status of threatened species, indicate that it is very likely that on average species in these areas are declining at least as fast, and probably faster, than average for the index as a whole.

Insert FIGURE II.18 Species population trends - the 2004 living planet index,

Insert FIGURE II.19 LPI in three major biomes (marine, freshwater and terrestrial)

This picture of overall decline is supported by a range of more localised studies, for example of Caribbean corals, butterflies in the United Kingdom, farmland birds in Europe and North America and marine fishery species. All such analyses indicate general or average trends, and in any particular situation some species will almost certainly be stable or increasing in number. These are often adaptable and widespread organisms becoming even more abundant, or they may be ones that are being successfully managed or subject to active conservation programmes. In a very few cases, increasing or stable numbers may be the rule rather than the exception – temperate forest birds in the Northern Hemisphere are one of the most notable.

II.4 What is Happening to Biodiversity at the Genetic Level?

Genetic variation is the raw material on which evolution operates. It underpins organismal and, indirectly, ecosystem diversity. In evolutionary terms, the greater the distance apart two lineages are, the greater the genetic difference between them – that is, closely related species are much more similar genetically than distantly related ones. This means that the extinction of an evolutionarily isolated lineage represents a greater loss of genetic diversity than the extinction of one or even several species from amongst a group of closely related ones. There are indications that small, evolutionarily isolated groups are often particularly extinction-prone, so that genetic diversity in this sense may be being lost at a faster rate than straightforward measures of species extinctions indicate.

Genetic variation also exists within populations of the same species and is important for maintaining fitness and adaptability. When populations are reduced to very low levels, a significant amount of genetic variation can be lost, leading to problems through so-called founder effects and in-breeding in subsequent generations. This can have important implications for the conservation of very rare species and the management of captive populations. Less drastic decreases may also lead to loss of genetic variation in more widespread and abundant species, particularly if isolated sub-populations that may be expected to be genetically distinct are lost. It has also been argued that selective harvest, for example of timber species, may lead to genetic erosion if there is a strong genetic component in the variation in timber quality. However, these kinds of losses are generally not well documented and it is not clear how important they are in the conservation and management of reasonably abundant and widespread species.

From a human perspective, genetic diversity is of most immediate importance in cultivated and domesticated species. Species directly used by humans in productive systems on a large scale are only a small fraction of the total number of species: a few tens of domesticated animals, a few hundred crop plants (if ornamental plants are excluded), and a few tens of major plantation timber species. At present, therefore, human well-being, and particularly food security, depends on a relatively small base at the species level. Failure of one individual crop can have catastrophic human consequences (as for example with potato blight in nineteenth century Ireland).

Genetic diversity within cultivated and domesticated species is crucial to maintaining the goods and services they provide: high yields, resistance to pests and diseases, ability to adapt to different and changing environmental conditions. Genetic diversity within crops and livestock in farming systems is usually characterised at the level of the “variety”, either local or traditional (land

races) or improved. Heritable variation in expressed traits, either visible or invisible (e.g. disease resistance or susceptibility), is a product of variation in DNA.

Centuries, and in some cases millennia, of localized, selective breeding and limited gene flow have led to the development of innumerable local varieties of crops and livestock, many of which are particularly well-suited to local conditions. Changes in agricultural practice, and particularly the Green Revolution of the 1960s and the industrialisation and globalisation of much agricultural production in the last half century, have had major impacts on the diversity of crop plants and livestock. A large proportion of global food and fibre production now comes from a relative small number of varieties of major crops and livestock breeds. Thirty crop species alone provide an estimated 90% of the world population's calorific requirements, with wheat, rice, and maize providing about half the calories consumed globally. Fourteen species of livestock currently account for 90% of global livestock production. Very many varieties of plants and animals have undoubtedly been lost as a result, and with them associated genetic variation. Quantifying such losses is, however, extremely problematic. By its very nature, knowledge of land races and other localised varieties is itself local and often informal rather than systematised in a way that makes it feasible to monitor changes over time and over extensive areas.

Furthermore, relating changes in the number of named varieties or recognised land-races of a particular crop or livestock species to any underlying changes in genetic diversity is itself not straightforward, there being no clear relationship between the two. In some cases, there may be only a narrow genetic base for a large number of apparently different varieties, while in other cases there may be considerable genetic diversity within a single named variety or between superficially similar varieties.

Overall, loss of genetic diversity is most closely associated with a transition from small-scale, often largely subsistence modes of agriculture to larger-scale industrialised or semi-industrialised forms. Such transitions are typical of developing countries (with some countries with economies in transition having undergone changes in the opposite direction in the past fifteen years). In developed countries where large scale commercialized agriculture is of long-standing, trends in genetic diversity of major crops over the last century or so are generally easier to quantify as time-series data and samples for analysis are more readily available. However, the limited number of studies on these generally do not show clear trends, with relatively little evidence for major changes in genetic diversity over the past century. Where changes can be shown, they have tended to be qualitative shifts rather than large, quantifiable declines or increases. This is apparently because intensification of breeding efforts and the continuous introduction of new varieties has in these cases largely offset the loss of older varieties.

With plants, genetic turnover through the development and spread of new varieties may occur relatively quickly (although there is still normally a considerable time-lag between the initial breeding of new crops and their widespread availability). It is also much more practical to maintain viable populations of a wide range of varieties in various forms of gene-bank – in seed-banks, in living collections and, increasingly in some parts of the world, dispersed among small-scale, often amateur, growers. Maintaining or increasing genetic diversity among livestock breeds is more difficult – lower reproductive rates among livestock animals than in cultivated plants mean that origination of new breeds is a much slower process. It is also far more difficult and expensive to maintain viable populations of large animals than plants over long time periods, so that breeds that are not attractive commercially at any given time are more likely to die out. As with plants, it is not always easy to relate the number of named animal breeds to the amount of underlying genetic diversity, nor is it easy to keep track of changes in the status of breeds. As a rough guide, FAO estimate that perhaps one third of some 6500 recognised breeds of domesticated animal are threatened with extinction.

While conventional breeding techniques still play a major role in determining trends in genetic diversity among cultivated plants and domestic livestock, new techniques of genetic manipulation have more recently introduced entirely novel genetic combinations, chiefly in plants. The impact of these new technologies on human well-being and on biodiversity is a subject of great controversy. International trade in genetically modified organisms and their products is the subject of the Cartagena Protocol on Biosafety negotiated under the CBD, which entered into force in September 2003.

II.5 Ecosystem Integrity and the Delivery of Ecosystem Goods and Services

Changes in the state of biodiversity are not merely important in themselves, but also have a crucial bearing on the capacity of the natural world to continue delivering the goods and services on which humanity ultimately depends. The Millennium Ecosystem Assessment has concluded that, in aggregate and for most countries, changes made to the world's ecosystems in recent decades have provided substantial benefits for human well being and national development, with many of the most significant changes essential to meet growing needs for food and water. These changes have helped reduce the proportion of malnourished people and improved human health. However, they have been achieved at growing costs in the form of the degradation of many ecosystem services, increased risks of nonlinear changes in ecosystems, the exacerbation of poverty for some people and growing inequities and disparities across groups of people.

Moreover, it is evident that many of the beneficial changes could have been delivered at far lesser cost to ecosystem integrity and much more equitably if their negative impacts had been taken into account from the start. As it is, the MA concluded that the majority of the important ecosystem services they evaluated were being degraded or used unsustainably. This included 70% of regulating and cultural services. The degradation of ecosystem services represents the serious loss of a capital asset and has compromised the ability of ecosystems to deliver benefits for future generations.

Ecosystem services that have been degraded over the past fifty years include capture fisheries, water supply, waste treatment and detoxification, natural hazard protection, regulation of regional and local climate, regulation of erosion, spiritual fulfilment and aesthetic enjoyment. Many of these are reflected in existing or proposed indicators chosen by the CBD for measuring progress towards the 2010 target.

Changes in capture fisheries are shown by changes in the *marine trophic index*, discussed under marine ecosystems above. Elements associated with inland water ecosystems, regarding for example water supply and waste treatment, are shown by measures of *water quality of freshwater ecosystems* while functions such as regulation of local and regional climate and regulation of erosion are at least in part reflected by indicators dealing with *connectivity and fragmentation of ecosystems* as well as those covering *trends in ecosystem extent*.

Other aspects of ecosystem services may be equally important but present considerably more difficulty in monitoring and assessment. These include *incidence of human-induced ecosystem failure, trophic integrity of other (ie. non-marine) ecosystems, health and well-being of communities that depend directly on local ecosystem goods and services* and *biodiversity for food and medicine.* There are numerous examples and case-studies illustrating the importance of each of these but currently little in the way of extensive, consistent information to enable the development of global level indicators.

II.6 Sustainable Use

One of the most important ways of trying to maintain ecosystem goods and services for future generations is to ensure that when components of biodiversity are used, they are used sustainably. The CBD attaches great importance to the sustainable use of biodiversity, having this as one of its

three objectives, and the subject of one of its substantive articles (Article 10). Assessing whether a resource is being used sustainably or unsustainably requires consideration of a number of factors, including the status of the resource in question, the impact of use on the ecosystem of which that resource is a part and the socio-economic context of the resource use. Such analysis may be reasonably easily carried out in simple systems such as a few high latitude fisheries or low-diversity boreal forests but is much more difficult in more complex systems such as tropical forests or most tropical and subtropical capture fisheries. An alternative approach to the analysis of use of a range of separate resources is to look at the overall impact of human consumption patterns through measures such as the ecological footprint (see box).

Insert BOX 1. Ecological footprints

Efforts to ensure that use of managed resources is sustainable are measured under the indicator on *area of forest, agricultural and aquaculture ecosystems under sustainable management* and the proposed indicator for possible development on *proportion of products derived from sustainable sources*. Both these are indicators of response and are addressed in Section III.

II.7 Traditional Knowledge

The CBD recognises the important role that the knowledge, innovations and practices of local and indigenous communities can play in the maintenance of biodiversity, and the importance of biodiversity for many such communities. The Parties to the CBD have also recognised that much relevant local indigenous knowledge is in danger of disappearing, with potentially negative consequences both for the people who possess that knowledge and the ecosystems in which those people occur. Because of the highly specific, dispersed and local nature of such knowledge, it is difficult to track changes in it, and to quantify the importance of such changes. One surrogate measure is change in language.

The diversity of languages in the world is one of the main exemplars of human cultural diversity. Each language carries with it a unique set of ideas and concepts, transmitted from generation to generation. This may include culturally-specific knowledge that may be lost if that language falls into disuse. There are estimated to be 5000 to 7000 languages spoken today. The number of speakers that have any given language as their mother tongue varies hugely, from a handful to hundreds of millions. A small number of languages now dominate global communication. Nearly half the world's population speak one of the ten most common languages. Some 250 languages in total are spoken by 97% of the world's people, while the remainder are spoken by around 3% of the global population (around 200 million people). More than half the world's languages are believed to be spoken by fewer than 10,000 people. Over 80% of these minority languages are confined to a single country.

The geographical distribution of languages, like the distribution of biodiversity, is very uneven, with some parts of the world having far more languages per speaker than is the norm, reaching its peak in the island of New Guinea. Overall, half of all languages are confined to just eight countries.

A UNESCO technical expert group on endangered languages noted in 2003 that at least half of the world's languages were currently losing speakers. Many languages are believed to have disappeared entirely in the past few centuries, particularly since the European age of expansion began in the fifteenth century. Many more are believed to be under threat of extinction or nearly extinct. Languages with fewer than 1000 active speakers are regarded as at high risk of extinction, as are some more widely spoken languages that are rapidly declining in number of speakers. Signs that a language is become threatened include a decreasing number of speakers, fewer domains of use and structural simplification. Those that are no longer being learnt by children and have only a

small number of usually elderly speakers left are deemed moribund or nearly extinct. Over 400 of these are identified in compendia such as *Ethnologue* and the Linguist list.

The causes and consequences of language loss are complex. Many different factors – social, political, economic and religious – affect the way in which languages are transmitted from one generation to the next and the use to which they are put, that is whether they are the sole language used by speakers, or the primary language amongst two or more, or are a language used in certain more restricted contexts (eg. domestic or ritual settings). Governments may have a major influence. They may actively suppress minority languages (although such action may have the effect of actually encouraging clandestine use of the language as a manifestation of resistance or dissent) or, more usually, may simply neglect them and encourage the adoption of a majority language or languages by ensuring that all formal education and official documents are in such a language.

Whatever the cause, the change of use of a language, and particularly its falling into disuse, clearly indicates a significant cultural shift amongst its (former) users. The consequences of the extinction of a particular language may not be clear-cut. It may be assumed that the loss of a language may lead invariably to the loss of specific forms of knowledge and perceptions of the world formerly expressed in that language. While this is generally likely to be true, it may not always be the case, particularly if the decline in the use of the language has been at all gradual. Knowledge and world-views may be translated into other more widely spoken languages and this may actually enhance opportunities for their dissemination. Overall, however, it does seem likely that the loss of a language will normally go hand in hand with the diminution or weakening of particular, local values and world-views and is therefore a signifier of increasing cultural homogenisation.

While reasonable data are available on the global distribution of languages, tracking changes in the number of speakers of minority languages is difficult and it is unclear if the rate of loss of languages is currently accelerating or not.

II.8 Access and Benefit Sharing

The CBD has the fair and equitable sharing of the benefits arising out of the use of genetic resources as one of its three principal objectives, along with the conservation of biological diversity and sustainable use of the components of biological diversity. This is in recognition of the argument that only if countries and peoples feel that they are receiving adequate benefits from the use of genetic resources will they have adequate incentives to maintain biodiversity. Measuring the extent to which the benefits arising from the use of genetic resources are being freely and equitably shared is problematic, and no indicator has yet been proposed for testing. A significant number of countries have implemented legislation controlling access to genetic resources, and there are a number of cases of benefit-sharing arrangements. The latter may involve some or all of the following: governments, local and indigenous communities, private companies, NGOs and scientific research institutes. However it is difficult to synthesise information about such arrangements in a systematic way.

Efforts to ensure the fair and equitable sharing of the benefits arising out of the utilization of genetic resources are a response discussed in more detail in Section III.

II.9 The Major Drivers of Biodiversity Loss

To determine what actions might be taken to try to reduce the rate of biodiversity loss, it is important first to understand to understand the major drivers that affect it. Understanding, and addressing, such threats is one of the major focal areas identified by the Parties in striving towards the 2010 target.

The most important direct drivers affecting biodiversity have been recognised as:

- Habitat change, particularly conversion;

- Overexploitation or unsustainable use of natural resources;
- Biotic exchange, chiefly through the introduction of alien species or pathogens;
- Nutrient loading;
- Climate change.

The impact of each of these is highly variable, both in the way it affects different biomes and ecosystem types, and in the way it might be expected to change in the future, but it is clear that almost all direct drivers of biodiversity loss are constant, or are expected to increase in intensity in the future (see Figure II.20).

Insert FIGURE II.20 Trends in, and impact of, the main direct drivers of biodiversity loss.

II.9.1 Habitat change

Human influence can now be detected in all parts of the biosphere, even the most isolated and distant ones. The most obvious manifestation of this is the conversion of natural habitats to wholly or largely artificial ones. This is most clearly manifested on land, with the major form of conversion being to agricultural land, although other forms of land-use – urban and industrial, for recreational uses and transport networks – are also very important. Cultivated systems, defined (by the MA) as areas where croplands, shifting cultivation, confined livestock production or freshwater aquaculture occupy at least 30% of the landscape. The conversion of up to 20% of the world's remaining grasslands and forests has been predicted by 2050. Most of the conversion has taken place in those areas where conditions are most suitable for cultivation, that is have adequate rainfall, high enough temperatures at least seasonally, are topographically favourable and have naturally fertile soils. Such conditions have contributed in many places to these areas being where natural ecosystems are typically diverse, with high species richness. A high proportion of unconverted land is at high altitudes, latitudes or in arid regions, where diversity tends to be lower. Habitat conversion or destruction is also an important factor in inland waters (chiefly through abstraction of water and drainage of wetlands) and coastal regions as well as some inshore marine systems such as coral reefs and sea-bottoms that are subject to intensive trawling.

It is not just the total area of an ecosystem that determines its value and the way that it functions. Its spatial configuration, and the kinds of interface it has with other systems, are both also of great importance. Changing these, through altering connectivity or fragmentation can have a major impact on ecosystem integrity and the ability of the system to deliver goods and services. The impacts of fragmentation vary greatly among ecosystems and from species to species. In tropical forests, for example, fragmentation is evidently to the detriment of many obligate forest-dwelling species, particularly if fragments become widely separated by completely deforested areas, but can benefit some species, such as large herbivores and their predators, through increasing favoured forest-edge habitats.

Similarly, increasing connectivity through the creation of various kinds of corridor can increase habitat availability for species and provide avenues for dispersal, but can also allow the spread of pathogens and invasive species – a classic example of this is the Suez canal, which has allowed several hundred species to enter the Mediterranean from the Red Sea.

Of the indicators chosen by the Parties to the CBD for addressing progress towards the 2010 target, two, on *trends in extent of selected biomes, ecosystems and habitats* and *connectivity/fragmentation of ecosystems*, clearly address changes in habitat extent and configuration. Clearly a number of the other indicators (for example those on *water quality*, *nitrogen deposition* and *marine trophic level*) address issues of ecosystem quality and integrity.

II.9.2 Overexploitation

Although the majority of human needs for food and fibre for clothing and other purposes are now met from agriculture, direct use of wild resources is still of great importance, both for humans and for those natural ecosystems that are affected by direct exploitation. From a global economic perspective, the two most important kinds of wild resource are timber and fish stocks, particularly marine stocks. Harvest of timber is one of the most important direct and indirect causes of deforestation, while marine fisheries are currently the main driver of change in marine ecosystems, with the majority of accessible marine fish stocks now either fully exploited or overexploited. On land, unsustainable harvest of wild animals for food, medicine or sometimes sport, has a major impact, particularly though not exclusively in the tropics. In many cases it may be a more significant threat to the survival of species than habitat loss.

Of the indicators chosen by the Parties to the CBD, the *marine trophic index,* and those addressing *change in status of threatened species*, *trends in abundance and distribution of selected species* and *area of forest under sustainable management* are the most relevant. Each is discussed in more detail below, the first and last under their specific biomes.

II.9.3 Invasive alien species (biotic exchange)

One of the most pervasive and far-reaching impacts of human activities has been the wholesale breaking down of natural barriers between species. Ever since people first domesticated animals and began to cultivate plants, they have taken them on their travels and grown or kept them elsewhere. Some of these transported species become established in the wild, far away from their origin. As well as domestic or cultivated species gone wild, humans have also accidentally or deliberately introduced a huge range of wild organisms into areas where they did not previously occur. Whatever their origin, so-called alien species often have far-reaching and sometimes devastating impacts on native biota. A proportion are important pests or pathogens that can incur enormous economic costs. Dealing with those that become pests or pathogens – knowns as invasive alien species – is one of the more intractable challenges in addressing biodiversity loss.

Because invasive species are often one of a whole suite of factors affecting particular sites or ecosystems, it is not always easy to determine their impact. In many cases non-native species tend to be associated with habitats that are already disturbed or degraded (eg. along logging trails and in secondary re-growth of tropical moist forests) and are much less evident in other areas. The most unequivocal examples of direct and catastrophic impact on biodiversity are extinctions or near extinctions of animal species caused by introduced predators, chiefly on islands but also in inland waters and on continental Australia. Examples are the predatory snail *Euglandina*, cause of the extinction or near extinction of a large number of endemic land snail species on Pacific islands, the Brown Tree Snake *Boiga irregularis* which has devastated the bird fauna on the island of Guam and Red Foxes *Vulpes vulpes* and feral domestic cats, which have drastically affected a significant number of native mammal species in Australia. In contrast, the introduced species that have probably the greatest economic impact tend to be crop pests, weeds and various aquatic species. The impact of many of these on native biota is much less clear.

Insert FIGURE II.21 Growth in number of marine species introductions.

The indicator *trends in invasive alien species* directly addresses this issue.

II.9.4 Nutrient loading

The remarkable increase in food production from agriculture in the past 50 years has, alongside increasing use of pesticides and irrigation, been driven by increasing application of fertiliser, chiefly reactive nitrogen but also phosphorus, sulphur and a range of micronutrients such as magnesium, potassium and zinc. Humans currently produce more reactive nitrogen than is produced from all natural pathways combined. While in some areas (notably parts of sub-Saharan

Africa) shortage of nitrogen still limits agricultural productivity, in much of the rest of the world its use is inefficient, with excess often applied, creating severe pollution problems. Aerial deposition of reactive nitrogen is implicated in reductions in biodiversity in a range of terrestrial ecosystems, including temperate grasslands, shrublands and forests. Increases in reactive nitrogen in aquatic ecosystems, through aerial deposition and runoff, lead to eutrophication (artificial nutrient enrichment) of these systems, often causing algal blooms and creating anoxic zones – regions where the level of dissolved oxygen is too low to support most or all oxygen-breathing organisms. Phosphorus, the use of which tripled between 1960 and 1990, has similar impacts. Fertilizers are not the only cause of nutrient loading, however. Human and animal waste are also important causes of nutrient enrichment in inland and coastal waters. Untreated sewage not only causes eutrophication, but is a major health hazard because of the likely presence of various kinds of pathogen.

Insert FIGURE II.22 Estimated reactive nitrogen deposition for 1860, 1990s and 2050.

Insert FIGURE II.23 Trends in global use of nitrogen fertiliser 1961-2002

Nutrient loading is directly addressed by the indicator on *nitrogen deposition*.

II.9.5 Climate change

Human-induced climate change is, arguably, the overarching environmental concern of the 21st century. While a small, though trenchant, minority (mostly but not exclusively representative of vested interests) denies any established link between human activities and observed or projected changes in global climate, the great majority of expert opinion agrees that humans are having an impact, very largely as a result of increases in atmospheric levels of greenhouse gases, and that the impact will grow larger in the coming century. The various scenarios produced by the Intergovernmental Panel for Climate Change project an increase in global mean surface temperature of between 2.0ºC and 6.4ºC above pre-industrial levels by 2100. Exactly how this increase will affect sea-level as well as climate regimes and weather patterns at smaller scales (from continental down to local) is much less certain, as is the impact of changes on human society and on biodiversity. With regard to sea-level changes, for example, while there is agreement that sea-levels are bound to rise, there is no consensus on the amount of that rise, with models predicting anything from eight cm to nearly one metre increase between 1990 and 2100.

Some impacts on ecosystems of climate change, particularly those associated with warmer regional temperatures, have already been observed, in changes in species distributions, the timing of reproduction or migration events and the outbreak of epidemics. In the seas, increases in coral bleaching events are associated with small increases in sea temperature during the warmest months. In general, however, major impacts are expected to become more evident in the coming decades. Historically, populations of wild organisms appear to have been able to cope quite well with changing climates – there are, for example, relatively few documented species extinctions during the Pleistocene in areas and during periods when hominids were absent, despite the fact that this era experienced the most extreme global climate fluctuations in at least the past 60 million years. However the radically different conditions on the planet prevailing now, owing to human activities, may be expected to alter the capacity of wild populations to adapt to changing climates. Effects such as the fragmentation and isolation of many natural or near-natural ecosystems will prevent many organisms from shifting their distributions to meet with changing climatic conditions, leaving them likely to be vulnerable to extinction.

Information on drivers of climate change, such as measures of greenhouse gas emissions, is collected within the context of the United Nations Framework Convention on Climate Change (UNFCCC). While there is no single indicator of the effects of climate change on biodiversity, a number of indicators, including those on *extent of ecosystems* (particularly applied to coral reefs,

polar systems and some kinds of forests and drylands), *abundance and distribution of selected species* and *incidence of human-induced ecosystem failure* can help to derive trends. Measures of *connectivity/fragmentation* of ecosystems can indicate the vulnerability of different ecosystems to climate change.

Insert FIGURE II.24 Historical and projected variation in earth's surface temperature.

II.10 The Indirect Drivers of Biodiversity Loss

Five categories of "indirect drivers" of change in biodiversity and ecosystem services are recognized in the Millennium Ecosystem Assessment (MA). These are: demographic; economic – trade, market and policy frameworks and globalisation; socio-political – governance, institutional and legal frameworks; cultural and religious – beliefs and consumption choices; and scientific and technological. These all interact in complex ways to drive change in the biosphere, and in the benefits that people derive from biodiversity. At heart, the central issue is a rapidly growing human population, coupled with globally increasing per capita consumption of resources and concomitant production of waste (of which greenhouse gases can be seen as one manifestation). Global economic activity is estimated as having increased seven-fold between 1950 and 2000, placing hugely increased pressure on ecosystems. It was estimated in the 1990s, for example, that humans directly or indirectly now accounted for perhaps 40% of global net primary production (essentially the capture by plants and other photosynthesising organisms of solar energy that drives all living processes). A measure of these indirect drivers can be found in the ecological footprint indicator described under sustainable use above.

FIGURES, TABLE AND BOX SECTION 2

Figure II.1: Percentage of total area change by individual change processes at regional and pan-tropical level, 1990-2000 (Source: FAO FRA 2000)

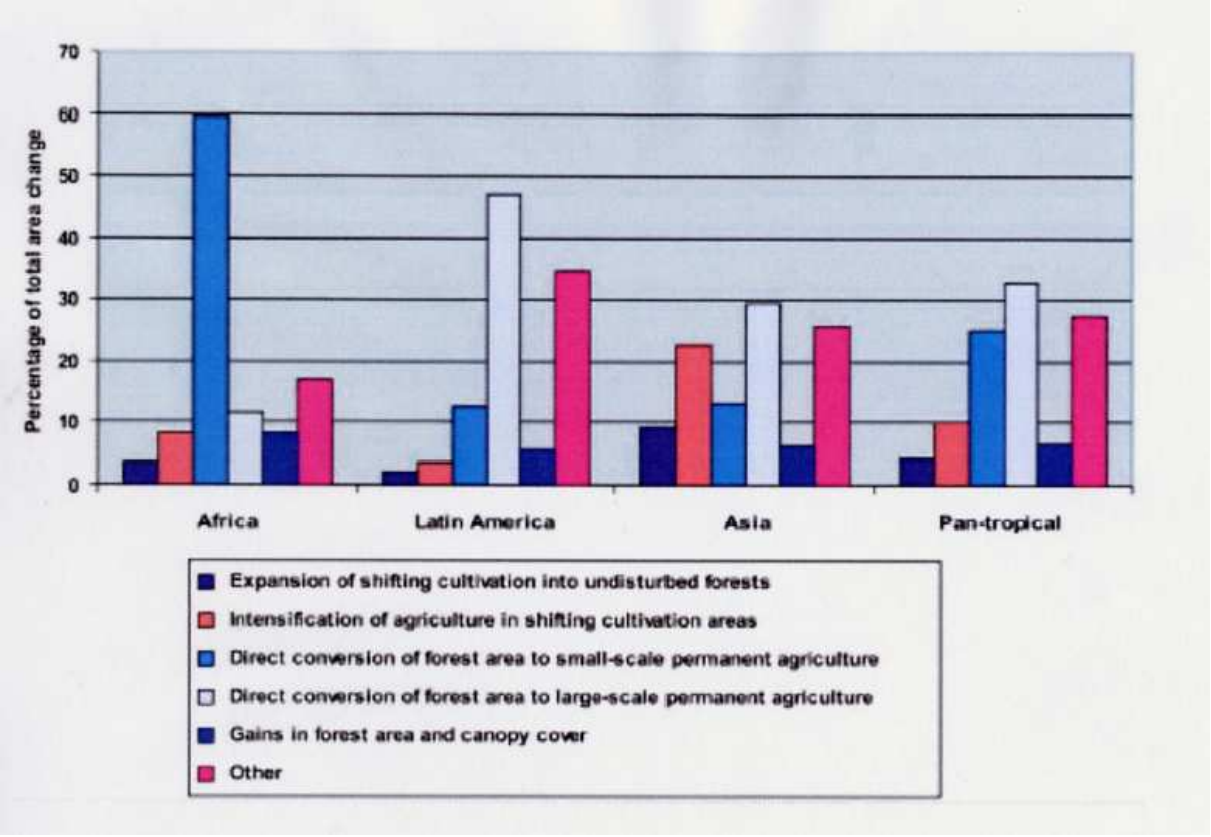


Figure II.2: Countries and forests with high rates of net forest area change 1999-2000 (Source FAO FRA 2000).

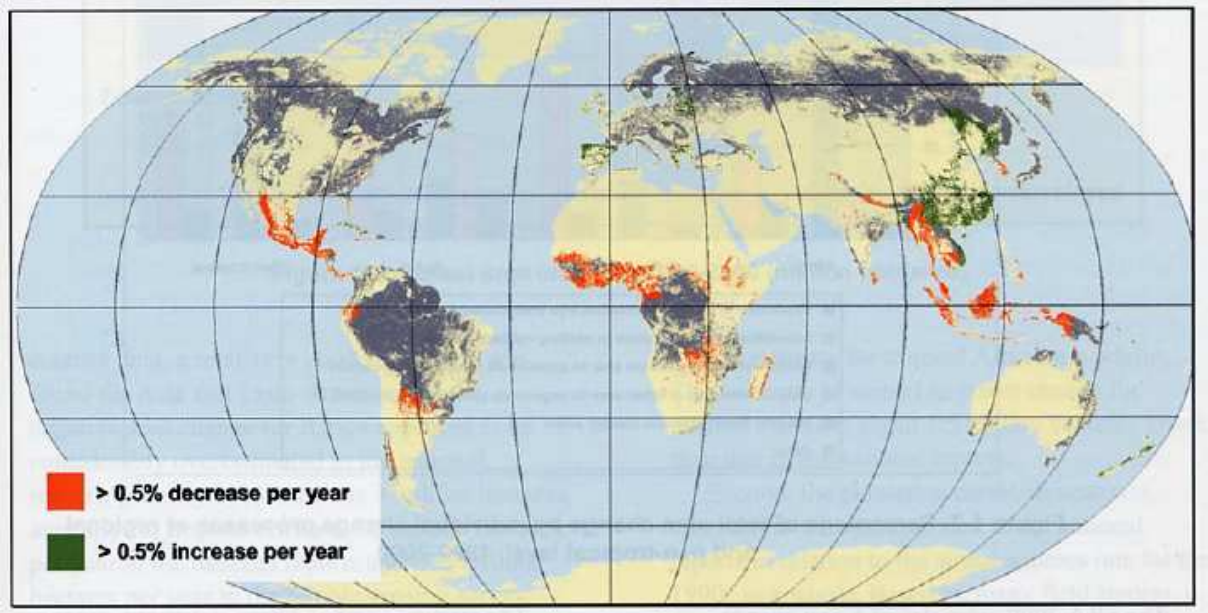


Figure II.3: Estimates of forest fragmentation due to anthropogenic causes (Source: Wade et al., 2003, and MA Biodiversity Synthesis Report)

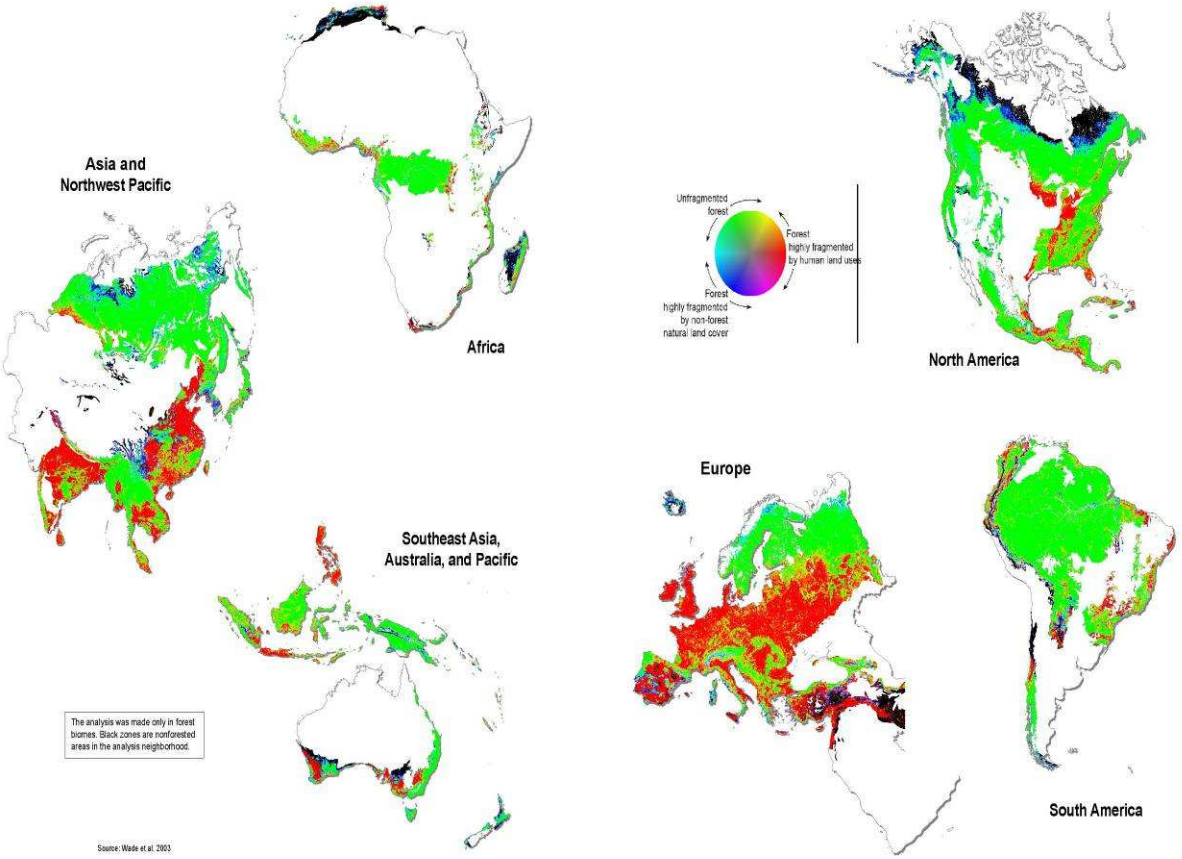


Figure II.4: Locations reported by various studies as undergoing high rates of land cover change in the past few decades (Source: Millennium Ecosystem Assessment)

In the case of forest cover change, the studies refer to the period 1980–2000 and are based on national statistics, remote sensing, and to a limited degree expert opinion. In the case of land cover change resulting from degradation in drylands (desertification), the period is unspecified but inferred to be within the last half-century, and the major study was entirely based on expert opinion, with associated *low certainty*. Change in cultivated area is not shown. Note that areas showing little current change are often locations that have already undergone major historical change (see Figure 1).

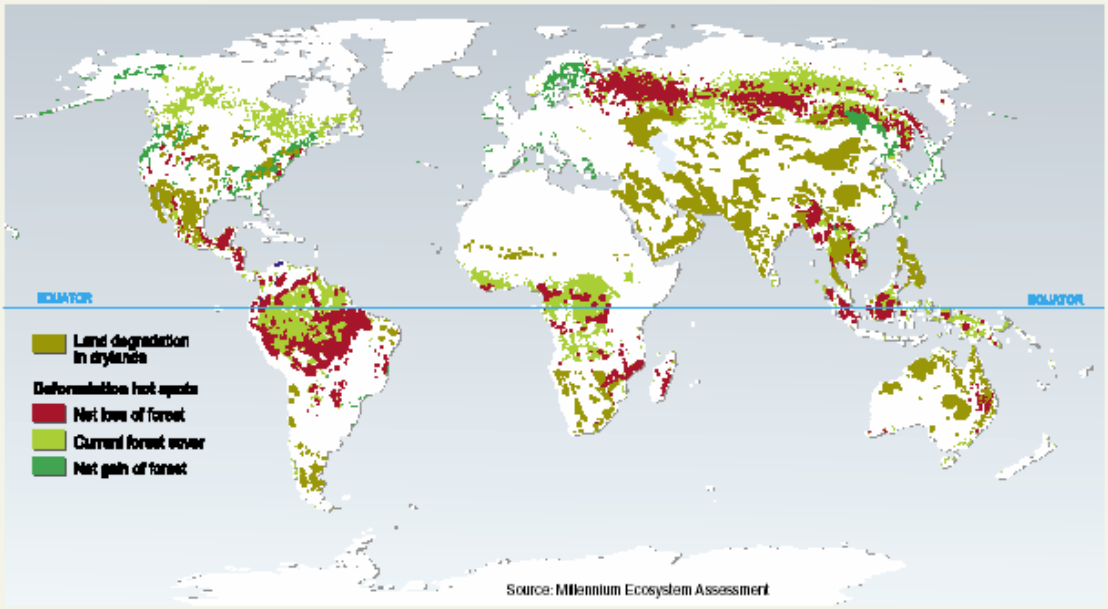
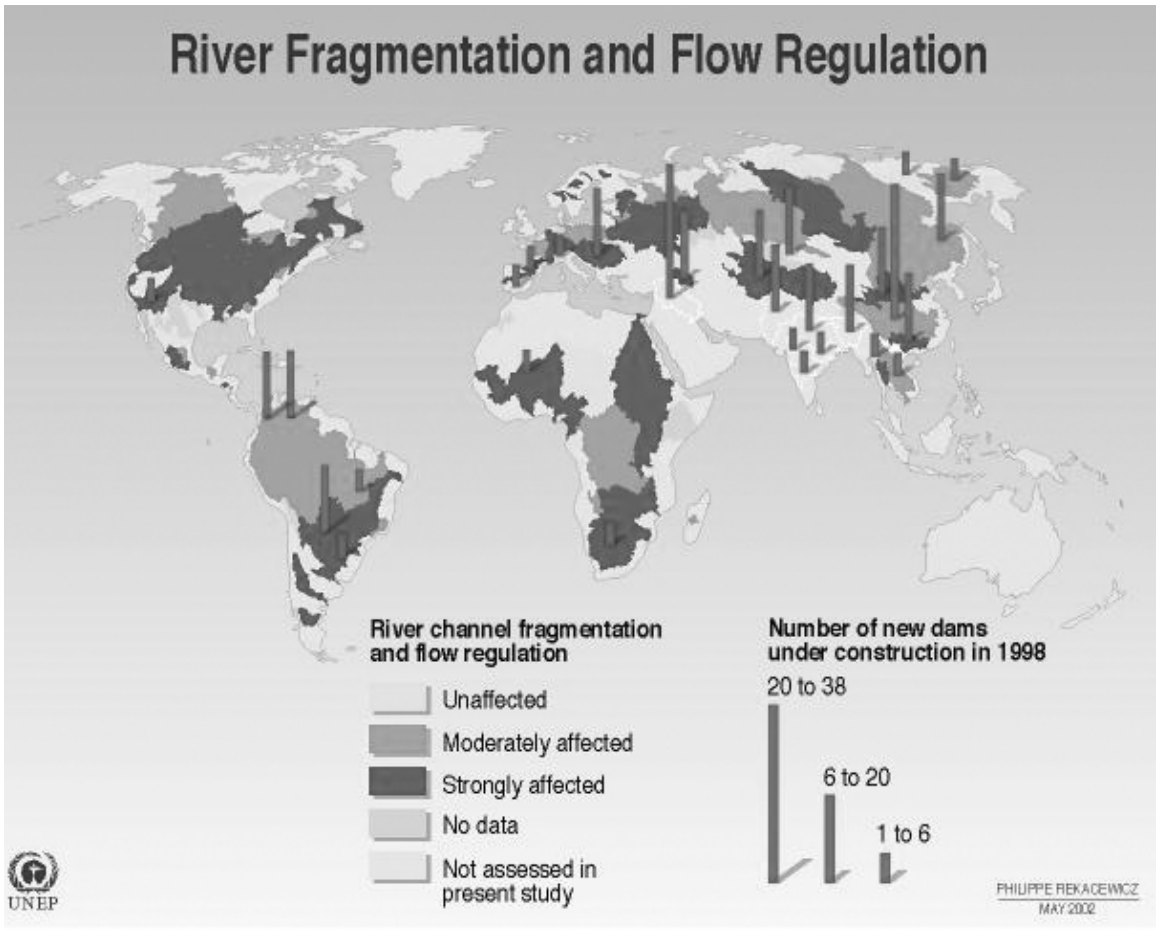


Figure II.5. Global map of river fragmentation through channel fragmentation, dams and flow regulation.

(Source: WRI, and modified from UNEP Vital Water Graphics)



Source: Revenga et al., World Resources Institute (WRI), Washington DC, 2000.

Figure II.6 Mean BOD (mg/l O_2) in surface waters by selected region, 1979–90 and 1991–99
(Source UNEP GEMS WATER)

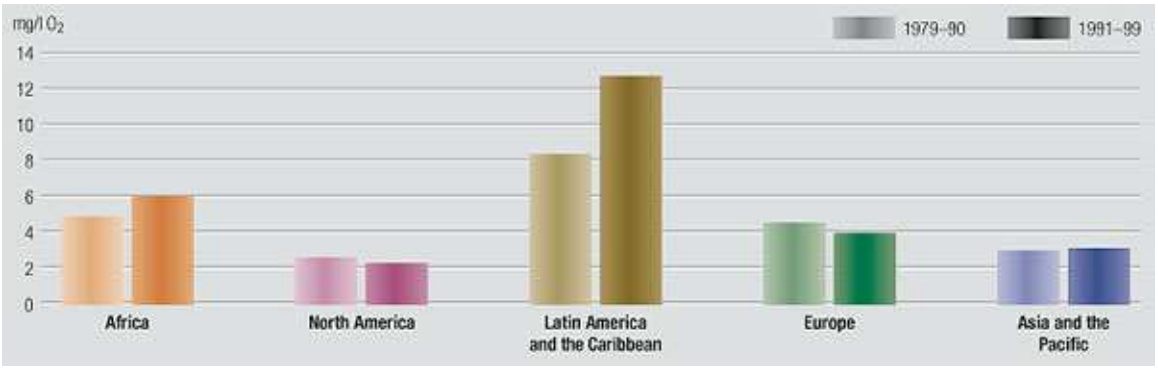
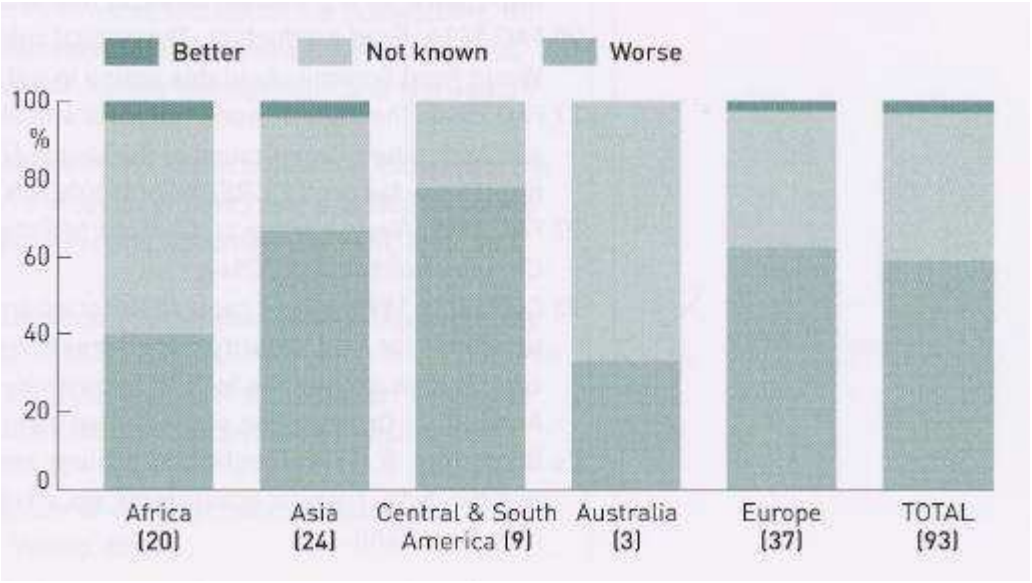


Figure II.7: Changes in condition of a sample of freshwater lakes between 1950s and 1980s. Note: Number following area name is number of lakes in sample (Source: World Atlas of Biodiversity).



1 **Figure II.8: Inland water fish introductions (Source: World Atlas of Biodiversity)**

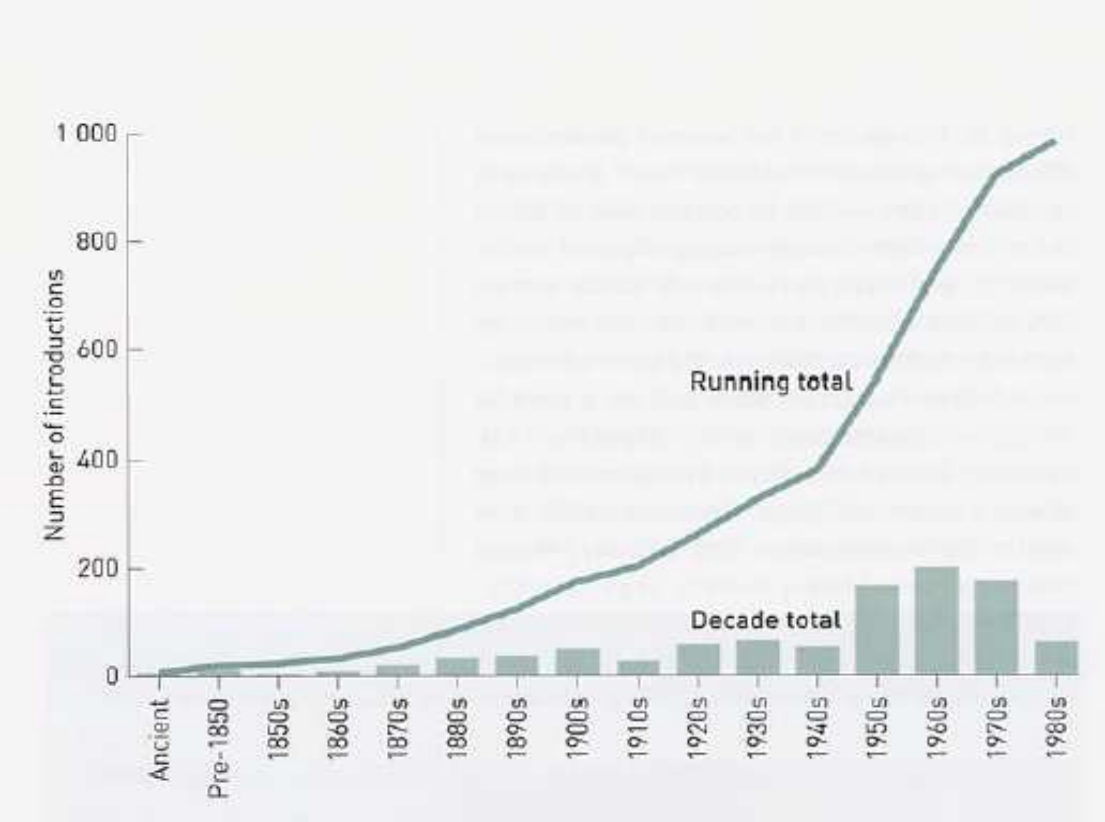


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Figure II.9: Decline in trophic level of fisheries catch since 1950 (Source: MA Biodiversity Synthesis Report)

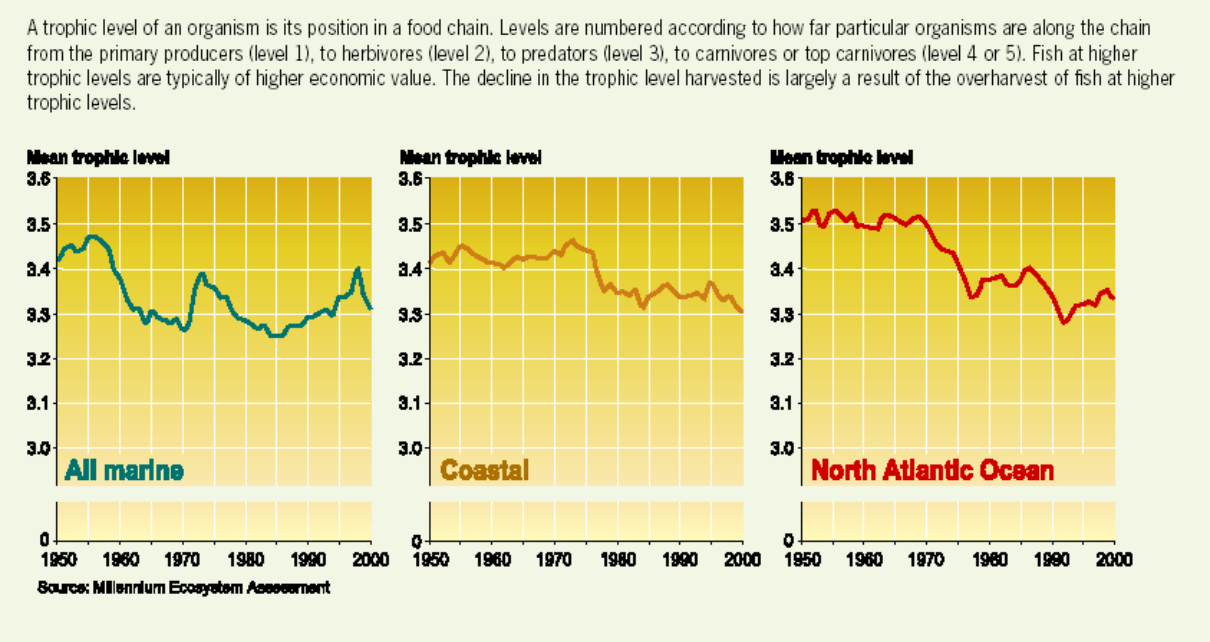


Figure II.10: Estimated global marine fish catch, 1950-2001 (Source: MA Biodiversity Synthesis Report)

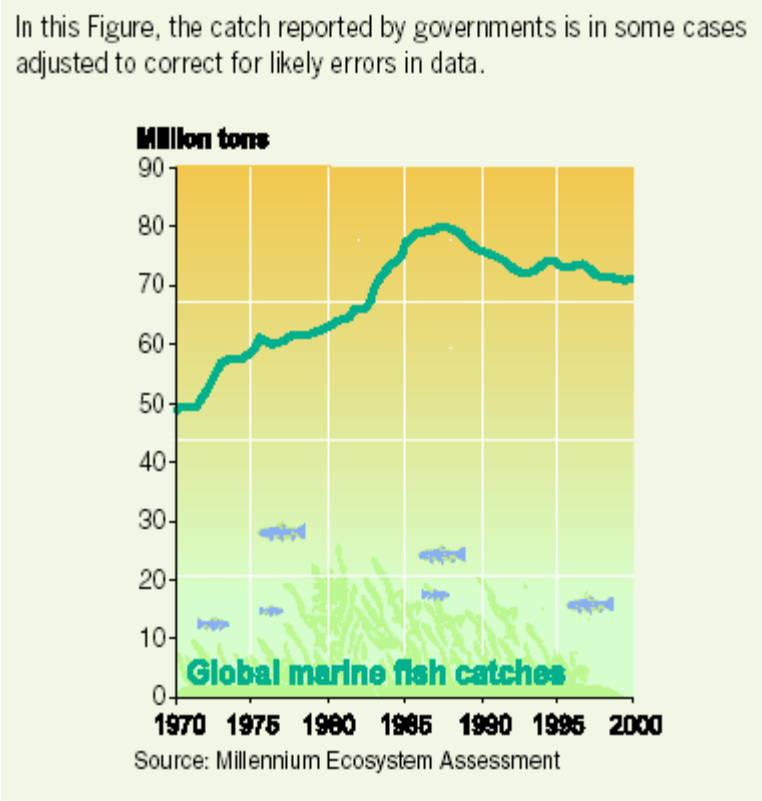


Figure II.11: Trend in mean depth of catch since 1950. Fisheries catches increasingly originate from deep areas (Source: MA Biodiversity Synthesis Report)

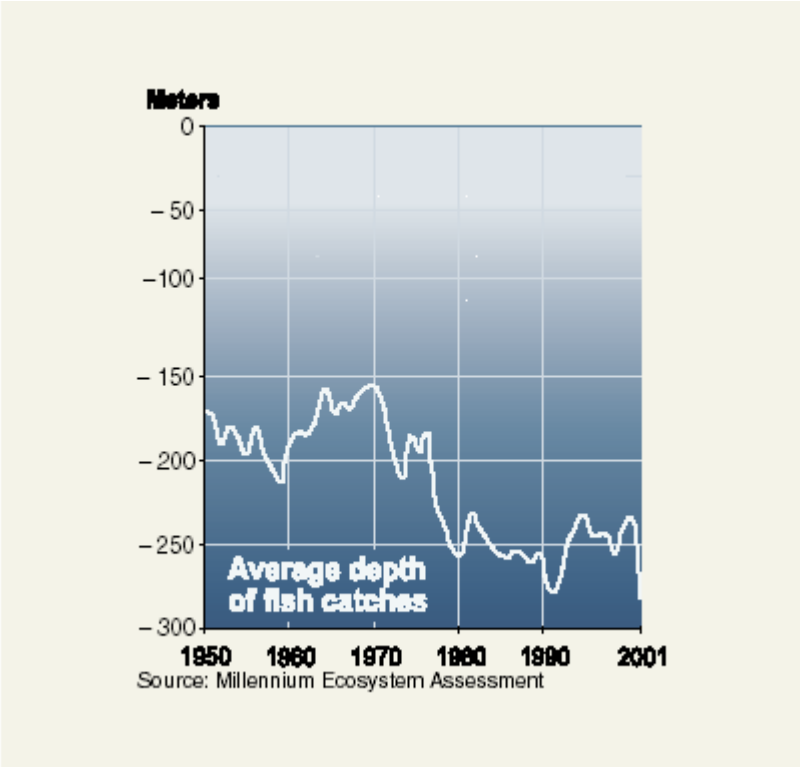


Figure II.12: Global trends in the state of world stocks since 1974 (Source: World Atlas of Biodiversity)

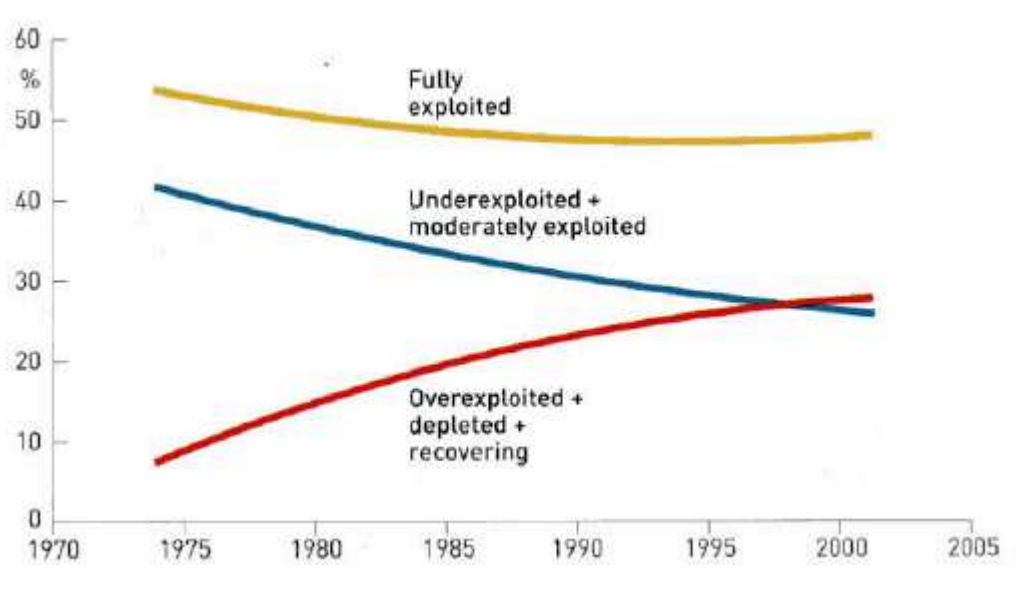


Figure II.13: Integrated assessments of six pressures in mountain regions (Source UNEP-WCMC, Mountain Watch).

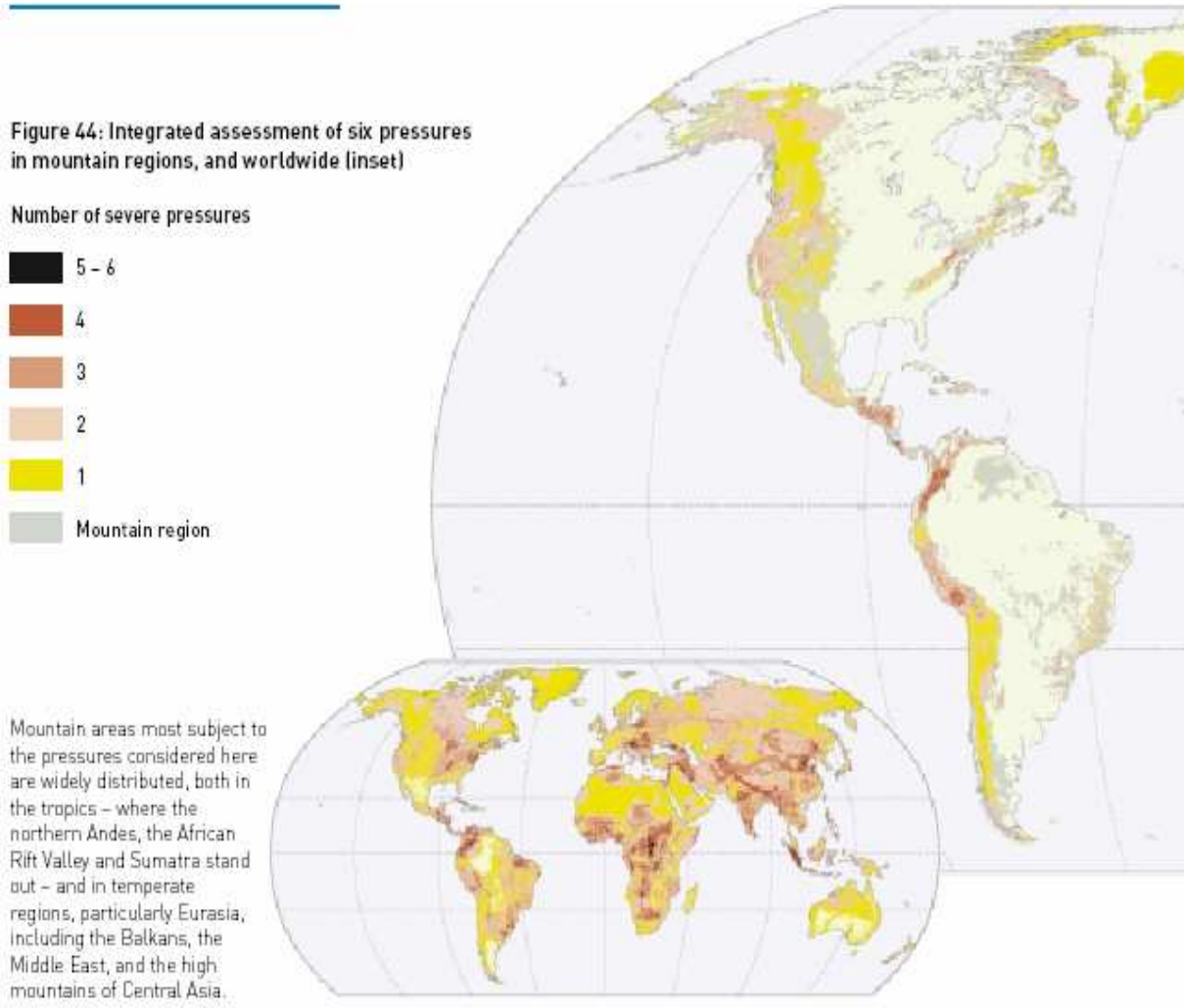


Figure II.13 cont.

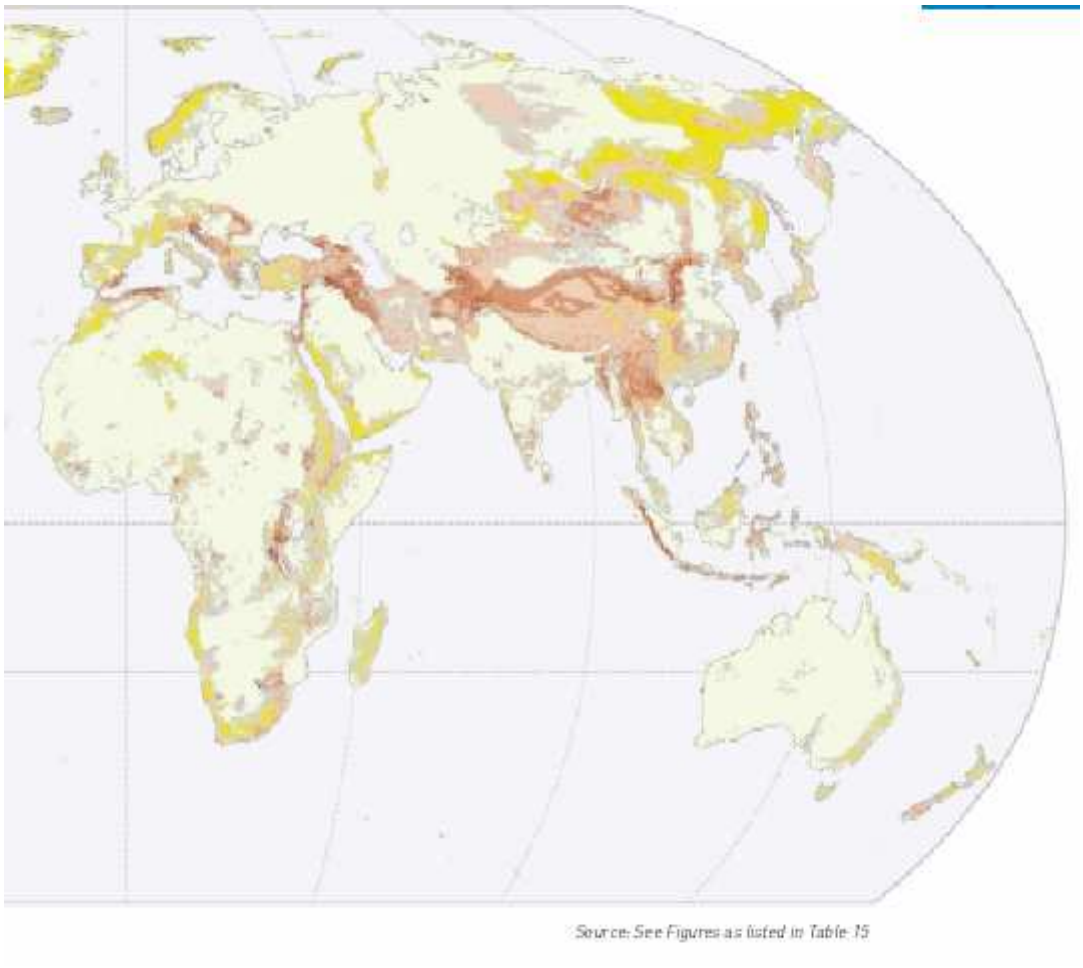


Figure II.14: IMAGE Land-cover for the Year 2000 (Source: MA Biodiversity Synthesis Report)

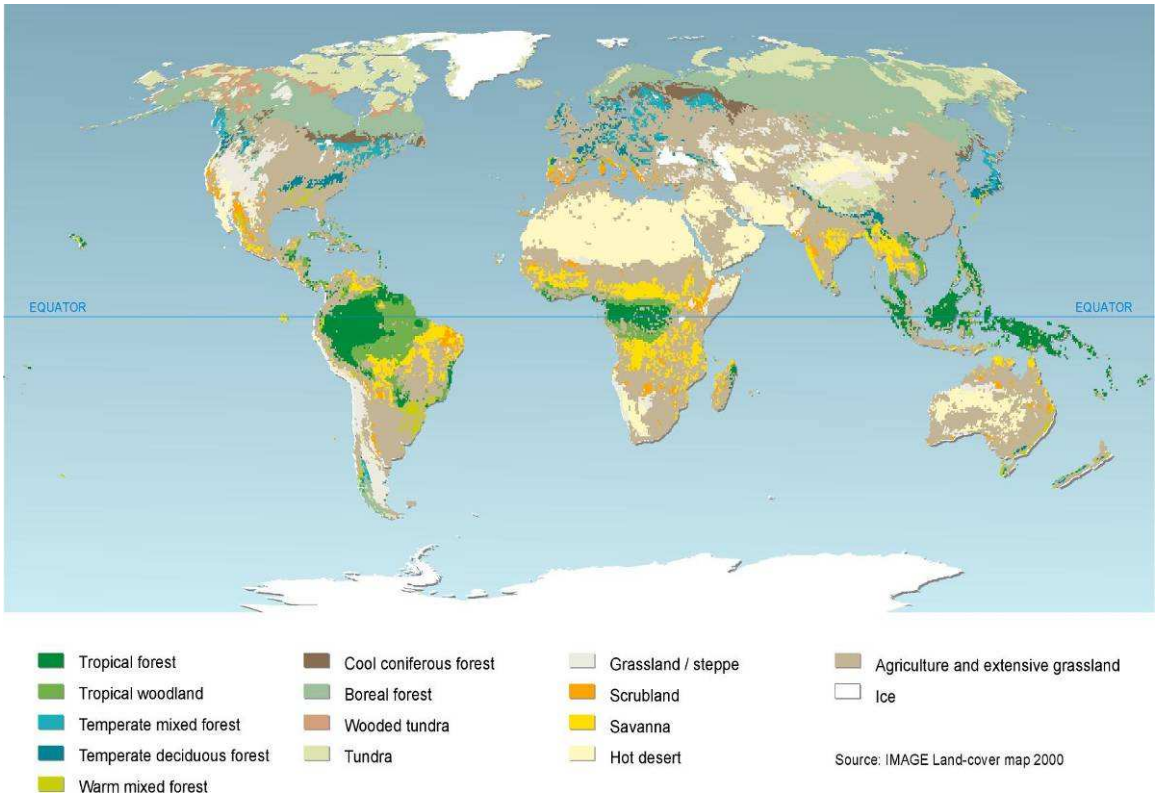


Figure II.15a: Trends in Farmland Wild Bird Indicators for each English region, 1970 to 1999. Direction and size of arrows indicate direction and magnitude of trends,, the figure below the arrows gives the number of species in the indicator for each region (Source DEFRA)

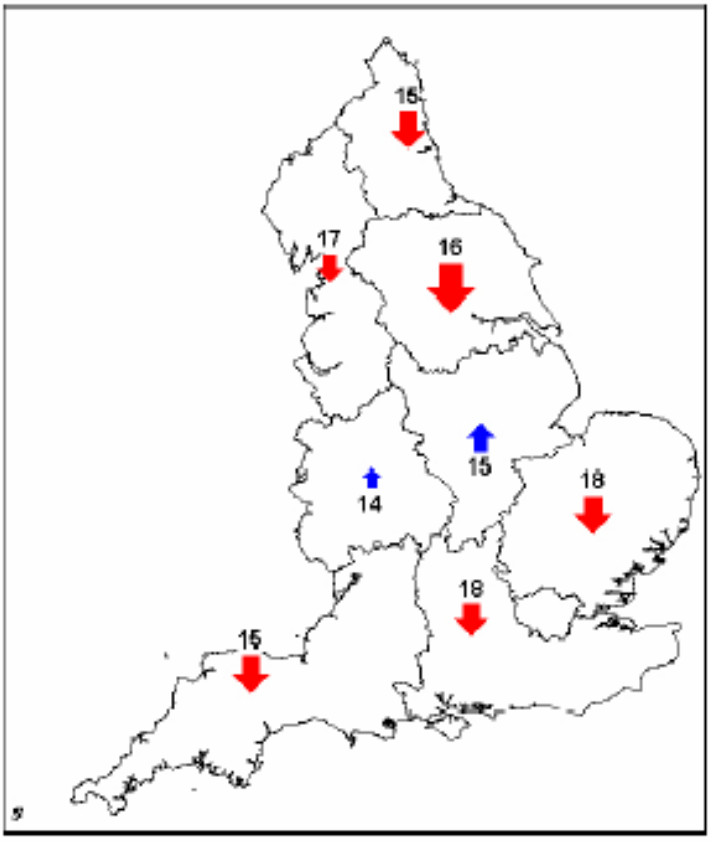


Figure II.15b: Bird populations in the United Kingdom, as a framework indicator (Source: Sustainable development indicators in your pocket 2005, DEFRA, UK)

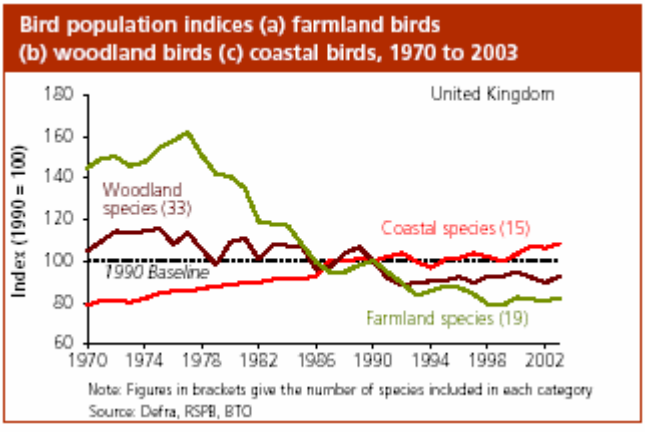
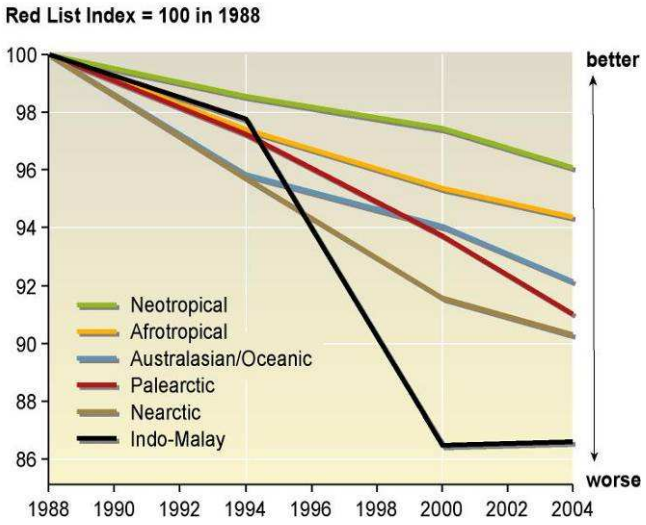


Figure II.16: Red List Indices for Birds, 1988-2004, in Different Biogeographic Realms (Source: MA Biodiversity Synthesis Report)



The Red List Index illustrate the relative rate at which sets of species change in overall threat status (i.e., projected relative extinction risk), based on population, range size, and trends as quantified by categories on the IUCN Red List..

Source: Butchart et al. 2005

Figure II.17: Density Distribution Map of Globally Threatened Bird Species Mapped at a Resolution of Quarter-degree Grid Cell (Source: MA Biodiversity Synthesis Report)

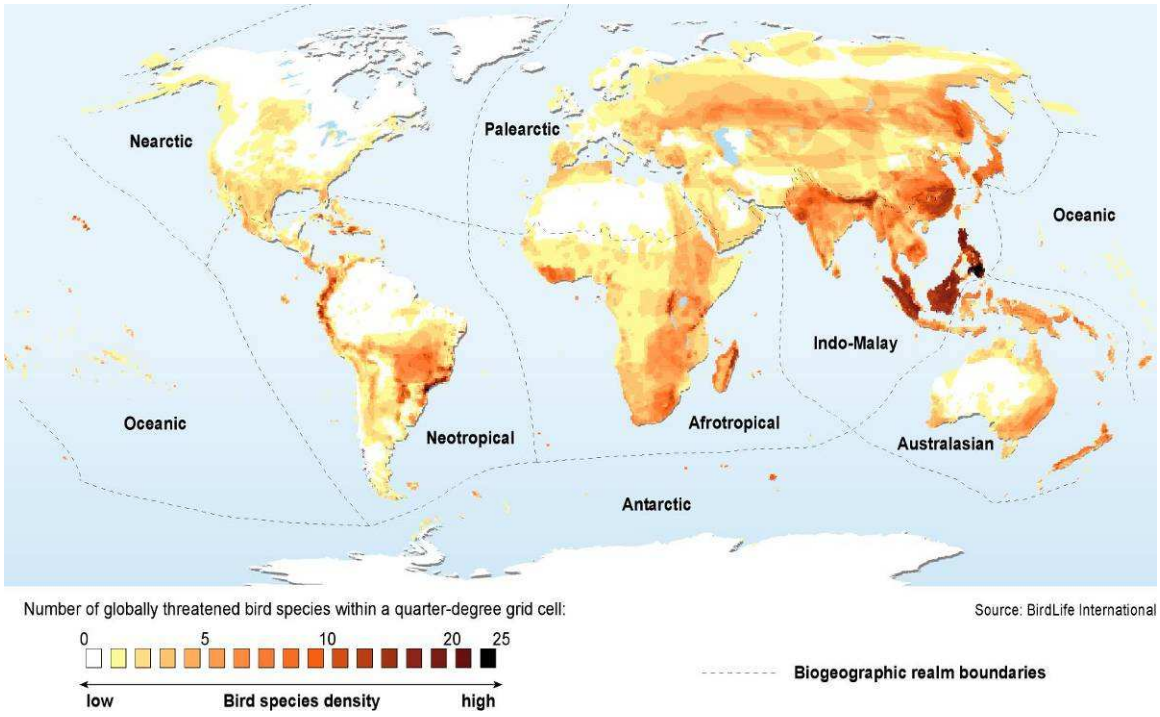


Figure II.18: Species population trends. The Living Planet Index shows average trends in populations of terrestrial, freshwater, and marine species worldwide. It declined by about 40% from 1970 to 2000

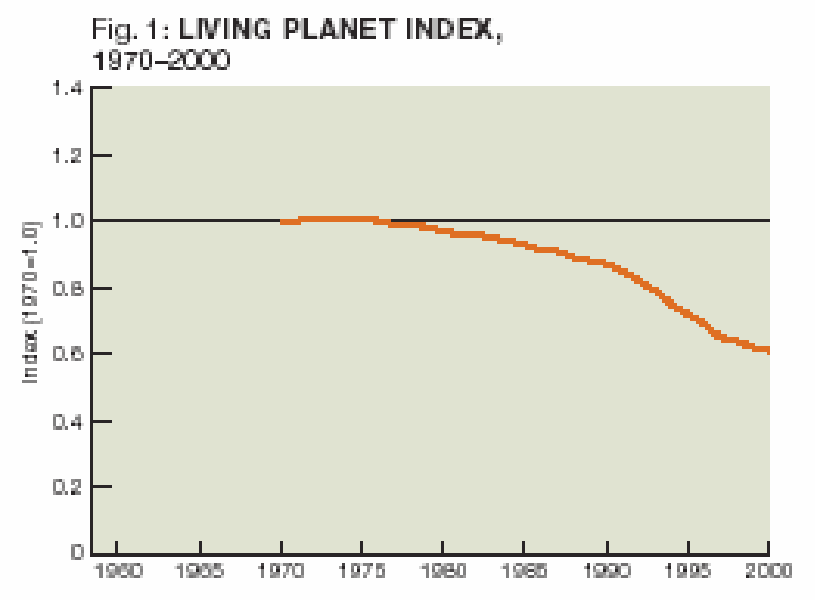
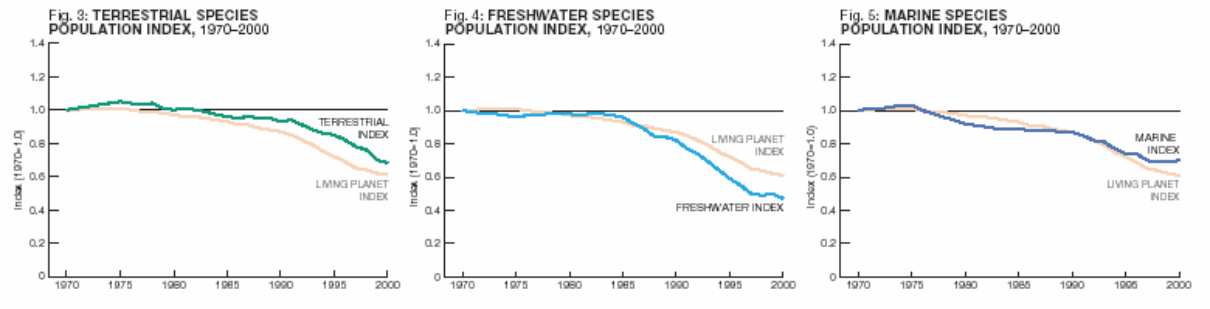


Figure II.19: LPI in terrestrial, freshwater and marine systems.

The terrestrial species index shows decline of about 30% between 1970 and 2000 in 555 species of mammals, birds and reptiles living in terrestrial ecosystems. The freshwater species index shows a decline of approximately 50% from 1970 to 2000 in 323 vertebrate species found in rivers, lakes, and wetland ecosystems. The marine species index shows a decline of about 30% from 1970 to 2000 in 267 species of mammals, birds, reptiles and fish occurring in the world's ocean and coastal ecosystems. (Source: Living Planet Index).



1 **Figure II.20 The main direct drivers of biodiversity loss**

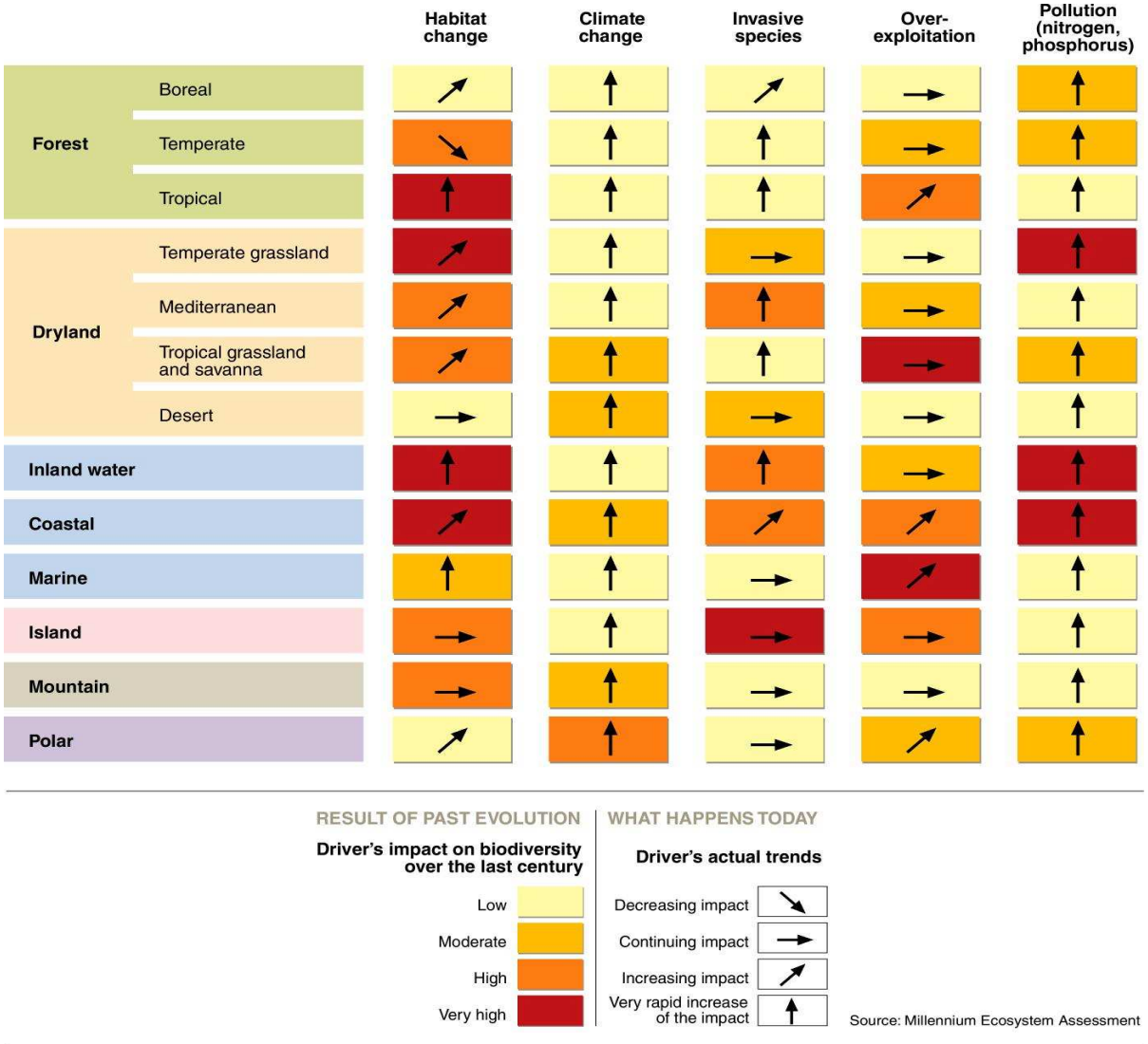


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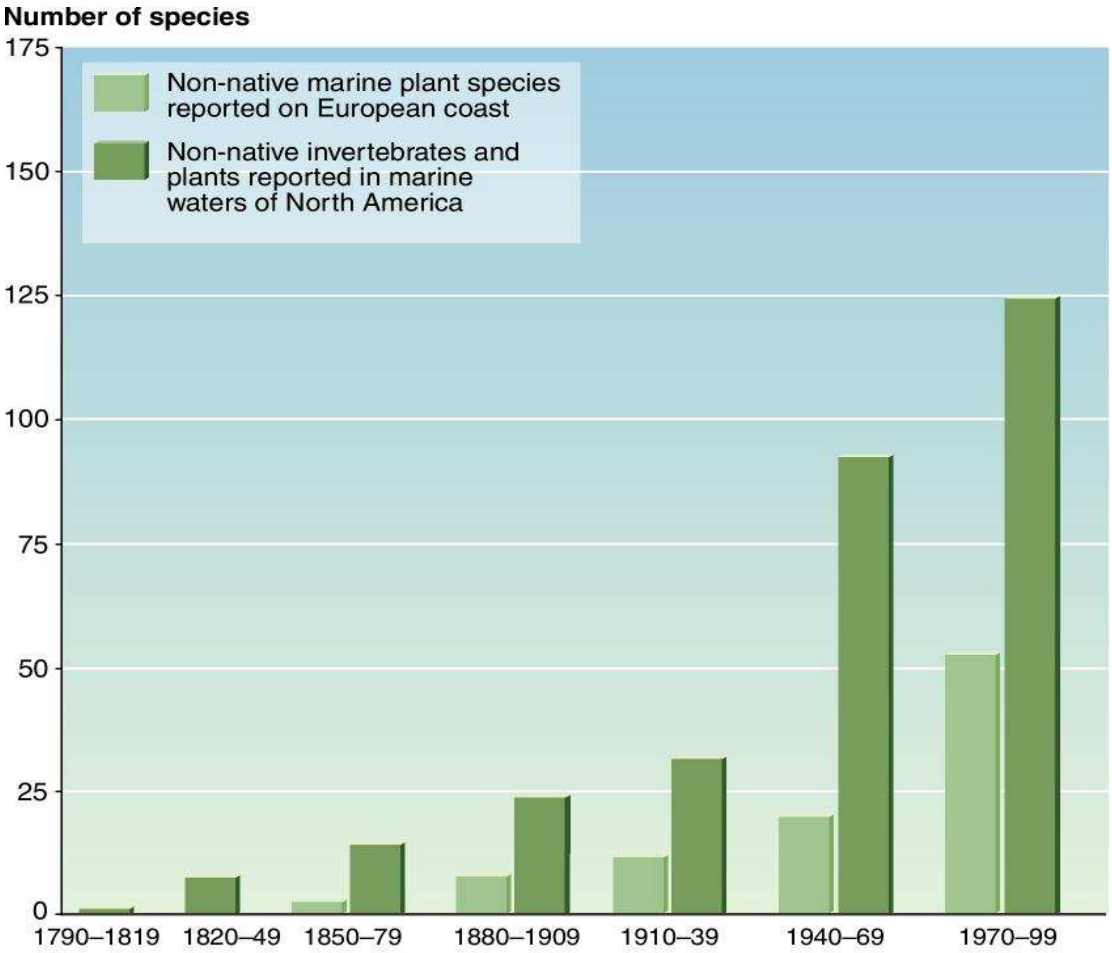
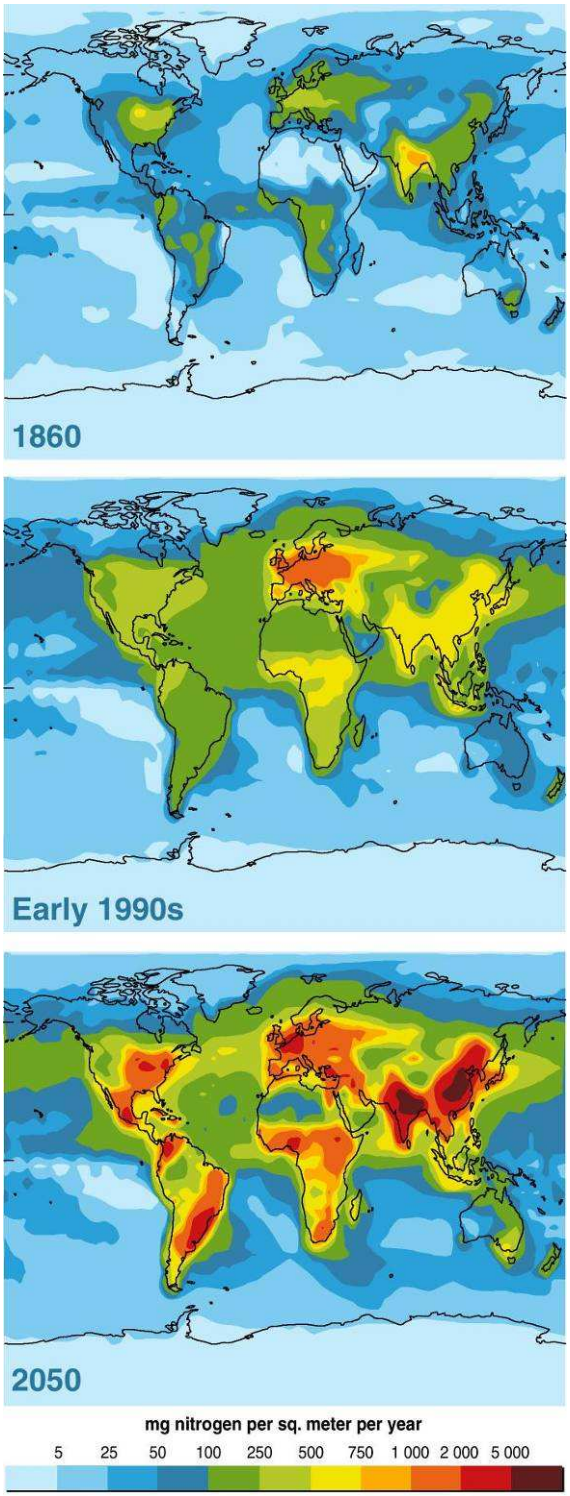
Figure II.21 Growth in number of marine species introductions.



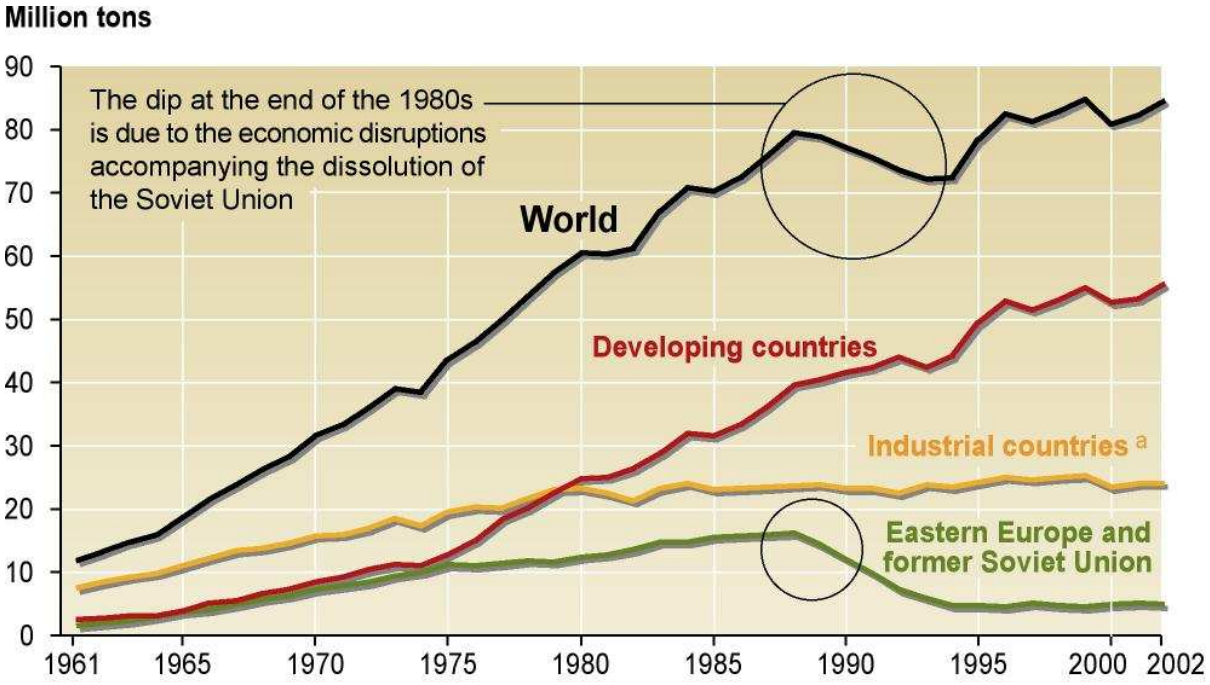
Source: Millennium Ecosystem Assessment

Figure II.22: Estimated Total Reactive Nitrogen Deposition from the Atmosphere (Wet and Dry) in 1860, Early 1990s, and Projected for 2050 (milligrams of nitrogen per square meter per year). Atmospheric deposition currently accounts for roughly 12% of the reactive nitrogen entering terrestrial and coastal marine ecosystems globally, although in some regions, atmospheric deposition accounts for a higher percentage (about 33% in the United States). (Source: MA Biodiversity Synthesis Report)



Source: Galloway et al. 2004

Figure II.23. Trends in global use of nitrogen fertiliser 1961-2002



[a] excluding Eastern Europe and former Soviet Union

Source: Millennium Ecosystem Assessment

Figure II.24: Historical and Projected Variations on Earth's Surface Temperature (Source: IPCC)

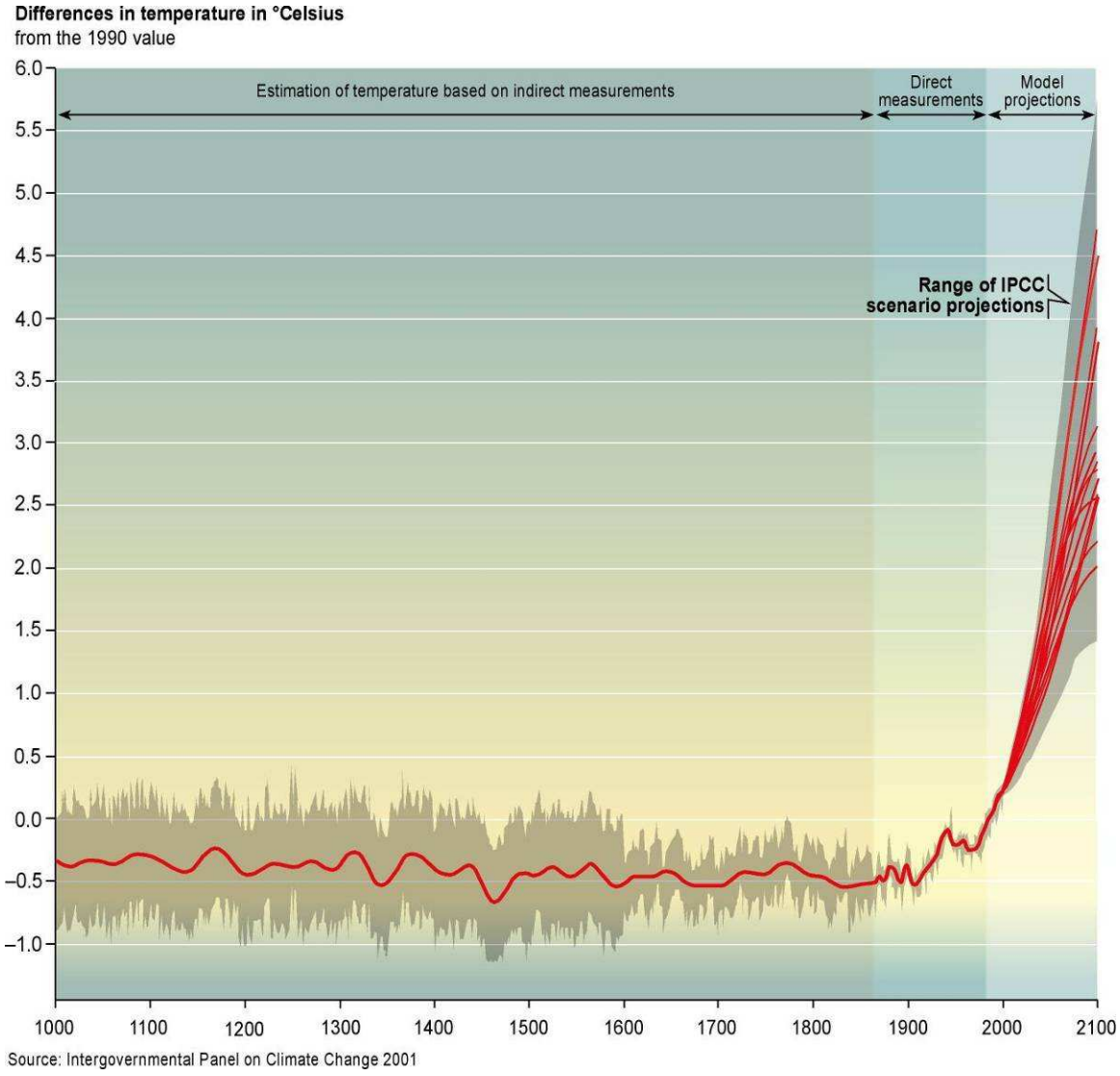


Table II.1: Forest area by region 2000 (Source: FAO FRA 2000)

Region	Land area	Total forest (natural forests and forest plantations)				Natural forest	Forest plantation
	million ha	*Million ha*	% of land area	% of all forests	Net change 1990-2000 *million ha/year*	*million ha*	*million ha*
Africa	2 978	650	22	17	-	642	8

					5.3		
Asia	3 085	548	18	14	-0.4	432	116
Europe	2 260	1 039	46	27	0.9	1 007	32
North and Central America	2 137	549	26	14	-0.6	532	18
Oceania	849	198	23	5	-0.4	194	3
South America	1 755	886	51	23	-3.7	875	10
WORLD TOTAL	**13 064**	**3 869**	**30**	**100**	**-9.4**	**3 682**	**187**

Note: Changes are the sums of reported changes by country.

BOX 1: Ecological footprints – a measure of carrying capacity

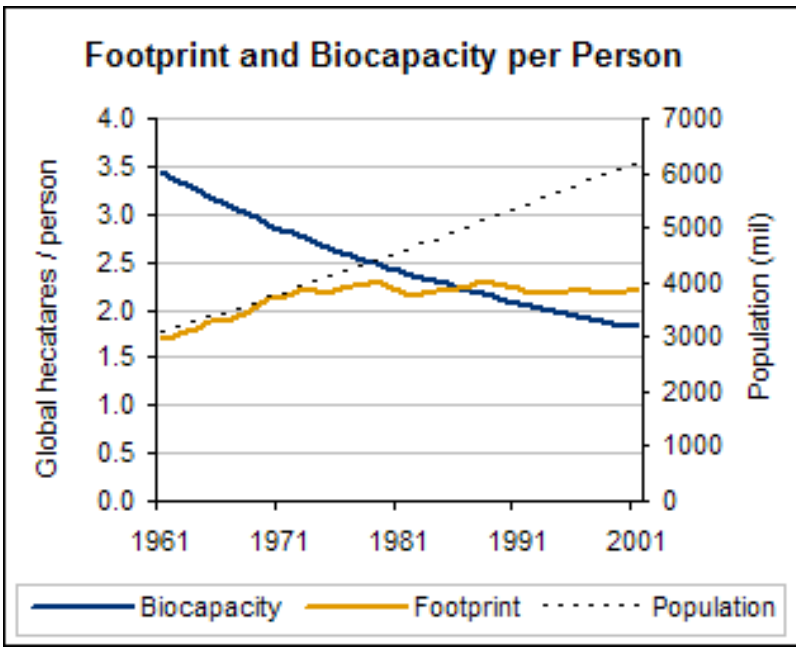
The ecological footprint is an estimate of how much land and water area is required to sustain a human population. It incorporates requirements of both producing the resources a population consumes, and absorbing its wastes. The measure takes into account available technologies, such as wastewater treatment facilities, or agricultural technologies, and aims to provide a quantitative indication of sustainability. Ecological footprints can be calculated at different scales, and a range of methodologies are available and used to calculate footprints for the global population, for regions, countries, cities, and individuals.

At a global scale, the ecological footprint compares the total requirements of the human population with the carrying capacity of the planet, expressed in terms of its capacity to renew resources. Figure 1 shows the ratio between the global demand for goods and services from a growing human population, and the changing capacity of the planet to supply these services (expressed in terms of "number of Earths" required to support the global population - the "biocapacity" of the Earth always being 1, represented by the horizontal line). The growing human population (which has doubled since the early 1960's) has moved from using, in net terms, half the planet's biocapacity in the early 1960s to approximately 1.2 times the Earth's biocapacity in 2001. Although methodologies vary, it is widely considered that the global ecological footprint exceeded the biocapacity of the planet at some time between the late 1970s and the mid 1980s.

Box Figure 1. Global ecological footprint, 1961-2001. (Source: Global Footprint Network)

The ecological footprint is determined by both the number of individuals, and per capita consumption and waste production. Although at a global scale the footprint has increased over the last 40 years, the global per capita footprint has remained fairly stable, and may even have decreased over the last 20 years. Figure 2 shows the global per capita ecological footprint and biocapacity since 1961, comparing this to the growth of the human population.

Box Figure 2. Per capita footprint and biocapacity, 1961-2000. (Source: Global Footprint Network)



The relative importance of population size and level of consumption is particularly apparent at the regional scale. For example the population of North America has the highest per capita ecological footprint, although the Asia-Pacific region has by far the highest overall ecological footprint. Ecological footprints have been calculated for a wide variety of cities. The city of Vancouver in Canada, for example, has a footprint more than 170 times larger than its urban area, and the aggregate footprint of 29 cities in the Baltic Sea drainage area is approximately 200 times larger than the cities themselves.

Sources:

Global Footprint Network, www.footprintnetwork.org

WWF, Global Footprint Network and IUCN. 2005. *Europe 2005. The Ecological Footprint.* Bruxelles, Belgium. www.global-vision.org/city/footprint.html

END OF BOX

SECTION III - RESPONDING TO BIODIVERSITY LOSS: 2010 AND THE CBD

Main Messages

- A wide range of mechanisms for responding to biodiversity loss has been implemented, to various degrees, at the international and national levels. While global and regional mechanisms provide essential frameworks for action, it is at the national and local level where activities for the conservation and sustainable use of biodiversity are most needed and most effective.
- Due to the lack of well-developed targets and indicators, it is often difficult to assess the effectiveness of response mechanisms. For measuring its success at the national level, the CBD depends in particular on an efficient national reporting system.
- If current measures developed within the CBD were more fully implemented, the rate of loss of biodiversity would undoubtedly be reduced. However, further measures are required to deal with the indirect drivers of biodiversity loss.
- The national implementation of global and regional agreements requires sufficient capacity and resources, including the communication of information, which would be more fully supported by increased cooperation between multilateral environmental agreements.
- Addressing direct drivers of biodiversity loss – in particular habitat change, overexploitation invasive species, climate change and pollution– through a range of local and national activities, as well as through regional and global cooperation, has been partially successful. However, the lack of integration of biodiversity concerns into those sectors that impact heavily on biodiversity remains one of the major obstacles for conservation and sustainable use. Improvements are particularly required for cooperation with the private sector.
- There is still a need to more fully demonstrate the links between the sustainable use and conservation of biodiversity and development. This relationship is currently not adequately reflected in planning for development, nor in the allocation of overseas development aid to biodiversity initiatives.

III.1 Introduction

A wide range of mechanisms already exists to address the loss of biological diversity, including local, national, regional and global practices, initiatives, projects and agreements. They are variously implemented by a variety of stakeholders ranging from local and indigenous organisations to the private sector, and from non-governmental organisations (NGOs) to governments, government agencies, intergovernmental organisations and governing bodies of agreements. However, as section II has demonstrated, the rate of loss of biodiversity shows no sign of slowing in most places, suggesting that current mechanisms for reducing the loss of biodiversity are either not fully implemented, are not effective, or are not sufficient in themselves to fully respond to the global loss of biodiversity.

This section provides an overview of the implementation of the CBD, indicating progress made in shifting emphasis from policy formulation to implementation. It explores current mechanisms in place that aim to address the trends highlighted in section II. With the adoption of the Strategic Plan and the seven focal areas (see section I), the Convention has developed a framework for the evaluation of achievements and progress in its implementation. Chapter III.2 of this section relates to these focal areas, while chapter III.3 looks at mechanisms responding to the four goals of the Strategic Plan.

Each of the thematic programmes of work of the CBD (see section II.1) establishes a vision and basic principles to guide future work; sets out key issues for consideration; identifies potential outputs; and suggests a timetable and means for achieving these outputs. Parties, the Secretariat, and relevant organisations contribute to the implementation of the thematic programmes of work, which are periodically reviewed and revised by the Conference of the Parties, following suggestions by the Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA).

The Conference of the Parties (COP) has also initiated work on key cross-cutting issues, which correspond to many of the issues addressed in the Convention's substantive provisions (Articles 6-20) (see table III.1). Work on cross-cutting issues serves to support and complement the thematic programmes of work.

Table. III.1: Cross-cutting issues addressed by the Convention on Biological Diversity

Access to genetic resources and benefit-sharing	Impact assessments
Invasive alien species	Indicators
Biological diversity and tourism	Liability and redress
Climate change and biological diversity	Protected areas
Economics, trade and incentive measures	Public education and awareness
Ecosystem approach	Sustainable use of biodiversity
Global Strategy for Plant Conservation	Technology transfer and cooperation
2010 biodiversity target	Traditional knowledge, innovations and practices
Global Taxonomy Initiative	

Work on cross-cutting issues has resulted in a number of principles, guidelines and other tools to facilitate the implementation of the Convention (see table III.2), which have been developed on the basis of expert technical and legal advice.

Table. III.2: Principles, Guidelines and other Tools Developed under the Convention
Description, Principles and Operational Guidelines for the Ecosystem Approach
Bonn Guidelines on Access to Genetic Resources and Fair and Equitable Sharing of the Benefits Arising out of their Utilization
Addis Ababa Principles and Guidelines for the Sustainable Use of Biodiversity
Guiding Principles on Invasive Alien Species
Akwé: Kon Voluntary Guidelines for the Conduct of Cultural, Environmental, and Social Impact Assessment regarding Developments Proposed to Take Place on, or which are Likely to Impact on, Sacred Sites and on Lands and Waters Traditionally Occupied or Used by Indigenous and Local Communities
Guidelines for Incorporating Biodiversity-related Issues into Environmental Impact Assessment Legislation and/or Processes and in Strategic Environmental Assessment
Guidelines on Biodiversity and Tourism Development
Proposals for the Design and Implementation of Incentive Measures
Proposals for the Application of Ways and Means to Remove or Mitigate Perverse Incentives
2010 Framework
Global Strategy for Plant Conservation

The Convention has developed a range of mechanisms for implementation. The Global Environment Facility (GEF) operates the financial mechanism. The Clearing-House Mechanism (CHM) was established by the COP to promote and facilitate technical and scientific cooperation, and COP 6 in 2002 adopted the Programme of Work for the Global Initiative on Communication, Education and Public Awareness (CEPA). In addition, the CBD Secretariat has produced a wide range of publications, including reports from the Conference of the Parties in six languages, news from the Convention, brochures, booklets, leaflets and CD-ROMs, to assist in communicating the work of the Convention, and the issues covered within its objectives.

Although many mechanisms have been developed to help reduce the rate of loss of biodiversity, it is on the whole extremely difficult to measure their success. This is largely because linking responses directly to indicators of biodiversity status and trends, in particular at the national level is problematic. Long-term data on trends in biodiversity, and on the application of particular instruments are widely lacking. In addition, for most of the tools developed under the auspices of the CBD, it is too early to draw any lessons about the degree to which Parties have implemented them at all, let alone their effectiveness. This is particularly true for the more elaborate instruments, such as the recently adopted thematic programmes of work, or the guidelines on sustainable use, on benefit-sharing, on invasive alien species, and on the ecosystem approach.

Several of the more recently developed CBD tools have incorporated targets and, to some extent, biodiversity indicators. Parties are being urged to develop further targets and indicators at the national level, and although the extent to which this has occurred remains largely unknown, the use of targets and indicators at the national level will contribute enormously to measuring the success of biodiversity mechanisms in the future.

National reports are the main mechanism by which Parties report on their implementation of international agreements. However, the current systems of national reporting for many agreements, including the CBD, have fallen short of providing a comprehensive overview of the status of implementation. The recent suggestions for streamlining reporting on implementation of the CBD and the other biodiversity-related conventions in the light of the 2010 target promise to lead to significant improvements in this regard, particularly through the development of harmonized approaches to reporting between conventions.

At the core of efforts to implement agreements are national initiatives undertaken by Parties, in many cases working in cooperation with non-governmental and indigenous organisations as well as academia and the private sector. The main mechanism for addressing the implementation challenges for the CBD are the National Biodiversity Strategies and Action Plans, which Parties have developed in accordance with Article 6a of the Convention. This is highlighted in the third strategic goal of the Strategic Plan, and presented here in chapter III.3.3.

III.2 Responding to the 2010 biodiversity challenge

The seven parts to this chapter consider mechanisms that address the seven focal areas of the CBD. The chapter focuses on global and regional mechanisms, while national mechanisms are further highlighted in chapter III.3. However, national activities are at the core of achieving global agendas. Indeed the success of global and regional mechanisms is only possible if they are implemented at a national level. This chapter therefore gives a framework that sets national mechanisms into a wider context.

The seven focal areas are not distinct and separate, and hence there is some need for cross-referencing between the various parts of this chapter. For example, habitat change and protected areas are considered under the first focal area, addressing the loss of components of biodiversity (III.2.1), but they are of course also relevant for addressing threats to biodiversity (III.2.3), and other focal areas.

III.2.1 Addressing the loss of components of biodiversity

This part addresses mechanisms within the first focal area of decision VII/30, reducing the rate of loss of the components of biodiversity, including biomes, habitats and ecosystems; species and populations; and habitat change. It focuses on protected areas and habitat change.

III.2.1.1 Protected areas

> 'The establishment of an integrated protected areas system is the centerpiece response of the Philippine government to protect and conserve its biodiversity resources'. *The Philippines Second National Report*

A protected area is defined as an area of land and/or sea especially dedicated to the protection and maintenance of biodiversity and of natural and associated cultural resources, managed through legal or other effective means. Protected areas have been identified as integral components of all thematic programmes of work of the CBD. Article 8 of the CBD requests Parties to establish a system of protected areas or areas where special measures need to be taken to conserve biodiversity. In addition, Parties are asked to develop guidelines for the selection, establishment and management of protected areas. The Global Strategy for Plant Conservation includes the targets, to be achieved by 2010, of, *inter alia*, at least 10% of each of the world's ecological regions effectively conserved, and protection of 50% of the most important areas for plant diversity assured. In acknowledging that protected areas will contribute to reducing the rate of loss of biodiversity, as well as the Millennium Development Goals, the 7th Conference of the Parties to the CBD adopted a Programme of Work on Protected Areas. The programme of work contains a number of targets, *inter alia*, to establish by 2010 terrestrially, and by 2012 in the marine area, a global network of comprehensive, representative and effectively managed national and regional protected area systems. The COP identified a large number of partners and collaborators for the implementation of the programme of work, including conventions, UN agencies, international organisations, non-governmental organisations, indigenous and local communities, and the private sector.

Protected areas have become a key response to biodiversity loss, forming the cornerstones of many National Biodiversity Strategies and Action Plans. As a result, the majority of Parties to the CBD have identified protected areas as the most obvious contribution towards achievement of the

first objective of the convention. Protected areas also address to various extents all seven focal areas of decision VII/30 and are subject to two of the targets under the first of those focal areas:

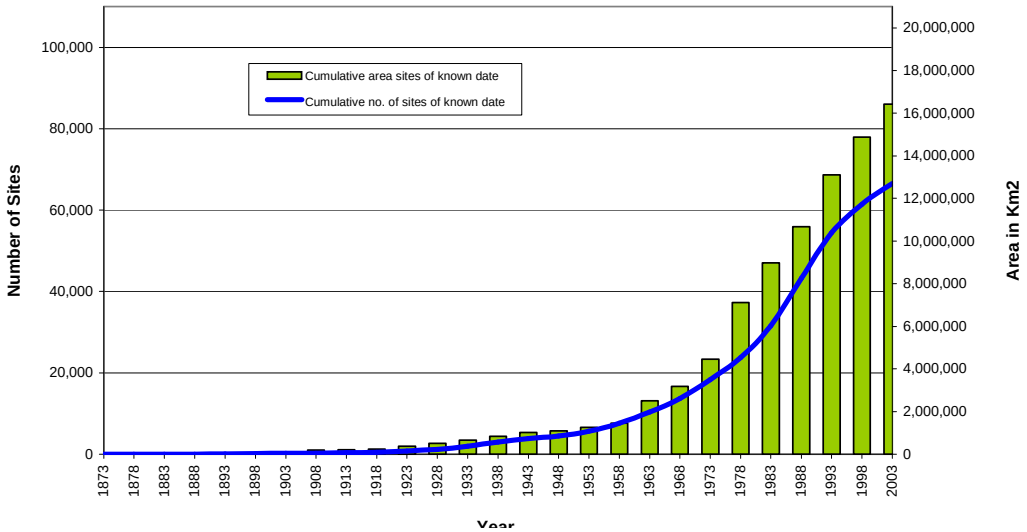
- At least 10% of each of the world's ecological regions effectively conserved.
- Areas of particular importance to biodiversity protected.

Coverage of protected areas has been identified as an indicator for immediate testing for the first focal area of decision VII/30, and as a key indicator for target 9 of MDG7, ensuring environmental sustainability.

All countries have systems of protected areas, and there are many other regional and global agreements and programmes that both promote the establishment of protected areas and give international recognition to specific sites. It is therefore not surprising that the number of protected areas, and the area that they cover has continued to rise year after year, a trend that is recorded in the World Database on Protected Areas and regularly published in the United Nations List of Protected Areas. Protected areas currently cover about 12% of the Earth's land surface, but only 0.5% of the world's marine areas. The largest number and area for marine protected areas are those within IUCN's World Commission on Protected Areas category VI, and are managed mainly for sustainable use of natural resources.

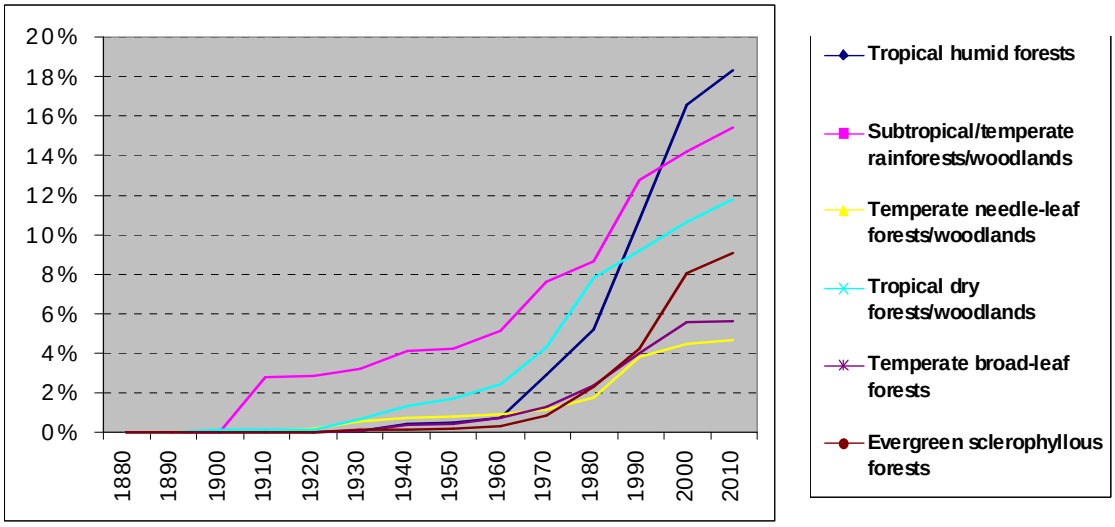
Protected area coverage has several advantages as an indicator: data are regularly compiled and stored, in the World Database of Protected Areas; the surface area can be calculated and analysed at various scales and in relation to different political or biogeographic features and to different categories of protected area; and the concept of protected area coverage as a means towards biodiversity conservation can be effectively communicated. However, the growth in number and area of protected areas (figure III.1) is a fairly crude indicator in itself, and a potentially misleading one if not interpreted in the context of other information, as it does not take into account the level of protection afforded (the management category), or the effectiveness of management. The development of an indicator to measure effectiveness of protected area management would contribute enormously to an understanding of the role of protected areas in reducing the rate of loss of biodiversity.

Figure III.1: Growth of the protected area network



Several recent analyses have demonstrated that current protected area systems do not adequately cover key components of biodiversity. For example, figure III.2 demonstrates increase in the proportion of each biome covered by protected areas over time for six of 14 terrestrial biomes, illustrating the substantial differences in coverage between biomes, and highlighting the need for a more systematic approach to protected areas establishment.

Figure III.2 Coverage of major biomes by protected areas over time



At the species level, analyses carried out for the 2003 World Parks Congress demonstrated that at least 300 critically endangered species, and at least 237 endangered and 267 vulnerable species of bird, mammal, turtle and amphibian have no protection in any part of their ranges, suggesting that an additional indicator would be useful, based on the percentage of species whose ranges overlap with protected areas. Such an indicator is in need of further development. Another approach would be to consider the protected area coverage of key biodiversity areas such as the Important Bird Areas identified by BirdLife International, or the Important Plant Areas identified by PlantLife International. These are sites identified according to agreed international criteria based on threat and geographical concentration. Again, overlay of mapped information on these sites and on protected areas will give percentage protection, which could provide a baseline for a future indicator.

Each of these approaches demonstrate the need for systematic planning of protected area networks, as called for both by Article 8 of the CBD, and the Programme of Work on Protected Areas. They also emphasise the importance of considering international issues and priorities in national conservation planning, including the development of ecological networks and corridors between protected areas, and within migratory pathways.

Parties have identified the following constraints to establishing and effectively managing protected areas:

- Weak policy, regulatory and institutional mechanisms
- Inadequate financial resources
- Gaps in biodiversity research
- Insufficient involvement of local communities
- Inadequate marketing strategies for wildlife-related resources
- Inadequate disaster preparedness mechanisms.

The following options would substantially improve the capacity of protected areas to contribute to reducing the rate of loss of biodiversity:

- Sustainable financing of protected area systems and individual protected areas, including through using the full range of revenue generation options and removing policy and institutional barriers
- Adequate capacity of protected area managers and institutions
- Application of scientific and traditional knowledge to protected area planning and management
- Inclusion of protected areas in development cooperation through an ecosystem and multisectoral approach
- Ensuring the fair and equitable sharing of costs and benefits of protected areas
- Improved design of protected area systems and individual protected areas, including through the use of all the IUCN protected area management categories and their integration into land and water use planning, taking future impacts of climate change into account, and integrating marine and coastal areas
- Improved monitoring of protected areas, the components of biodiversity within protected areas, and the effectiveness of protected area management.

III.2.1.2 Habitat change

Large-scale habitat modification around the world has had the most significant impact on biodiversity over past centuries, and continues to contribute significantly to biodiversity loss. Current rates of habitat change are most rapid in subtropical and tropical ecosystems, although knowledge on the status of such ecosystems is largely limited to terrestrial systems. Much less is known about the status and dynamics of many marine systems, such as seamounts and cold-water coral reefs, and inland water systems.

Each of the thematic work programmes of the CBD address habitat change (table III.3). Of particular importance are the CBD Guidelines for Incorporating Biodiversity-related Issues into Environmental Impact Assessment Legislation and/or Process and in Strategic Environmental Assessment, adopted by COP 6, and the Akwé:Kon Voluntary Guidelines for the Conduct of Cultural, Environmental and Social Impact Assessments Regarding Developments Proposed to Take Place on, or which are Likely to Impact on, Sacred Sites and on Lands and Waters Traditionally Occupied or Used by Indigenous and Local Communities, adopted by COP 7.

Table III.3: Major examples of issues related to habitat change addressed in the CBD thematic programmes of work

Programme of work	Issues related to habitat change
Marine & Coastal Biodiversity	Integrated marine & coastal area management
	Marine & coastal protected areas
	Work Plan on Coral Bleaching: identification & testing of management regimes
Inland Water Biodiversity	Integration of biodiversity concerns into all relevant sectors of water-resource and river-basin management, taking into account the ecosystem approach
	Establishment of comprehensive systems of protected inland water ecosystems within the framework of integrated catchment / watershed / river-basin management
	Rehabilitation and restoration of degraded ecosystems

Forest Biodiversity	Application of the ecosystem approach to forests both inside and outside protected forest areas as well as both in managed and unmanaged forests
	Reduction of the threats and mitigation of the impacts of threatening processes on forest biodiversity
	Protection, recovery and restoration of forest biodiversity
Agricultural biodiversity	Identification of management practices, technologies and policies that promote the positive and mitigate the negative impacts of agriculture on biodiversity
	Enhancement of productivity and the capacity to sustain livelihoods
Dry and sub-humid lands	Use and establishment of protected areas
	Development of further specific measures for biodiversity conservation in dry and sub-humid lands
	Rehabilitation or restoration of the biodiversity of degraded dry and sub-humid lands
	Sustainable management of dry and sub-humid land production systems
	Appropriate management and sustainable use of water resources
Mountain biodiversity	Prevention and mitigation of negative impacts of key threats to mountain biodiversity
	Protection, recovery and restoration of mountain biodiversity

The conservation of habitats and addressing threats to habitats is at the heart of a range of biodiversity-related conventions. The Ramsar Convention on Wetlands has adopted a number of guidelines that address the challenges of habitat change, addressing, *inter alia*, laws and institutions, integrated coastal zone management, management planning for Ramsar sites, National Wetland Policies, peatlands, river basin management, and the allocation of water for maintaining the ecological functions of wetlands. The Convention has put a focus on wetland restoration, and has adopted Principles and Guidelines for Wetland Restoration to this end. The Ramsar Wetland Risk Assessment Framework identifies types of change in the ecological character of wetlands and steps to be taken to assess the risks to wetlands, including early warning indicators. The Ramsar COP has asked Parties to make use of the CBD Guidelines for Incorporating Biodiversity-related Issues into Environmental Impact Assessment legislation and/or Processes and in Strategic Environmental Assessment (resolution VIII.9).

The Convention on Migratory Species (CMS) asks Parties that are Range States to the species listed on CMS Appendix I to conserve and restore those habitats of the species, which are of importance in removing the species from danger of extinction. The CMS COP has emphasised the role of environmental impact assessment (EIA) and strategic impact assessment (SEI) for implementing the Convention, and has asked Parties to include in EIAs and SEIs the consideration of effects involving impediments to migration. The CMS COP has also requested Parties to make use of the CBD Guidelines for Incorporating Biodiversity-related Issues into Environmental Impact Assessment legislation and/or Processes and in Strategic Environmental Assessment.

Although there have been many successes in reducing and reversing (through restoration) habitat loss, section II has demonstrated that the loss of many habitats is continuing. For example, governments from industrial and developing countries alike have been unable to reduce the loss of forests, in particular lowland rainforest, dry forests and cloud forests in tropical and subtropical regions. The reasons for this ongoing loss, a major cause of extinction of species and genetic diversity, are complex. Most of them refer to indirect drivers of biodiversity loss, including the lack of political will, for example regarding the control of imports of illegally harvested wood and wood products into industrial countries; the prevalence of corruption; and the lack of acknowledgement of indigenous land rights.

Wider availability of information on the multitude of instruments addressing habitat change, and on their application at the international, regional, national and local level would enable more effective decisions to be made in managing habitats around the world, and would contribute to the objective of the Clearing-House Mechanism (CHM) of the CBD, to promote and facilitate technical and scientific cooperation.

III.2.2 Promoting sustainable use of biodiversity

The sustainable use of the components of biodiversity is the second objective of the Convention, and has been identified as the second focal area for the framework for evaluation of progress in implementing the Strategic Plan (decision VII/30). Sustainable use is a significant tool to promote conservation of biodiversity as it often provides incentives for conservation due to the social, cultural and economic benefits derived from such use. In this regard, sustainable use of biodiversity is also a major contribution to development, and the alleviation of poverty. The current high level of unsustainable use of ecosystems, habitats and species has been presented in Section II. This chapter identifies some of the major mechanisms that the Convention and other actors have developed for the promotion of sustainable use of biodiversity. In addition, it highlights mechanisms to address overexploitation of biodiversity as a major area where sustainable use has become an important tool.

III.2.2.1 Sustainable use of biodiversity

CBD COP 7 in 2004 adopted two important sets of policy guidance on sustainable use. The Addis Ababa Principles and Guidelines for the Sustainable Use of Biodiversity provide a framework for decision-makers, but also for resource managers, indigenous and local communities, and the private sector to ensure that their use of biodiversity will not lead to the long-term decline of biodiversity. The Guidelines on Biodiversity and Tourism Development relate to tourism in vulnerable terrestrial, marine and coastal ecosystems and habitats of major importance for biodiversity and protected areas, including fragile riparian and mountain ecosystems. In addition, a programme of work on the development and implementation of social, economic and legal incentive measures for the conservation and sustainable use of biodiversity was established by CBD COP 5 in 2000. As a first step of its implementation, COP 6 endorsed proposals for the design and implementation of incentive measures, and COP 7 subsequently encouraged Parties to use these proposals to remove or mitigate perverse incentives, and requested SBSTTA to further refine those proposals.

The CBD Global Strategy for Plant Conservation includes the following targets, related to sustainable use, to be achieved by 2010:

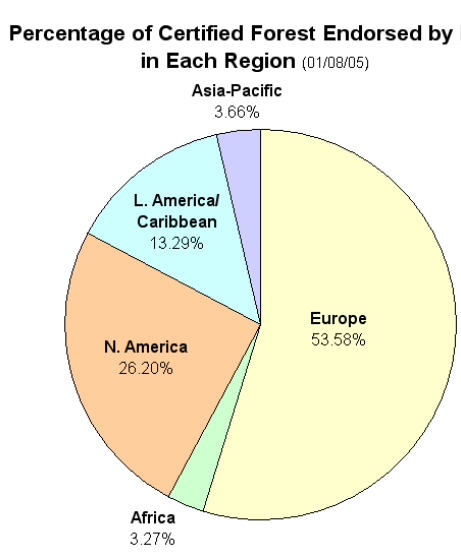
- No species of wild flora endangered by international trade
- 30% of plant-based products derived from sources that are sustainably managed.
- The decline of plant resources, and associated indigenous and local knowledge, innovations and practices that support sustainable livelihoods, local food security and health care, halted.

The CBD has adopted a plan of action for the International Initiative for the Conservation and Sustainable Use of Pollinators. The Initiative aims to promote coordinated action to monitor the

decline in pollinators, its causes and its impact on pollination services; address the lack of taxonomic information on pollinators; assess the economic value of pollination and the economic impact of the decline of pollination services; and promote the conservation and the restoration and sustainable use of pollinator diversity in agriculture and related ecosystems. The Convention has also established an International Initiative for the Conservation and Sustainable Use of Soil Biodiversity within the framework of the programme of work on agricultural biodiversity. The Conference of the Parties has asked FAO to facilitate and coordinate both these initiatives.

CBD decision VII/30 proposed the area of forest, agricultural and aquaculture systems under sustainable management as an indicator for assessing progress towards the 2010 target. Global figures for such an indicator are currently not available. In 2000 however, 93 countries had provided figures to the FAO Global Forest Resources Assessment about the area under forest management plans, with the percentage of the total forest area per country ranging from 0.1 to 100%. The *Forest Stewardship Council* (FSC) is an international network setting international standards for responsible forest management. Under the FSC, as of August 2005, over 57 million hectares, some 1.5% of global forest cover, were certified (see figure III.3 for regional distribution).

Figure III.3 Percentage of certified forests endorsed by the Forest Stewardship Council per region Source: http://www.certified-forests.org/pp_slides/fscglob.ppt



The Marine Stewardship Council (MSC) has developed a certification programme that recognises sustainably-managed fisheries, with the aim to harness consumer preferences. By 2004, ten fisheries were certified by the MSC as sustainable, and a total of 4% of the world's wild fish supply was in the MSC assessment process. A number of national schemes exist for the certification of sustainable agricultural systems, but there is no comprehensive internationally agreed scheme that allows an assessment of the area of agricultural land under sustainable management.

A number of other initiatives also have the potential to contribute significantly to the sustainable use of biodiversity. The Code of Conduct for Responsible Fisheries, adopted by the FAO Conference in 1995, for example, encourages responsible practices with a view to ensure the effective conservation, management and development of living aquatic resources, with due respect for biodiversity. Within the framework of the Code, International Plans of Action (IPOAs) have been developed. They address reduction of the incidental catch of seabirds in longline fisheries; the conservation and management of sharks; the management of fishing capacity; and the prevention, deterring and elimination of illegal, unreported and unregulated fishing.

The World Conservation Union's (IUCN) Sustainable Use Initiative works through 16 regional networks of the IUCN Sustainable Use Specialist Group. The Initiative aims to enhance and share knowledge of the social and biological factors affecting the sustainable use of wild renewable resources, supporting the conservation of biodiversity and alleviation of poverty.

The FAO Global Strategy for the Management of Farm Animal Genetic Resources provides a framework for assistance to countries. The strategy includes a mechanism for policy development and government involvement at the intergovernmental level; a country-based global infrastructure to help countries to plan and implement national strategies for the management of animal genetic resources; and a technical programme assisting effective national action in the sustainable identification, conservation, characterisation and access to animal genetic resources.

The BIOTRADE Initiative aims to stimulate trade and investment in biological resources to further sustainable development in line with the objectives of the CBD. BIOTRADE has established a range of regional and national partnerships in Latin America that have set up programmes to enhance the capability of developing countries to produce value-added products and services derived from the sustainable use of biodiversity for domestic and international markets.

Sustainable use has been successful in particular in cases of managing individual species and in protected areas. Integrating sustainable use in wider ecosystem and natural resources management has been much more challenging. However, the efforts to implement sustainable use on a large scale need to be substantially strengthened. This is particularly true for marine and coastal ecosystems, for inland waters, dry and sub-humid lands, and tropical and subtropical cloud and lowland dry and rainforests.

At the level of conventions and agreements, better coordination and cooperation, as outlined above, would support an improved use of sustainable use mechanisms. An encouraging example is the Collaborative Partnership on Forests (CPF), which brings agreements, such as the CBD, and international organisations of the forest sector together. The CPF supports, *inter alia*, the implementation of the IPF/IFF Proposals for Action. Similar partnerships could be considered for other ecosystem types.

The IUCN Sustainable Use Specialist Group (SUSG) has produced a number of key principles for sustainable use of biodiversity, that if incorporated effectively would greatly assist in the contribution of sustainable use to both the conservation and development agendas:

- The supply of biological products and ecological services available for use is limited by intrinsic biological characteristics of both species and ecosystems, including productivity, resilience and stability, which themselves are subject to extrinsic environmental change.
- Institutional structures of management and control require both positive incentives and negative sanctions, good governance, and implementation at an appropriate scale. Such structures should include participation of relevant stakeholders and take into account land tenure, access rights, regulatory systems, traditional knowledge, and customary law.
- Wild living species have many cultural, ethical, ecological and economic values, which can provide incentives for conservation. Where an economic value can be attached to a wild living species, perverse incentives removed, and costs and benefits internalised, favourable conditions can be created for investment in conservation and sustainable use of the resources.
- Levels and fluctuations of demand for wild living resources are affected by a complex array of social, demographic, and economic factors, and are likely to increase in the coming years. Thus attention to both demand and supply is necessary to promote sustainable use.

III.2.2.2 Overexploitation

Overexploitation is a direct threat to biodiversity at the level of populations and species, and has significant impacts in a range of ecosystems, particularly forests, drylands and marine systems.

A wide range of species is harvested from the wild, to support the demand for food, live animals and plants, and wildlife derivatives, including medicines.

National legislation has long been at the forefront of addressing the overexploitation of wild populations, and international measures have been in place for many decades. Key amongst the response measures is the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). CITES has been particularly successful in establishing a global overview of international trade in threatened taxa and in providing incentives for conservation. The Convention is, however, limited to its scope of regulating only international trade in those taxa on its Appendices, and adding taxa to the Appendices often depends on the results of political negotiations rather than science-based deliberations. Also, the Convention has no jurisdiction over domestic trade, which for many species, such as primates, parrots and songbirds, has become a major threat, and currently has limited jurisdiction over the international trade in timber and fisheries.

An important tool established by CITES is the significant trade review process. This includes the review of the biological, trade and other relevant information on Appendix II species, in order to identify problems with the implementation of the provisions of the Convention and make specific recommendations for particular taxa. The recommendations may include administrative procedures, specific quotas or temporary export restrictions, field studies, and taxon- or country-specific assessments.

CITES COP 11 established a bushmeat working group to address the unsustainable and often illegal international trade in bushmeat. The working group consists of interested range and donor states, with the CBD, FAO and ITTO invited to participate. The group aims to identify the scope of problems relating to bringing bushmeat trade into a sustainable and legal process, identify solutions and facilitate the process of achieving those solutions.

The CBD Expanded Programme of Work on Forest Biological Diversity carries several activities under the objective of preventing losses caused by unsustainable harvesting of timber and non-timber forest resources, including cooperation with CITES on bushmeat. The Global Strategy for Plant Conservation identifies the following target to be achieved by 2010: No species of wild flora endangered by international trade.

For the management of fisheries, many mechanisms have been developed, ranging from strict enforcement of regulations that include the establishment and implementation of quotas, gear restrictions and spatial closures, to marine protected areas and decommissioning schemes. An ecosystem-based approach to fisheries has increasingly been recognised as a particularly useful tool. Of specific importance is the FAO Code of Conduct for Responsible Fisheries, which includes technical guidelines and recommendations. The Code is a voluntary instrument that would benefit from a more comprehensive implementation steered by national implementation plans.

The various instruments addressing overexploitation of biodiversity have proved to be successful for the conservation of a range of species, but others, such as many tropical and subtropical trees, various medicinal plants, rhinoceroses, tigers, fish populations in many parts of the world, and several species of birds continue to be overexploited. The role of local communities in ensuring the sustainability of the exploitation of wild resources has often been overlooked, and many efforts to conserve species threatened by exploitation have benefited from the participation of communities, and attention to the IUCN SUSG principles for sustainable use outlined above.

III.2.3 Addressing threats to biodiversity

The third focal area of decision VII/30 is concerned with addressing the major direct threats to biodiversity. It lists invasive alien species, climate change, pollution and habitat change as major direct drivers of biodiversity loss. Additionally, overexploitation is covered in the second focal area, and addressed here in chapter III.2.2. Mechanisms addressing habitat change have been considered

in chapter III.2.1, and this chapter considers mechanisms that address invasive alien species, climate change and pollution. Table III.4 gives an overview of response measures that the Millennium Ecosystem Assessment has identified in order to address direct and indirect drivers of biodiversity loss.

Table III.4: Some additional response measures identified in the Millennium Ecosystem Assessment to address the direct and indirect drivers of biodiversity or establish enabling conditions for biodiversity conservation and sustainable use

Ecosystem restoration
Payments and markets for biodiversity and ecosystem services
Incorporating considerations of biodiversity conservation into management practices in sectors such as agriculture, forestry, and fisheries
Enhancement of human and institutional capacity for assessing the consequences of ecosystem change for human well-being and acting on such assessments
Elimination of subsidies that promote excessive use of ecosystem services (and, where possible, transfer of these subsidies to payments for non-marketed ecosystem services)
Sustainable intensification of agriculture
Addressing unsustainable consumption patterns
Slowing and adapting to climate change
Slowing the global growth in nutrient loading
Correction of market failures and internalization of environmental externalities that lead to the degradation of ecosystem services
Integration of biodiversity conservation and development planning
Increased transparency and accountability of government and private-sector performance in decisions that affect ecosystems, including through greater involvement of concerned stakeholders in decision-making

III.2.3.1 Invasive alien species

Invasive species have increasingly been identified as major contributors to biodiversity loss and in recent years, the efforts to control invasive species have significantly increased, particularly in many island States. The international community has increasingly recognised that the problem requires mechanisms to allow for information and experience exchange, capacity development and further joint efforts. However, in particular due to the ever-growing international trade, current efforts have not managed to keep pace with the rate of spread of invasive species.

The CBD, in Article 8h, requests Parties to prevent the introduction of, control or eradicate those alien species which threaten ecosystems, habitats or species. The COP has recognised the particularly damaging impacts that alien species can have on the native biodiversity of geographically and/or evolutionary isolated ecosystems, such as small islands (decision IV/1C). COP 6 adopted Guiding Principles for the Prevention, Introduction and Mitigation of Impacts of Alien Species that Threaten Ecosystems, Habitats or Species. The COP also urged Parties and other Governments to review relevant policies, legislation and institutions in the light of the Guiding Principles; to consider the potential effects of global change on the risk of invasive alien species to biodiversity and related ecosystem goods and services; and to promote and carry out research and assessments on invasive alien species. Importantly, the COP also established or offered cooperation on the issue with a range of other conventions such as the Ramsar Convention and the International

Plant Protection Convention, World Trade Organization, UN agencies, and the Global Invasive Species Programme.

The International Plant Protection Convention has developed phytosanitary standards that cover some of the CBD's concerns on invasive alien species. The International Convention on the Control and Management of Ships' Ballast Water and Sediments, adopted in 2004 by the International Maritime Organization, but not yet in force, aims to prevent, minimise and ultimately eliminate the transfer of harmful aquatic organisms and pathogens through the control and management of ships' ballast water and sediment. The basic mechanism for implementation will be ballast water management plans for each vessel.

The Global Invasive Species Programme (GISP) was established in 1997 to support the implementation of Article 8h of the CBD. GISP is a partnership of a wide range of organisations from around the world. It promotes the sharing of best practices on invasive species issues, through enabling information exchange and networking. Together with IUCN, GISP has developed a Global Strategy on Invasive Alien Species.

The considerable experience in dealing with invasive alien species gained over the past decades has demonstrated that prevention is a much more effective, and often cheaper, solution than efforts to eradicate or control invasive species once they are established. The same is true for eradication in early stages of the spread of invasive species compared to later stages. With the dramatic increase of global trade, however, prevention is becoming ever more difficult, as increasing numbers of invasive species, subspecies and genotypes are being spread and introduced around the world.

Successful eradication of introduced invasive species often depends on a holistic approach, taking ecological, biological and socio-economic aspects into account. The latter is particularly important. For example, people living in affected areas and the general public need to understand the problems that invasives are causing as well as the measures taken for their control.

The increasing number of international mechanisms that aim to address the problems brought about by invasive species require both sufficient resources for implementation, but also increased cooperation between them. In addition, there are still gaps in the range of mechanisms that have been developed that need to be addressed. Many such gaps have been identified by the CBD Ad Hoc Technical Expert Group on Gaps and Inconsistencies in the International Regulatory Framework on Invasive Alien Species, meeting in May 2005, and COP 8 in 2006 is expected to review them and make proposals for how to fill them.

III.2.3.2 Pollution

Pollution constitutes a major driver of biodiversity loss through increased presence of toxic substances, but also through the impacts on ecosystems of increased nutrients, and particularly nitrogen (see section II). Although levels of pollution are not well recorded globally, many industrial countries have assembled information over several decades on many important pollutants. Action to reduce pollution has been widely taken in industrial countries, but to a much lesser extent in the developing world. International instruments and support for pollution reduction and regulation measures are likely to be particularly important to assist in many countries' efforts to reduce levels of pollution.

Although the CBD has not addressed pollution directly, each of the thematic programmes of work has identified activities required to reduce the impact of pollution on biodiversity (see table III.5).

Table III.5: Major examples of issues related to pollution addressed in the CBD programmes of work

Programme of work	Issues related to pollution

FOREST BIODIVERSITY	Mitigating the impact of pollution such as acidification and eutrophication on forest biodiversity
Marine & coastal biodiversity	Promote action to reduce and control sea-based sources of pollution
	Achieve substantial progress in protecting the marine environment from land-based activities through effective application of the Global Programme of Action for the Protection of the Marine Environment from Land-based Activities and other instruments
Inland water biodiversity	Identify and remove the sources, or reduce the impacts, of water pollution (chemical, thermal, microbiological or physical) on the biological diversity of inland waters
Mountain biodiversity	Identification of local and long-range pollution (air, water and soil), which threaten mountain biodiversity at all levels and for taking appropriate measures to prevent and mitigate the impacts
Agricultural biodiversity	Comprehensive analyses of the impacts of agricultural production, including their intensification and extensification, on the environment and identification of ways to mitigate negative and promote positive impacts

The increasing number of chemicals-related agreements (table III.6) and initiatives has led to suggestions of a more strategic approach to the management of chemicals at the global level. In 2002, the UNEP Governing Council proposed the further development of a Strategic Approach to International Chemicals Management (SAICM), which is to culminate in a final International Conference on Chemicals Management in 2006. The International Nitrogen Initiative, established in 2003, aims to optimize the use of nitrogen in food production, while minimizing its negative impacts on human health and the environment. The activities of the Initiative include scientific assessments, development of solutions to a variety of nitrogen-related problems, and interaction with policy-makers.

Table III.6: List of international agreements in the field of chemicals

Agreement	Year of adoption	Year of entry into force	No. of Parties	Scope
Stockholm Convention on Persistent Organic Pollutants	2001	2004	106	Prohibition, elimination and/or restriction of persistent organic pollutants
Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade	1998	2004	97	Information exchange on hazardous chemicals and the national decision-making process on future import and export
Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal	1989	1992	165	Protection of human health and the environment from the adverse effects that may result from handling,

				transporting and disposing of hazardous and other wastes
Vienna Convention on the Protection of the Ozone Layer	1985	1988	190	Intergovernmental cooperation on research, systematic observation of the ozone layer, monitoring of chlorofluorocarbon production and the exchange of information
Montreal Protocol on Substances that Deplete the Ozone Layer	1987	1989	189	Phasing out of substances that deplete the ozone layer

Successfully addressing the spread of pollutants via waterways requires an integrated approach that takes watersheds and river basins into account. The River Basin Initiative is a global activity under the CBD and the Ramsar Convention joint work plan (2002-2006), designed to support Parties in implementing the CBD programme of work on inland water biodiversity and the Ramsar Guidelines for integrating wetland conservation and wise use into river basin management. The Initiative operates through cross-sectoral partnerships at local, country and international scales. At the regional level, the EU Water Framework Directive, adopted in 2000, aims to achieve a 'good status' for all waters within the European Union. It addresses the issue of water management at the river basin level, beyond administrative or political boundaries, and takes the combined approach of emission limit values and quality standards.

Although pollution has been very effectively addressed for a range of pollutants in many industrial countries, eutrophication from agricultural and other sources of nutrient loading remains a very severe problem in many aquatic systems around the world. The range of agreements does not yet cover the full range of chemicals that potentially contribute to the loss of biodiversity. To effectively address eutrophication, for example, the extensification of nitrogen-intensive agriculture in the industrial world needs to be further promoted, including through appropriate incentive measures.

III.2.3.3 Climate change

Climate change is set to become one of the most important drivers of biodiversity loss in the decades ahead, and already is having an important negative impact on biodiversity in many parts of the world. Climate change is a major challenge for efforts to reduce the loss of biodiversity, requiring especially strong global and regional cooperation. This includes both efforts to reduce emissions of greenhouse gases, and efforts to ensure that measures developed in response to climate change, for example under the United Nations Framework Convention on Climate Change (UNFCCC) and its Kyoto Protocol, do not themselves contribute to the loss of biodiversity. In addition, ecosystems need to be managed in a way that enables adaptation to the predicted future impacts of climate change.

The Intergovernmental Panel on Climate Change (IPCC) is the key mechanism by which information on climate change, and its impacts on both biodiversity and people is assessed, and communicated to decision makers. Within the CBD, an Ad Hoc Technical Expert Group on Biological Diversity and Climate Change has assessed the interlinkages between biodiversity and climate change, and concluded that there are significant opportunities for mitigating climate change, and for adapting to climate change while enhancing biodiversity conservation. The group also identified a suite of tools that can help decision-makers assess the likely impacts and make informed choices, and examined the likely impacts of adaptation options in terrestrial and aquatic

ecosystems, stressing the importance of the ecosystem approach. CBD COP 7 invited Parties to take a synergistic approach when implementing the UNFCCC and its Kyoto Protocol, and the CBD.

The Ramsar Convention on Wetlands, at COP 8, comprehensively addressed the issue of wetlands and climate change. Ramsar Resolution VIII.3 urges Parties to ensure that the implementation of the UNFCCC and its Kyoto Protocol does not negatively impact on the ecological character of wetlands, to manage wetlands in a way that enhances their resilience to climate change, and to take action to minimise the degradation and improve management practices of wetlands that are significant carbon stores, such as peatlands.

With climate change impacts on ecosystem composition and distribution of ecosystems and species becoming increasingly apparent, adaptation and mitigation measures are likely to achieve greater prominence. Such measures need to be integrated into land use planning, protected area management and species conservation strategies, but should be additional to the urgent need to reduce greenhouse gas emissions at a scale that limits the extent of climate change. Such considerations are particularly significant for current discussions under the UNFCCC relating to climate policy beyond 2012.

III.2.4 Maintaining ecosystem integrity and the provision of goods and services

Maintaining ecosystem integrity and the supply of goods and services from ecosystems represents the fourth focal area of decision VII/30. It has, in recent years, increasingly been acknowledged that human well-being depends on ecosystem services, which can be categorised into provisioning, regulating, cultural and supporting services (box III.1).

Box III.1: Ecosystem services

Source: *Millennium Ecosystem Assessment.* 2005. Ecosystems and Human Well-being. Biodiversity Report

Provisioning services/goods: Products obtained from ecosystems

- *Food, fibre and fuel*
- *Genetic resources*
- *Biochemicals*
- *Fresh water*

Regulating services: *Benefits obtained from regulation of ecosystem processes*

- Regulation of climate, water and disease
- Water purification
- Pollination
- Invasion resistance
- Erosion regulation

Cultural services: *Non-material benefits obtained from ecosystems*

- Spiritual and religious values
- Recreation and aesthetic values
- Education and inspiration
- Sense of place
- Knowledge systems

Supporting services: *Services necessary for the production of all other ecosystem services*

- Primary production

- Provision of habitat
- Soil formation and retention
- Nutrient cycling
- Water cycling
- Production of atmospheric oxygen

A full assessment of the capacity of ecosystems to provide ecosystem services was provided in the recently launched Millennium Ecosystem Assessment (MA), which found that 60% of the services considered were degraded, and recognised the decline in the capacity of ecosystems to provide services as a major constraint to development, particular in rural regions. The rural poor are often the most directly dependent on ecosystem services for their well-being, and most affected by changes to biodiversity that affect the capacity of ecosystems to supply services.

The Millennium Development Goals recognise the significance of biodiversity for alleviating poverty through Goal 7: 'Ensure environmental sustainability', and the accompanying target 'Integrate the principles of sustainable development into country policies and programmes and reverse the loss of environmental resources'. However, UNDP's studies on MDG country reports found that only 65 out of 100 countries reported on environmental indicators beyond those for MDG 7. In the few cases where other MDGs were referenced, neither the causal link between poverty and environment nor possible response systems were developed.

The 2002 World Summit on Sustainable Development (WSSD) acknowledged biodiversity conservation and sustainable use as a significant tool for sustainable development by identifying biodiversity as one of its five major issues, besides water, health, energy and agriculture. The WSSD Plan of Implementation carries a range of provisions for biodiversity and confirms the CBD target of reducing biodiversity loss by 2010. Both the Millennium Development Goals, with targets for 2015, and the WSSD Plan of Implementation provide broad frameworks that are intended for implementation through tangible targets and commitments. The maintenance, and in some cases restoration, of ecosystem services will be key to achieving the full range of targets within the MDGs.

The CBD has adopted the ecosystem approach as the primary framework of action to be taken under the Convention (decision II/8). The ecosystem approach is a strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way. It works on the basis that in order to maintain the services that ecosystems provide for human well-being, the ecological structures and functions of ecosystems need to be conserved. For achieving this, it is necessary to pay particular attention to the frequent undervaluation of ecosystem goods and services. In decision V/6, the CBD COP developed principles and operational guidance for the application of the ecosystem approach, and the approach is reflected in numerous provisions of the thematic work programmes (see table III.7).

Table III.7: Provisions on the ecosystem approach in the CBD thematic programmes of work

Programme of work	Provisions on the ecosystem approach
Marine & coastal biodiversity, operational objective 2.1	**TO PROMOTE ECOSYSTEM APPROACHES TO THE CONSERVATION AND SUSTAINABLE USE OF MARINE AND COASTAL LIVING RESOURCES, INCLUDING THE IDENTIFICATION OF KEY VARIABLES OR INTERACTION, FOR THE PURPOSE OF**

	ASSESSING AND MONITORING COMPONENTS OF BIOLOGICAL DIVERSITY, THE SUSTAINABLE USE OF SUCH COMPONENTS AND ECOSYSTEM EFFECTS
Inland water biodiversity, goal 1.1	To integrate the conservation and sustainable use of biodiversity into all relevant sectors of water-resource and river-basin management, taking into account the ecosystem approach
Forest biodiversity, programme element 1, goal 1, objective 1	Develop practical methods, guidelines, indicators and strategies to apply the ecosystem approach adapted to regional differences to forests both inside and outside forested protected areas as well as both in managed and unmanaged forests
Dry and sub-humid lands, activity 8	Promotion of responsible management, at appropriate levels, applying the ecosystem approach, through an enabling policy environment
Agricultural biodiversity, programme element 2, operational objective	To identify management practices, technologies and policies that promote the positive and mitigate the negative impacts of agriculture on biodiversity, and enhance productivity and the capacity to sustain livelihoods, by expanding knowledge, understanding and awareness of the multiple goods and services provided by the different levels and functions of agricultural biodiversity
Mountain biodiversity, action 1.2.4	Develop strategies for land-use and water-resource planning at landscape level using the ecosystem approach, taking into account elements of ecological connectivity and traditional uses of indigenous and local communities, and to prevent and mitigate losses of mountain biological diversity due to fragmentation and land-use conversion

The conservation and sustainable use of biodiversity in support of achieving the Millennium Development Goals has become a prime focus within the United Nations Development Programme's (UNDP) focal area of Energy & Environment. The UNDP Biodiversity Global Programme has developed capacity development, knowledge management, policy advice and advocacy as its major tools, and supports countries with integrating biodiversity, ecosystem services and protected areas into national policies and programmes, such as Poverty Reduction Strategy Papers and the National Strategies for Sustainable Development.

The Millennium Ecosystem Assessment identified a range of responses for the sustainable supply of ecosystem services, focusing specifically on sustainable use of biodiversity. These include the following tools and mechanisms:

- Payments and markets for biodiversity and ecosystem services
- Incorporating biodiversity considerations into management practices in sectors such as agriculture, forestry and fisheries
- Capture of benefits by local communities
- Increased coordination between multilateral environmental agreements and between environmental and other international economic and social institutions
- Public awareness, communication and education

- Enhancement of human and institutional capacity for assessing the consequences of ecosystem change for human well-being, and acting on such assessments
- Increased integration of sectoral responses
- Addressing unsustainable consumption patterns
- Elimination of subsidies that promote excessive use of ecosystem services and transfer of these subsidies to payments for non-marketed ecosystem services
- Sustainable intensification of agriculture
- Slowing of and adaptation to climate change
- Slowing the global growth in nutrient loading
- Correction of market failures and internalization of environmental externalities that lead to the degradation of ecosystem services
- Integration of biodiversity conservation and development planning
- Increased transparency and accountability of government and private-sector performance in decisions that affect ecosystems, including through greater involvement of concerned stakeholders in decision-making
- Making scientific findings and data available to all of society.

The MA also stresses the importance of supporting local people, as the primary resources managers, to ensure the sustainable supply of ecosystem services. Such an approach requires appropriate property right systems, including land tenure rights. A number of tools has been identified that help achieving both local people's well-being and biodiversity conservation. They particularly refer to incentives. Indirect incentives include redirecting labour and capital away from activities that degrade ecosystems, for example agricultural intensification; encouraging commercial activities that supply or support ecosystem services, for example ecotourism, and raising incomes of local people to reduce dependence on resource extraction that degrade ecosystems. Direct incentives in this context are payments for conservation. They include a number of options, *inter alia* tax incentives and easements (contractual agreements between a landowner and a conservation interest). In addition, the removal and redirection of perverse incentives is a potentially powerful tool that on a wider scale has not found the political backing it urgently requires. Perverse incentives include subsidies, tax relief and below-cost pricing in the agricultural, forestry, fisheries, energy, mining and transport sectors, but also market restrictions.

The integration of biodiversity conservation and sustainable use into the land-use sectors is a key mechanism to maintain ecosystem services on managed lands. For the agricultural sector, ecoagriculture has proved a significant tool. Ecoacgriculture aims to achieve simultaneously improved livelihoods, sustainable production at a landscape scale and biodiversity conservation. This approach rests on six elements:

- Creating space for biodiversity reserves within agricultural landscapes
- Developing low-cost habitat niches and networks for wild biodiversity on and around farmlands
- Modifying farming systems to mimic natural ecosystems
- Reducing pressure to convert further land to agriculture and enhancing the productivity of existing agricultural land
- Reducing the use of external inputs within integrated pest, livestock and nutrient systems
- Encouraging soil, water and vegetation resource management with the potential to benefit biodiversity.

For the forestry sector, the shifting of harvest away from timber to non-timber forest products as well as certification schemes (see chapter III.2.2) have proven successful for integrating

biodiversity concerns into production. In the fisheries sector the establishment of marine reserves has allowed for substantial increases in density, biomass, size and diversity of fish and other species.

There has been an increasing range of tools and mechanisms developed in recent years aiming at maintaining the integrity of ecosystems and their ability to provide goods and services essential for human well-being. Further efforts are now required on overcoming the obstacles for implementing such tools.

III.2.5 Protecting traditional knowledge, innovations and practices

> 'The relationship that Maori have with New Zealand's indigenous biodiversity as tangata whenua is recognised and valued in terms of conserving and sustainably using biodiversity. Traditional Maori knowledge, or Matauranga Maori about biodiversity is respected and informs biodiversity management.'
>
> ***New Zealand Thematic Report on Access and Benefit-sharing***

The fifth focal area of decision VII/30 addresses the protection of traditional knowledge, innovations and practices. Traditional knowledge, innovations and practices, preserved and applied by indigenous and local communities, have conserved major components of biodiversity over centuries and millennia, including the integrity of ecosystems, and their ability to provide goods and services for human well-being. In addition, traditional practices are often the best examples of sustainable use of natural resources. With the high rate of biodiversity loss in many regions of the world, traditional knowledge and practices are also being lost. Conversely, as traditional knowledge is lost, so biodiversity is sometimes devalued, leading to its loss. The challenge of substantially reducing the rate of biodiversity loss is therefore closely linked with the challenge to preserve traditional knowledge and practices.

Article 8j of the CBD requests Parties to respect, preserve and maintain knowledge, innovations and practices of indigenous and local communities embodying traditional lifestyles relevant for the conservation and sustainable use of biological diversity. Through article 8j, the international community has acknowledged the close and traditional dependence of many indigenous and local communities on biological resources, the vital role that these resources play in lives and livelihoods, and the important contribution that traditional knowledge can make to the conservation and sustainable use of biological diversity. Indigenous peoples representatives are well engaged with the Convention processes but this is often limited at the national level, suggesting the need to develop appropriate participatory mechanisms.

In 2000, the COP adopted a Programme of Work on Article 8(j) and related provisions. In implementing the work programme, COP 7, in 2004, adopted the Akwé:Kon Guidelines for the conduct of cultural, environmental and social impact assessments regarding developments proposed to take place on, or which are likely to impact on, sacred sites and on lands and waters traditionally occupied or used by indigenous and local communities.

The CBD work programme provides for the preparation of a composite report on the status and trends of traditional knowledge. The first phase of the composite report dealing with status and trends (and its regional components Latin America, Asia, Europe, North America and Africa) was submitted to COP 7 in 2004. The report acknowledges the loss of traditional knowledge and emphasises the relative scarcity of examples of measures and initiatives specifically designed to protect, promote and facilitate the use of traditional knowledge. Work on phase II of the composite report is underway, laying emphasis on the identification of national processes and processes at the local community level that may threaten the maintenance, preservation and application of traditional knowledge, innovations and practices. The Working Group on Article 8(j) is currently considering the issue of *sui generis* systems of protection based on customary laws of indigenous peoples.

The International Treaty on Plant Genetic Resources for Food and Agriculture recognises the enormous contribution that local and indigenous communities, particularly those in the centres of origin and crop diversity, have made and continue to make to the conservation and development of plant genetic resources. Parties to the Treaty have the responsibility to realise Farmers' Rights through the protection of traditional knowledge and farmers' rights to participate equitably in benefit-sharing and national decision-making.

Guidelines for Establishing and Strengthening Local Communities' and Indigenous People's Participation in the Management of Wetlands were adopted by the Ramsar Convention on Wetlands, at COP 7 in 1999. In addition, Ramsar COP 8 in 2002 adopted Guiding Principles for Taking into Account the Cultural Values of Wetlands for the Effective Management of Sites. COP 8 also recognised participatory environmental management as a tool for achieving sustainability in the use and management of wetlands.

The World Heritage Convention has put particular efforts into the preservation of sacred sites and cultural landscapes all over the world and their inclusion in the World Heritage List. With IUCN, UNESCO has developed Guidelines for the Conservation and Management of Sacred Natural Sites. One of the aims of the UNESCO Programme on Man and the Biosphere (MAB) is to learn about traditional forms of land-use. Biosphere reserves are well suited to protect those land-uses and to offer local people the chance to improve their economic well-being through the application of traditional technologies. These traditional systems often conserve ancient breeds of livestock and old land races of crops, which are invaluable gene pools for agriculture.

The World Intellectual Property Organization (WIPO) provides a forum for policy debate on the interface between intellectual property and traditional knowledge. Through the work of the WIPO Intergovernmental Committee on Intellectual Property and Genetic Resources, Traditional Knowledge and Folklore, WIPO develops practical tools aimed at enhancing the intellectual property interests of the holders of traditional knowledge, resources and expresses. These tools include case studies, a database of searchable contractual clauses for access and benefit-sharing agreements, intellectual property resources and guidelines for safeguarding intangible cultural heritage. The Committee has compared experiences with existing *sui generis* systems for the protection of traditional knowledge and prepared a technical study on disclosure requirements related to genetic resources and traditional knowledge.

The International Indigenous Forum on Biodiversity was established at the third meeting of the Conference of the Parties to the CBD for the purpose of indigenous lobbying at the CBD. The Indigenous Peoples Biodiversity Information Network (IBIN) is a forum established as an indigenous caucus for CBD meetings and to exchange information about experiences and projects and to increase collaboration among indigenous groups working on common causes related to biodiversity use and conservation. Close links exist to the UN Permanent Forum on Indigenous Issues.

A wide range of mechanisms to protect traditional knowledge, innovations and practices on biodiversity has been developed in recent years. Many of them have been increasingly applied at the national level, but policies, activities and practices that effectively suppress and drive back indigenous and local practices continue and contribute to the further loss of biodiversity. A major problem for the recognition and protection of traditional knowledge arises from the frequently encountered incompatibility of conventional intellectual property rights (IPR) regimes with traditional knowledge systems. IPRs are based on the protection of individual property while traditional knowledge is mostly collective. A number of critical issues for overcoming those challenges include the development of *sui generis* systems for the protection of traditional knowledge, the fair and equitable sharing of benefits arising out of the use of resources on indigenous lands, and the recognition and implementation of land rights and land use rights for indigenous and local communities.

III.2.6 Ensuring the fair and equitable sharing of benefits

Ensuring the fair and equitable sharing of benefits arising out of the use of genetic resources is one of the three objectives of the Convention and has been identified by decision VII/30 of the COP as the sixth focal area of the framework for the evaluation of progress in the implementation of the 2010 target. Benefit-sharing not only derives from the recognition of local and national ownership over genetic resources, but has also major potential for providing incentives for local communities to preserve the genetic resources of which they are the custodians. The mechanisms for benefit-sharing need to provide strong tools for governments, local communities, the private sector and other stakeholders to substantially contribute to the 2010 target. An indicator for the status of access and benefit-sharing, as foreseen in CBD decision VII/30, has not yet been developed.

The CBD, at COP 6 in 2002, adopted the Bonn Guidelines on Access to Genetic Resources and Fair and Equitable Sharing of the Benefits Arising out of Their Utilization. The guidelines aim to assist Parties, governments and other stakeholders in developing an overall access and benefit-sharing strategy, and in identifying the steps involved in the process of obtaining access to genetic resources and benefit-sharing. More specifically, these voluntary guidelines are meant to assist Parties, governments and other stakeholders when establishing legislative, administrative or policy measures on access and benefit-sharing and/or when negotiating contractual arrangements for access and benefit-sharing. The Bonn Guidelines provide a useful first step of an evolutionary process in the implementation of the Convention's provisions on access and benefit-sharing. The next major step refers to the call of the Plan of Implementation of the WSSD for the negotiation, within the framework of the CBD, of an international regime to promote and safeguard the fair and equitable sharing of benefits arising out of the utilisation of genetic resources. The Conference of the Parties has established an Ad Hoc Open-ended Working Group on Access and Benefit-sharing with the task to elaborate and negotiate the nature, scope and elements of such an international regime. The COP has also adopted an action plan on capacity-building for access to genetic resources and benefit-sharing.

The CBD COP has frequently addressed the relationship of the Convention with the Agreement on Trade-related Aspects of Intellectual Property Rights (TRIPS) of the World Trade Organization (WTO) in relation to access and benefit-sharing. The COP has stressed the need for consistency in implementing the CBD and the TRIPS Agreement, and has repeatedly called for the Executive Secretary to apply for observer status in the TRIPS Council. This status has still not been granted.

The Multilateral System created by the International Treaty on Plant Genetic Resources for Food and Agriculture will provide for access to plant genetic resources for food and agriculture and for fair and equitable sharing of the benefits. The conditions for the Multilateral System will be set out in a Material Transfer Agreement that the governing body of the Treaty works out. Plant genetic resources will be available through the Multilateral System for utilisation and conservation in research, breeding and training. A payment will be provided for in case a commercial product arises out of this utilisation. Beyond that, the Treaty provides for the sharing of benefits through information exchange, access to and the transfer of technology, and capacity building.

In recent years, regional legislation and guidance on access and benefit-sharing has been developed. The Andean Pact Decision 391 on the Common Regime on Access to Genetic Resources is a legally binding agreement. The African Union has developed the African Model Law for the Protection of the Rights of Local Communities, Farmers, Breeders, and for the Regulation of Access to Biological Resources, which serves as a model for national access and benefit-sharing regimes. The draft ASEAN Framework Agreement on Access to Biological and Genetic Resources and the draft Central American Agreement on Access to Genetic Resources and Bio-chemicals and related Traditional Knowledge are currently being developed.

UNDP have undertaken country capacity assessments on traditional knowledge, and access and benefit-sharing, the main findings of which are:

- There is a need to increase awareness of stakeholders and policy-makers on the value and potential benefit of biodiversity.
- Stakeholder participation in ABS processes is insufficient and needs to be enhanced through awareness-raising, capacity-building and emphasising trust and transparency.
- There is a need to address overlapping jurisdictional mandates and develop mechanisms for effective coordination.
- Procedures and institutions need to be established for processing requests for access and prior informed consent.
- Government officials, policy-makers and other stakeholders are in need of training on ABS issues.
- Countries need to develop genetic resource inventories.
- Training needs to be provided for customs officials in species identification.
- There is a capacity need for the management of protected areas.
- Governments, gene banks and research organisations are often in need of adequate resources and staffing.
- Laws and implementing regulations need to be developed for benefit-sharing.
- Communities should be participating in the sharing of benefits from protected areas.
- Model agreements on bioprospecting could serve as short-term measures while long-term legislation is being drafted.

IUCN, through its Environmental Law Programme, has been providing guidance on the access and benefit sharing-related obligations under the CBD for many years. Currently, IUCN's ABS project assists national governments and international processes in bringing the access and benefit-sharing objective and obligations to fruition. The assistance includes legal and technical advice, evidence and support to the process of developing the ABS regime at international, regional, national and sub-national levels. In this regard, IUCN has supported governments on the national level and in their participation in the international negotiations of the international regime under the CBD.

The experience with current access and benefit-sharing regimes and arrangements has demonstrated that beyond specific arrangements an appropriate institutional environment is needed. This should include a system for tracing the flow of genetic resources internationally and the development of networks of codes of conduct for botanical gardens and gene banks. Also, the legal framework of intellectual property rights needs to be further developed and linked with the access and benefit-sharing regime, creating an international legal system beneficial to the implementation of the Convention's third objective.

III.2.7 Mobilising financial and technical resources

Many of the parts of the world that are richest in biodiversity are also among the poorest in terms of financial resources. Effective conservation and sustainable use of biodiversity depends on the availability of appropriate resources, including financial, technical and human resources. Therefore the resources needed to conserve biodiversity are in short supply where they are most needed and where issues of social and economic development and the eradication of poverty are the overriding priorities of governments. As a result, financial resources to support implementation of the provisions of the Convention in many countries are required from outside sources. This is addressed in the seventh focal area of decision VII/30, on mobilising financial and technical resources for implementing the Convention and the Strategic Plan, especially for developing

countries, in particular least developed countries, small island developing states, and countries with economies in transition.

The current provision of financial resources for biodiversity is inadequate to implement the measures and policies under the CBD, despite the commitment of industrial countries through Article 20 of the CBD, to 'provide new and additional financial resources to enable developing country Parties to meet the agreed full incremental costs to them of implementing measures which fulfil the obligations of this Convention'. In addition to financial resources, the provision of technology and the development of capacity also require increasing attention.

The CBD COP has developed guidance to its financial mechanism, the Global Environment Facility (GEF), requesting targeted support to Parties' efforts to implement the Convention, in particular related to the thematic and cross-cutting work programmes of the Convention. The GEF has, between 1991 and 2004, allocated US$1.89 billion in grants and mobilised another US$3.8 billion in co-financing for biodiversity projects. In supporting the implementation of the Convention, GEF is guided by four strategic priorities: catalising the sustainability of protected areas, mainstreaming biodiversity in production landscapes and sectors, capacity building for the implementation of the Cartagena Protocol on Biosafety, and generation and dissemination of best practices for addressing current and emerging biodiversity issues. GEF works through the following operational programmes: arid and semi-arid zone ecosystems; coastal, marine and freshwater ecosystems; forest ecosystems; mountain ecosystems; and conservation and sustainable use of biodiversity important to agriculture (table III.8).

Table III.8: GEF investments in biodiversity by operational programme (1991-2003).
Source: Global Environment Facility. 2004. GEF and the Convention on Biological Diversity. A Strong Partnership with Solid Results. Washington DC, USA.

Operational programme	*Number of projects*	*GEF funding (US$ million)*
Arid and semi-arid zone ecosystems	81	360.13
Coastal, marine and freshwater ecosystems	114	545.92
Forest ecosystems	148	773.71
Mountain ecosystems	74	436.74
Agricultural biodiversity	9	33.97

GEF Enabling Activities have assisted countries in the preparation of their National Biodiversity Strategy and Action Plans, their national reports to the CBD, and participation in the Clearing-House Mechanism. Enabling Activities also support country self-assessments of capacity development needs in biodiversity issues such as *in situ* and *ex situ* conservation and sustainable use, threats to biodiversity, biosafety, assessment and monitoring, agricultural biodiversity, incentive measures, access and benefit-sharing, and traditional knowledge.

Box III.2 shows a wide range of financial mechanisms for protected areas, many of which are also relevant for other forms of biodiversity conservation and sustainable use. Many have been used very little. An urgent requirement is the establishment of a system of information exchange where experiences and lessons learned from efforts to mobilise funding for biodiversity can be made available, for example through the CBD Clearing-House Mechanism.

Box III.2: A checklist of financing mechanisms for protected areas

Source: UNEP/CBD/WG-PA/1/3, 2005, adapted from: Pablo, G. 2003. *From Good will to payments for Environmental Services: A survey of Financing Alternatives for Sustainable Natural*

Resource Management in Developing Countries. WWF Macroeconomics for Sustainable Development Programme Office, Economic Change Poverty and Environment Project, Danida, WWF.

Mostly public sources:

- Public budget funding for protected areas
- Earmarking for protected areas a percentage of one or more general taxes collected at national, state or local level
- Special laws delivering extra-budgetary financial support to particular social groups, geographical areas or activities
- Tax breaks or subsidies for protected areas
- Earmarking for protected areas financing a percentage of one or more selective taxes collected at national, state or local level (e.g. taxes on energy, airports, cruise ships, hotel and resort charges and others)
- Earmarking for protected areas financing a percentage of one or more charges, fees, fines and penalties related to the use (or abuse) of natural resources (e.g. water charges, ground water charges, stumpage fees and other natural resources extraction fees, entrance and users fees, charges on emissions and feed stock, release or dumping of fertilizers, pesticides, charges to solid wastes, and environmental fines and penalties etc)
- National, state and local development bank loans
- Debt-for-nature swaps
- Environmental funds (endowments, sinking and revolving funds)
- Multilateral aid and development agencies
- International development bank loans
- Bilateral aid and development agencies.

Mostly private for non-profit sources:

- Community self-support groups and other forms of social capital
- Secular and faith-based charities
- Special fund-raising campaigns (e.g. save panda, friends of national park etc)
- Merchandising and good cause marketing
- Lotteries
- Social and environmental NGOs
- Foundations.

Mostly private for-profit sources:

- Community based enterprises, formal and informal
- Private investment by local business
- Commercial bank loans
- Direct investment by non-local investors (e.g. ecotourism)
- Private public partnerships
- Private community partnership
- Venture capital
- Portfolio investors (green funds).

Mostly payments for environmental products:

- Markets for organic agriculture products
- Markets for sustainably harvested non timber forest products
- Markets for certified forest products
- Markets for certified fishery products
- Resource extraction charges.

Mostly payments for environmental services:

- Markets for biodiversity conservation and bioprospecting
- Markets for carbon offsets
- Markets for watershed protection
- Markets for landscape beauty, including eco-tourism and tourism
- Markets for development rights and conservation easements
- Quasi-markets and non-market systems of payments for environmental services
- Use fees and entry fees
- Funds for protected areas associated with international treaties
- GEF payments for the global commons
- Earmarking for protected areas, part of one or more international taxes.

Mostly reducing the need for additional financing

- Freeing up existing public resources (e.g. redirecting money from harmful public subsidies to protected area)
- Encouraging the mobilization of private resources (e.g. securing tenure, promotion, regulation streamlining).

CBD COP 7 in 2004 adopted a Programme of Work on Technology Transfer and Technological and Scientific Cooperation, which spells out a range of activities within four programme elements: technology assessments, information systems, creating enabling environments, and capacity-building and enhancement. An indicator for technology transfer, as foreseen by CBD decision VII/30, is currently not available.

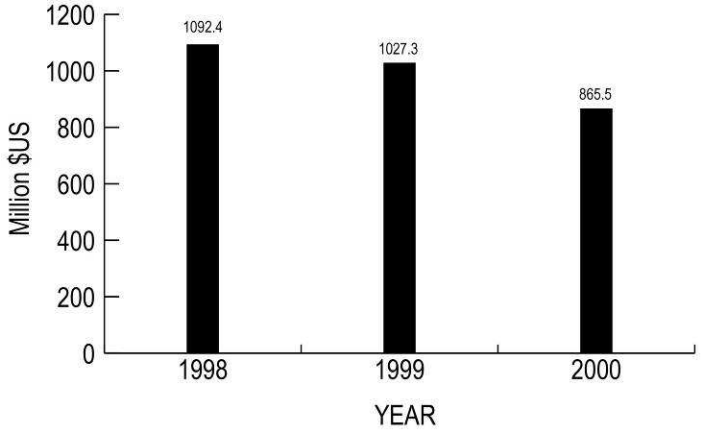
Official development assistance (ODA) is the provision of financial resources from official agencies (including state and local governments) in industrial countries to developing countries and to multilateral institutions for the promotion of the economic development and welfare of developing countries. As natural resources, including biodiversity, are key to human livelihoods and well-being, some ODA is directed at biodiversity and is therefore a component of financial assistance that can assist implementation of the CBD in poor countries. ODA provided in support of the CBD represents one of the indicators for immediate testing as identified by COP decision VII/30.

The OECD Development Assistance Committee (DAC) tracks the development assistance provided by OECD countries in relation to a number of sectoral activities and development objectives through its Creditor Reporting System (CRS). Beginning in 1998, the CRS has categorised aid activities that target the objectives of the CBD (as well as those targeting objectives of the other Rio Conventions). The resulting statistics on biodiversity-related aid provide one measure of the availability of financial resources for implementing the Convention in less developed countries and trends in these resources over time.

Initial data suggest that the financial resources available for implementation of the Convention are in the order of US$1 billion per year but may in fact be declining rather than increasing (figure

III.4). However, the lag between allocation and reporting of aid and uncertainty associated with the categorisation of investments means that accurate assessment of these trends requires longer-term data. Such data are becoming available through the continued use of the biodiversity markers in the CRS. The DAC has agreed to continue the use of this marker at least until 2007.

Figure III.4: Biodiversity-related aid, commitments 1998-2000 by 19 members of the OECD Development Assistance Committee. Source OECD-DAC



It is evident that the amount of ODA earmarked for biodiversity conservation and sustainable use is still very little, and falls way short of the scale recommended by the United Nations (0.7% GNP). Comparing biodiversity-related aid with aid overall can provide a measure of the perceived importance of biodiversity between both donor and recipient nations. Other financial resources that support biodiversity conservation and sustainable use include the considerable investments made by conservation NGOs and by the private sector in addition to those of national governments.

III.3 Implementing the Convention on Biological Diversity

This chapter looks at mechanisms that respond to the four goals of the CBD Strategic Plan. The parts III.3.1-III.3.4 correspond to these goals accordingly. The chapter focuses on mechanisms that support the implementation of the Convention and the 2010 target, such as cooperation between multilateral environmental agreements, biodiversity assessments, building capacity for biodiversity conservation and sustainable use as well as communication, education and public awareness. Chapter III.3.3 specifically highlights national action for the implementation of the biodiversity agenda. There is some overlap in issues between this chapter and the previous chapter III.2, which considered mechanisms in support of the seven focal areas of CBD decision VII/30. Some of the mechanisms of relevance to the four goals of the Strategic Plan, and thus this chapter, have already been highlighted in chapter III.2. For example, the mobilisation of financial and technical resources responds not only to the seventh focal area, but also to the second goal of the Strategic Plan, but has been dealt with under the former (chapter III.2.7).

III.3.1 Biodiversity on the international agenda

This chapter relates to the first goal of the Convention's Strategic Plan, that the Convention is setting the global biodiversity agenda (box III.3). It demonstrates how the CBD cooperates with other multilateral environmental agreements (MEAs), introduces the Cartagena Protocol on Biosafety, and identifies challenges to the implementation of MEAs. Furthermore, it looks at the range of assessments of biodiversity that are crucial for informing decisions taken by Parties in implementing the Convention.

Box III. 3: Strategic goal 1 of the Strategic Plan of the CBD and its objectives

Strategic goal 1: The Convention is fulfilling its leadership role in international biodiversity issues.

Objectives:

1. The Convention is setting the global biodiversity agenda.
2. The Convention is promoting cooperation between all relevant international instruments and processes to enhance policy coherence.
3. Other international processes are actively supporting implementation of the Convention, in a manner consistent with their respective frameworks.
4. The Cartagena Protocol on Biosafety is widely implemented.
5. Biodiversity concerns are being integrated into relevant sectoral or cross-sectoral plans, programmes and policies at the regional and global levels.
6. Parties are collaborating at the regional and subregional levels to implement the Convention.

III.3.1.1 Ensuring appropriate legal and institutional arrangements

Many multilateral environmental agreements have major relevance for the conservation and sustainable use of biodiversity. Most of the agreements have evolved around specific concerns, such as the trade in wildlife, the sustainable use of specific types of ecosystems, or the conservation of specific groups of wildlife. Many MEAs date back to the 1970s, while some have been adopted following more recent events such as the United Nations Conference on Environment and Development in 1992. The 2002 World Summit on Sustainable Development (WSSD) Plan of Implementation recognised the Convention on Biological Diversity (CBD) as the key instrument for the conservation and sustainable use of biological diversity and the fair and equitable sharing of benefits arising from the use of genetic resources.

A subset of the MEAs, the so-called biodiversity-related conventions, including CBD, CITES, CMS, Ramsar Convention on Wetlands and World Heritage Convention, have established closer forms of cooperation, as have the so-called Rio Conventions, which include the CBD, UNFCCC and UNCCD. The Biodiversity Liaison Group, called for by the CBD Conference of the Parties, comprises the heads of the secretariats of the biodiversity-related conventions, and the Joint Liaison Group those of the Rio Conventions. Table III.9 shows the formal cooperation agreements between the five biodiversity-related conventions. In addition, joint work programmes or plans exist with other organisations and conventions, such as the International Plant Protection Convention and the UNEP Regional Seas Programme. The CBD has also established, or is in the process of doing so, memoranda of understanding or cooperation with more than 60 institutions and organisations.

Table III.9: Formal cooperation agreements established or in development among the biodiversity-related conventions

M = memorandum of cooperation/understanding, J = joint work programme/plan, * = in development

	CBD	CMS	CITES	Ramsar	WHC
CBD		M J	M J	M J	M*
CMS	M J		M J	M J	M
CITES	M J	M J*			
Ramsar	M J	M J			M
WHC	M*	M		M	

The Cartagena Protocol on Biosafety is the first legally-binding agreement developed under the aegis of the CBD. The Protocol aims to contribute to ensuring an adequate level of protection in the field of the safe transfer, handling and use of living modified organisms resulting from modern biotechnology that may have adverse effects on the conservation and sustainable use of biodiversity. The Protocol deals primarily with genetically modified organisms (GMOs) that are to be intentionally introduced into the environment and with genetically modified farm commodities, referring especially to the Precautionary Principle. For transboundary movements of those GMOs, the Protocol establishes a system of information exchange, risk assessment and documentation. In addition, the Protocol provides for capacity building, public awareness and participation, and a financial mechanism.

UNEP/GEF, through the Pilot Biosafety Enabling Activities, has carried out country-level assessments and supported the development of National Biosafety Frameworks in up to 100 countries as well as the implementation of these national frameworks in pilot countries. In this context, the project has raised awareness on issues arising from the UNEP International Technical Guidelines for Safety in Biotechnology. Another UNEP/GEF project is building capacity for effective participation of developing countries in the Biosafety Clearing House of the Cartagena Protocol on Biosafety. The project develops core human resources and establishes appropriate Biosafety Clearing House infrastructure, including access to scientific, technical, environmental and legal information on living modified organisms.

At the regional level, the European Union has adopted a range of legal instruments. The most significant ones for conservation and sustainable use of biodiversity are the Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (Habitats Directive), the Council Directive 79/409/EEC on the conservation of wild birds, and the Council Regulation (EC) No 338/97 on the protection of species of wild fauna and flora by regulating trade therein. Through the degree of integration within the European Union, these instruments have become legally-binding. In some other regions, addressing biodiversity loss is often hampered by the lack of legal and institutional instruments, resulting from a lack of regional cooperation and conflicting interests. This is exemplified by the challenges for policy responses in the Caribbean Sea (box III.4).

Box III.4: Challenges for policy responses in the Caribbean

Source: MA Caribbean Subglobal Assessment (CARSEA).

The Caribbean Sea comprises territorial waters and coastal areas of 33 bordering countries and territories, which makes a coordinated approach to management of the area extremely difficult. Players are not only those countries and territories, but also the colonial powers from North America and Europe, international institutions such as UNEP, UNDP, World Bank, OAS, international NGOs, donor agencies and regional intergovernmental organisations such as the Association of Caribbean States (ACS) and the Caribbean Community (CARICOM).

The scale of problems such as over-fishing, pollution and expanding tourism is not matched by an appropriate managerial response as management is organised along the lines of individual countries or political blocks such as CARICOM.

The existing governance framework makes for much complexity, presenting many challenges such as the lack of harmonisation. This extends into the non-governmental sector where NGOs are not well integrated into the policy analysis and decision-making process. On the other hand, the diversity of the governance structure offers a variety of opportunities for exercise of authority in relation to shared issues and interests. However, it has been suggested to create another decision-making body at the highest regional intergovernmental level.

Globally, the United Nations have recently addressed attention to the Caribbean Sea, stressing, in UN Resolution 57/216, the need for a comprehensive and integrated approach to the management

of the Caribbean Sea. This Resolution offers a high-level and up-to-date common policy basis upon which wider Caribbean states might take concerted action among themselves and enlist global cooperation in an effort to meet the objectives of the policy.

Many of the biodiversity-related agreements have been in force for many years, but to date have not resulted in a reduced rate of loss of biodiversity globally or regionally. The various agreements have generally been successful in raising awareness of the aspects of biodiversity they cover, they have stimulated research and some have catalysed the political debate. What is lacking is a coherent implementation. Across the agreements, the following major reasons have been identified for this lack of success to date:

- A substantial lack of financial, technical and human resources to implement the agreements.
- The lack of compliance mechanisms in most agreements.
- Poor monitoring of implementation, in part due to insufficient reporting.
- Insufficient political will at the national level to implement the agreements.

The range of options to improve the implementation of agreements includes the following:

- Capacity building and the provision of financial and technical resources to support the implementation of agreements in developing countries and countries with transition economies.
- Sufficient resources to support the implementation of agreements by Parties provided to secretariats of agreements.
- Closer coordination and cooperation between agreements, building on the existing joint work programmes, memoranda of understanding, liaison groups and other means of cooperation.
- Better compliance with reporting obligations, encouraged by governing bodies of agreements. To this end, regional workshops and targeted support to Parties could be particularly helpful, as for example the World Heritage Convention has demonstrated.
- Monitoring the implementation of agreements, *inter alia* through a thorough analysis of the information provided through increased submission of national reports.
- Harmonising national reporting between agreements, for example through the development of joint report format sections on specific issues that are shared between conventions.

III.3.1.2 Assessing biodiversity

The Convention on Biological Diversity, in its Preamble, recognises the 'general lack of information and knowledge regarding biological diversity' and 'the urgent need to develop scientific, technical and institutional capacities to provide the basic understanding upon which to plan and implement appropriate measures'. A number of global assessments have recently assembled information on status and trends in biodiversity and options for responding to such changes. They have provided substantial and essential information of use for measuring the progress towards the 2010 target, and have considered genetic, species and ecosystem level biodiversity. Increasingly, assessments of appropriate responses to the loss of biodiversity have become important.

The Millennium Ecosystem Assessment (MA) was an international initiative under the auspices of the United Nations, which launched its main findings in 2005. The MA established a collaborative and scientific approach to assess ecosystems, the services they provide and how changes in ecosystem services impact upon human well-being. The MA has produced synthesis reports on biodiversity, desertification, wetlands, health, and the private sector. The Biodiversity Synthesis Report was published in May 2005.

UNEP's Global Environment Outlook (GEO) is a process producing periodic reports on the state of the environment. It results from a cross-sectoral and participatory assessment process, incorporating regional views and aiming for building regional capacity. The GEO report series includes three GEO reports so far, with plans to publish GEO 4 in 2007.

Assessments are conducted on a regular basis by the FAO, building on national data submitted by governments. These assessments build a significant bridge between biodiversity and other sectors, as they showcase the state of biodiversity in ecosystems of interest to major sectors such as agriculture, forestry and fisheries. The following FAO assessments are those that most related to biodiversity.

- The Global Forest Resources Assessments have been conducted by the FAO since 1948. The process assesses various benefits for people from forests, including the extent of forest resources and global carbon cycle, forest ecosystem health and vitality, biodiversity, the productive function of forests, the protective function of forests, and socio-economic functions of forests. The FAO State of the World's Forests is published biennially, presenting a global picture of the forest sector. The 2005 edition has the theme of realising the economic benefits from forests, focusing on, *inter alia*, experiences and lessons from agroforestry, the economics of wood energy, tariff and non-tariff measures in trade of forest products, and forests and war/peace.
- The State of World Fisheries and Aquaculture (SOFIA) is published every two years. It presents trends in production, utilisation and trade in fisheries resources and an overview of policy and governance in the areas of fisheries and aquaculture. The latest edition was published in 2004.
- The Land Degradation Assessment in Drylands (LADA) project will generate ecological, social, and economic and technical information, to guide integrated and cross-sectoral planning and management in drylands, building on a combination of modern science and traditional knowledge. LADA is conducted in cooperation with UNEP, the Global Mechanism of the UNCCD and other partners, and responds, inter alia, to the assessment of biodiversity in dry and sub-humid lands components in the joint work programme of CBD and UNCCD.
- An earlier assessment of the State of the World's Plant Genetic Resources was prepared by the Commission for Genetic Resources for Food and Agriculture in 1996, and resulted in the adoption of the Global Plan of Action for the Conservation and Sustainable Utilization of Plant Genetic Resources for Food and Agriculture.

At the species level, the IUCN Red List is an inventory of the global conservation status of plant and animal species. The List uses a set of criteria to evaluate the extinction risk of species and subspecies, which have been adapted for use at sub-global scales in many regions of the world (see section II).

The CBD has, through its Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA), undertaken a number of assessments, with the aim of testing a range of methods and modalities for assessments and to advance assessments on the status and trends of forest biological diversity, and on the ecological and socio-ecological impacts of invasive alien species on island ecosystems and inland waters. SBSTTA also developed rapid assessment methods for the biological diversity of inland waters and for marine and coastal biological diversity. In addition, SBSTTA established steps for conducting future assessments of which several are planned for the years up to 2010, in accordance with the multi-year programme of work of the Conference of the Parties.

The resulting information from the many assessments conducted in recent years provides a valuable basis for decision-making. Whilst gaps remain in the understanding of many aspects of biodiversity, enough is known to indicate the need for urgent collective action, building on existing activities, to mitigate the further loss of biodiversity. Enough is also known about the effectiveness

of various responses, such that lack of information is no longer a significant obstacle for implementing measures to reduce the loss of biodiversity.

However, filling gaps in current understanding can only further aid the decision-making process, including the selection of appropriate responses, and monitoring their effectiveness. Certain important aspects of biodiversity remain underrepresented in assessments, as has been demonstrated in section II. There remains a need to bring the existing biodiversity assessments together and initiate a process to identify gaps and further research priorities, and to ensure coordination between assessments. UNEP's proposed Environment Watch system could be tailored towards meeting such a demand, were it be sufficiently supported and resourced. The resulting improved and better-coordinated assessments would improve support to Parties to the CBD with strengthening the basis for further defining the measures needed to achieve the 2010 and future targets.

The CBD has collaborated with partners in several assessments, in particular the MA. COP 7, in decision VII/2, adopted a process for the periodic assessment of status and trends of biodiversity in dry and sub-humid lands. As part of this process, the COP invited the Land Degradation Assessment in Drylands (LADA) project as well as the MA to investigate how the needs of dry and sub-humid lands could be integrated into the ongoing assessments. COP 7 also identified FAO, LADA, MA, the United Nations Convention to Combat Desertification (UNCCD) and the Consultative Group on International Agricultural Research (CGIAR) as key actors for the assessment of status and trends of drylands, as part of the CBD programme of work on dry and sub-humid lands.

III.3.2 Building capacity to implement effective responses

This chapter addresses mechanisms in response to the second goal of the Strategic Plan (box III.5). It focuses on efforts to build the capacity of Parties to implement the Convention and the 2010 target and to undertake training in biodiversity-related matters. Note that the mobilisation of financial and technical resources, an important aspect of capacity building, has been dealt with in chapter III.2.7 as this issue also corresponds to the seventh focal area of decision VII/30.

Box III.5: Strategic goal 2 of the Strategic Plan of the CBD and its objectives

Strategic goal 1: Parties have improved financial, human, scientific, technical and technological capacity to implement the Convention.

Objectives:

- All Parties have adequate capacity for implementation of priority actions in national biodiversity strategy and action plans.
- Developing country Parties, in particular the least developed and the small island developing States amongst them, and other Parties with economies in transition, have sufficient resources available to implement the three objectives of the Convention.
- Developing country Parties, in particular the least developed and the small island developing States amongst them, and other Parties with economies in transition, have increased resources and technology transfer available to implement the Cartagena Protocol on Biosafety.
- All Parties have adequate capacity to implement the Cartagena Protocol on Biosafety.
- Technical and scientific cooperation is making a significant contribution to building capacity.

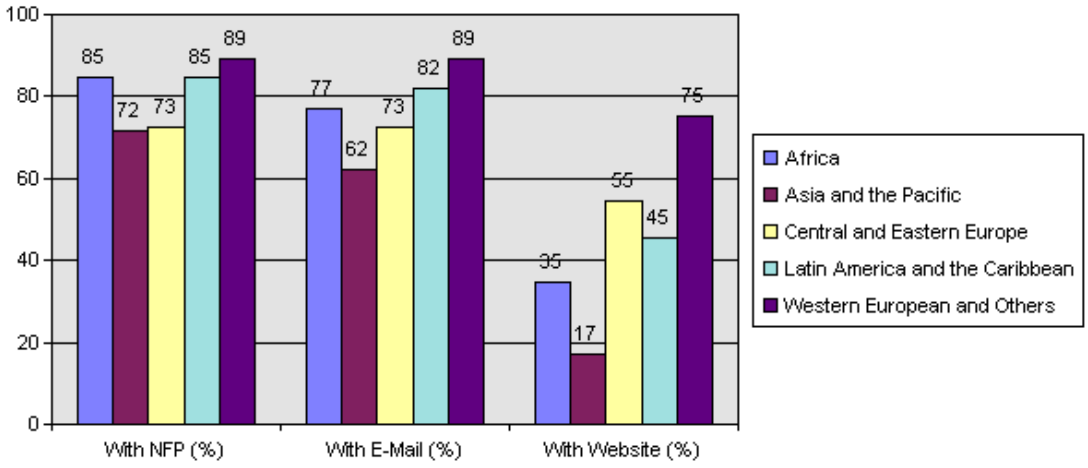
The building of capacity has been recognised by the CBD as a precondition for successful implementation by Parties of the Convention and its programmes of work. The Convention's Clearing-House Mechanism (CHM), established to promote and facilitate technical and scientific cooperation (article 18), is central to this endeavour (box III.6).

Box III.6: The Clearing-House Mechanism of the Convention on Biological Diversity – goals and strategies

Goal 1: Cooperation: Promotion and facilitation of scientific and technical cooperation
• Track best practices, needs and priorities for collaboration
• Use funding to promote country involvement, partnering and progress in priority areas
• Provide a collaboration promotion mechanism for institutions and experts, and service and technology providers
Goal 2: Information Exchange: Development of a global mechanism for exchanging and integrating information on biodiversity
• Provide open, world-wide access to existing biodiversity information
• Ensure compatibility through standardization and interoperability
• Track information needs, priorities and best practices
• Prioritize and promote expansion in content
Goal 3: Network Development: Development of the CHM focal point and their partners
• Provide star-up assistance and ongoing capacity building
• Address obstacles to growth
• Maintain local ownership of information
• Rely on partnerships, and focus on facilitation
• Concentrate on value-added
• Promote use of the CHM
• Develop funding strategies of all focal points

The data available indicates that the information exchange goal of the CHM has been achieved, with the CHM supporting Parties efficiently through the dissemination of information. However, the lack of capacity in many countries creates a serious obstacle to make effective use of the information provided by the CHM. The CHM has also been successful in developing networks (goal 3), including the network of some 150 national CHM focal points and a number of electronic discussion forums on issues such as indicators for the 2010 targets. Figure III.5 shows the percentage of Parties with national CHM focal points (NFPs), e-mail and websites per region. Again, lack of capacity has prevented many Parties from efficiently participating in those networks. While the CHM has successfully facilitated technology transfer and scientific and technical cooperation (goal 1) related to the clearing-house mechanism, its efforts to facilitate technology transfer and cooperation related to other issues, including the thematic programmes of work and cross-cutting issues of the Convention, have not reached their full potential.

Figure III.5: Growth in number of national CHMs



The Cartagena Protocol on Biosafety has established the Biosafety Clearing-House (BCH), in order to facilitate the exchange of scientific, technical, environmental and legal information on, and experience with, living modified organisms, and to assist Parties to implement the Protocol. The BCH currently offers information on national biosafety contacts, laws and regulations, decisions and declarations, capacity building, and a roster of experts. It is in the process of moving from the pilot phase to being fully operational, and the second Meeting of the Parties to the Cartagena Protocol in 2005 adopted a multi-year programme of work for the operation of the BCH.

Capacity building is central to the programmes of work and initiatives of the CBD. The Programme of Work on Technology Transfer and Technological and Scientific Cooperation has adopted a capacity building-related objective: Technical, scientific, institutional and administrative capacity is adequate for the effective cooperation, transfer, diffusion and adaptation of technology as well as technical and scientific cooperation. The Programme of Work for the Global Taxonomy Initiative, adopted by COP 6 in 2002, recognises the need to build capacity for taxonomic activity in all regions, but especially developing countries, including reference materials, databases, and taxonomic expertise. Taxonomic needs and capacity assessments have been built into the programme of work, as well as capacity building to support access to and generation of taxonomic information as well as capacity building for taxonomic activities related to the work programmes and initiatives under the Convention.

Other processes have also established mechanisms for building capacity in Parties for the implementation of agreements. CITES, for example, provides training to Parties through workshops and various forms of electronic learning, focussing on permits and certificates, non-detriment findings, border inspections, and general compliance with CITES provisions. The Ramsar Convention develops regional centres for training and research on wetlands in the western hemisphere, and in Western Asia, while for the Mediterranean the MEDWET unit promotes, *inter alia*, capacity building initiatives. Involvement of private enterprise support is achieved through the Danone - Evian Fund for Water, which provides support for the promotion of capacity building training workshops and related projects, which have global coverage.

UNESCO’s programme on Man and the Biosphere (MAB) puts a strong focus on building capacity for the sustainable use and conservation of biodiversity. The programme runs Centres of Excellence and Training, for example the Ecole Régionale Post-universitaire d'Aménagement et de Gestion Intégrés des Forêts Tropicales (ERAIFT), located in the Democratic Republic of Congo.

Since 1993, UNDP, through Capacity 21, has assisted over 75 developing countries and countries in transition to adopt innovative capacity building approaches to meet the challenges of environmental degradation and develop good practice in natural resource management. Capacity 21

has since been transformed into the Capacity 2015 programme. The activities of UNDP's Capacity 2015 as related to capacity building for natural resource management include capacity development at the local level to improve local environmental governance and promote sustainable natural resource-based economies; implementing national sustainable development strategies through local level initiatives; promoting public-private partnerships at the local level to stimulate local sustainable development and improve livelihoods; building national policies that promote environmentally sustainable development; stimulating sustainable development in the Small Island States while reducing their vulnerability; and creating natural resource management knowledge, learning and information networks.

UNEP is conducting global, regional and national training programmes and workshops in the field of environmental law and policy, aimed at policy makers and environmental lawyers especially from developing countries. The goal is to strengthen participants' capacity to develop and implement environmental law in their respective home countries. An example is the Partnership for the Development of Environmental Laws and Institutions in Africa (PADELIA) project, which is jointly implemented with UNDP, the World Bank, the World Conservation Union (IUCN) and donor governments. Under the Balkan Stability Pact's Regional Environmental Reconstruction Programme for South Eastern Europe, UNEP is involved with the Acceptance and Implementation of MEAs in Southeastern Europe (AIMS) project. In-country experts prepare in-depth country assessments of acceptance and implementation of MEAs, and governments of the region are establishing national advisory groups to set national priorities for MEA development.

Since the inception of the World Bank/WWF Alliance for Forest Conservation and Sustainable Use, the Bank has invested significant resources in developing tools and associated training and informational materials to educate stakeholders and to facilitate the forest certification process in selected countries and regions. Given the body of work it has amassed on this issue, the Alliance is developing a Learning and Capacity Building (LCB) strategy for promoting sustainable forest management, with a specific emphasis on creating the enabling environment for forest certification in those countries and regions with the greatest potential to bring certified product to market while delivering the environmental, social and economic benefits at the level of the forest management unit.

Under its Biodiplomacy Initiative, the United Nations University Institute of Advanced Studies (UNU-IAS) is conducting capacity building activities in the area of biosafety. The Biodiplomacy Initiative's work on biosafety is carried out with due awareness of the ongoing work relating to the implementation of the Cartagena Protocol through other UN organisations such as UNEP and UNDP, but it is also mindful of the gaps that exist in understanding and employing integrated approaches, and the enormous amount of capacity development required to manage these issues. Part of this initiative is a series of capacity building workshops focused on an integrated approach to the development of biotechnology regimes and sustainable development.

Capacity building and training for biodiversity have become significant elements of many policies, programmes and projects, including of the provision of assistance to developing countries and countries with transition economies. One of the challenges is to make this experience better available and to enable the exchange of information. The UN's Environmental Management Group (EMG) is currently investigating options for enhancing the UN system-wide information exchange on environmental capacity building. The CBD Clearing-House Mechanism has been successful in providing information for the implementation of the Convention, building networks and promoting and facilitating scientific and technical cooperation, but the main obstacle in particular for developing countries remains the lack of capacity to efficiently making use of the information and assistance provided.

III.3.3 Focusing on national action

National and local action is fundamental if global commitments to the conservation and sustainable use of biodiversity, such as the 2010 target, are to be achieved. The previous chapter has discussed mechanisms that aim to provide these local and national stakeholders with sufficient resources and build their capacity, and it has been stressed that these are preconditions for any successful national implementation of global commitments.

The third strategic goal of the CBD Strategic Plan (box III.7) addresses the two issues of article 6, the development of national strategies, plans and programmes for biodiversity, and the integration of biodiversity into relevant sectoral or cross-sectoral plans, programmes and policies. This chapter addresses the first of those, while the second has been discussed throughout various chapters of this section.

Box III.7: Strategic goal 3 of the Strategic Plan of the CBD and its objectives

Strategic goal 3: National biodiversity strategies and action plans and the integration of biodiversity concerns into relevant sectors serve as an effective framework for the implementation of the objectives of the Convention.

***Objectives*:**

- Every Party has effective national strategies, plans and programmes in place to provide a national framework for implementing the three objectives of the Convention and to set clear national priorities.
- Every Party to the Cartagena Protocol on Biosafety has a regulatory framework in place and functioning to implement the Protocol.
- Biodiversity concerns are being integrated into relevant national sectoral and cross-sectoral plans, programmes and policies.
- The priorities in national biodiversity strategies and action plans are being actively implemented, as a means to achieve national implementation of the Convention, and as a significant contribution towards the global biodiversity agenda.

The chapter starts with discussing national reports to the CBD and national biodiversity strategies and action plans (NBSAPs). It then demonstrates examples of national action for biodiversity in several of the areas that the previous chapters have highlighted. As there are no comprehensive overviews of action at the national level, the chapter draws mainly on examples, taken from national reports to the CBD, national biodiversity strategies and action plans, and case studies submitted to the CBD. The purpose of presenting national examples is to show the wide range of mechanisms that Parties to the CBD are establishing for biodiversity conservation and sustainable use, and to give examples of best practice that might be useful for national and local actors in other countries.

National reports

The most important mechanism for measuring the implementation of MEAs is through analyses of national reports, and all biodiversity-related agreements request Parties to provide national reports on a regular basis. However the limited submission of national reports, and the information contained within them has not allowed for a comprehensive overview of the implementation of the conventions. Recently, efforts have been made to improve the reporting systems and in finding ways of harmonizing the reporting between the biodiversity-related conventions. Such efforts aim to support harmonized and efficient national systems of biodiversity information management, reduce the burden for Parties from reporting to a multitude of conventions, and maximize the gain in information about national implementation.

The CBD COP has requested Parties three times to submit national reports. The first national reports were due 1998, the second 2001 and the third 2005. By mid 2005, the Secretariat had

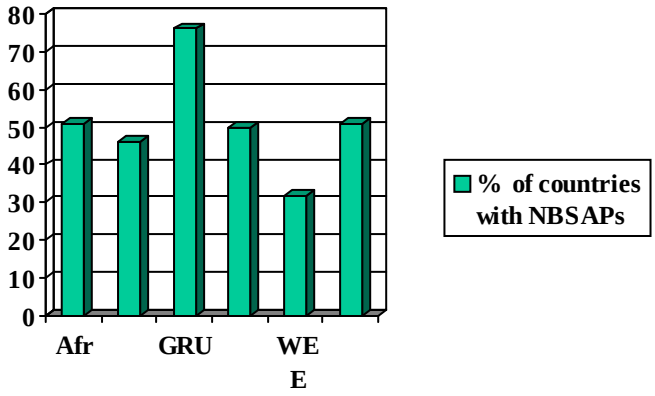
received 140 first national reports and 120 second national reports from a total of 188 Parties. In addition to the national reports, the COP has invited Parties to submit thematic reports on items due for in-depth consideration at future COPs. So far, the following issues have been covered by thematic reports: invasive alien species, access to genetic resources and benefit-sharing, forest ecosystems, mountain ecosystems, protected areas, technology transfer and cooperation, and Global Taxonomy Initiative. Parties have also been invited to submit a voluntary report on forest biological diversity.

National Biodiversity Strategies and Action Plans

National Biodiversity Strategies and Action Plans (NBSAPs) are 'the primary mechanisms for the implementation of the Convention and the Strategic Plan' (COP decision VII/30), in line with Article 6a of the Convention and goal 3 of the Strategic Plan. By mid-2005, 108 Parties had completed their NBSAP, with another 15 countries having had prepared drafts or having had NBSAPs awaiting government approval (see figure III.6 for regional distribution). A further 17 countries had NBSAPs under preparation. Two Parties have revised their original NBSAP. According to the second national reports, only very few countries have produced reports on the implementation of their NBSAP and also very few countries have measurable targets for their NBSAPs in place. A single set of guidelines for measuring implementation of NBSAPs has not been developed. Such guidelines could build on the existing valuable guidance from a variety of organisations, and the experience gained in-country.

Figure III.6: Percentage of countries with National Biodiversity Strategies and Action Plans in the CBD regions

(Afr = Africa, AsP = Asia-Pacific, GRU = Latin America and Caribbean, CEE = Central & Eastern Europe, WEE = Western Europe and others)



At the national level, the United Kingdom for example has adopted 391 Species Action Plans and 45 Habitat Action Plans, and has set up a local action planning process for species and habitats, which has produced more than 160 Local Biodiversity Action Plans. These plans bring together local stakeholders, such as local government, non-governmental organisations, farmers, foresters, business and landowners to develop targeted actions for habitats and species. South Africa has developed a number of species-specific conservation action plans that have been drafted by non-governmental organisations and provincial authorities, and the 2003 South African Mammal Red Data Book incorporates a mammal conservation plan.

The development of NBSAPs in more than 140 eligible countries has been supported by the Global Environment Facility (GEF) Enabling Activities. The Biodiversity Planning Support Programme (BPSP) was approved by the GEF Council in 1998, implemented by UNDP and UNEP, and worked to strengthen countries' ability to develop and implement NBSAPs in accordance with

their obligations under CBD Article 6. BPSP resulted in thematic studies on integration of biodiversity into the agriculture, forestry, fisheries and tourism sectors, integration of biodiversity with environmental assessment procedures, the use of economic tools in biodiversity planning, financial planning for NBSAPs, and harmonization of legal obligations under biodiversity-related MEAs. The Biodiversity Service is a joint project of UNEP, IUCN, European Centre for Nature Conservation and Regional Environment Center for Central & Eastern Europe, providing support to Central & Eastern European, Caucasus and Central Asian countries for implementation of their NBSAPs. A number of other organisations have supported the development and implementation of NBSAPs, amongst them IUCN through the Regional Biodiversity Programme in Asia, and Fauna & Flora International (FFI) in Eastern Europe, the Caspian region and Central Asia.

From the experience of the national biodiversity planning process, a number of conclusions can be drawn. The following opportunities for national biodiversity strategies and action plans have been identified:

- Undertaking a comprehensive national biodiversity planning process
- Bringing together stakeholders
- Building awareness amongst stakeholders of the obligations under the CBD
- Building capacity for implementation
- Setting the stage for implementation
- Linking up with other strategies
- Building on experience gained elsewhere.A number of challenges for NBSAPs have been recognised:
- Achieving national and local ownership
- Involving those that ultimately decide on effective CBD implementation, including decision-makers and local communities
- Intersectoral integration
- Addressing all three CBD objectives
- Inserting new issues arising from the CBD Conference of the Parties
- Linkage to other donor-sponsored planning processes
- Resource mobilisation from foreign and domestic sources
- Building capacity for implementation.

It remains critical to resource the implementation of the NBSAPs. In many countries, the establishment of the NBSAPs has been achieved through a participatory process, ensuring the support of stakeholders, with funds from the GEF Enabling Activities. But despite the support efforts outlined above, the implementation process has in many cases prematurely ceased, due to the lack of capacity and resources. This has resulted in the implementation of the CBD through single, often not well-connected projects, rather than through a consideration of a holistic and comprehensive approach.

Habitat change

A range of measures to combat habitat loss and improve conservation and sustainable use has been introduced in the previous chapters. Habitat change is in particular addressed through the establishment of protected areas and measures for sustainable use of natural resources. Comprehensive approaches to ensuring habitat conservation are taken through the NBSAPs that frequently identify the major ecosystems and habitats in the respective country and outline activities for their conservation and sustainable use. Box III.8 gives an example of management suggestions

addressing habitat deterioration around a protected area in Cameroon that affects the reserve as well as indigenous people living in the area.

Box III.8: Impact of forest logging in the Dja Biosphere Reserve, Cameroon

Source: Lagarde Betti, J., Ministry of Environment and Forestry, Cameroon. http://www.biodiv.org/doc/case-studies/for/cs-ecofor-cm-01-en.pdf

The Dja Biosphere Reserve is located in the East and South Provinces of Cameroon, at the meeting point of the low Guinean area and the Congolese Basin. It covers an area of 5,260 km² and is classified among the largest protected areas of the Guinea-Congolian tropical rain forests. The Reserve accommodates a large proportion of the equatorial flora and wildlife species including such endangered species as the forest elephants, the chimpanzees, and the gorillas. The major ethnic groups, the Bantus and the Baka Pygmies live side by side in and outside the reserve. The Dja reserve has not yet been subject to forest logging. But the high processing of timber extraction and the commercial hunting of large mammals around the reserve, result in fragmentation of the forest with negative impacts on biodiversity and on the Baka pygmies. Today, eight forest logging companies are working around the Dja reserve. In all, 157.429 m³ of wood have been extracted in the North and the South of the Dja Biosphere Reserve from 2000 to 2003. In July 2003, about 72,167 m³ of *Milicia excelsa* and 7,154 m³ of *Entandrophragma cylindricum* were illegally logged. Forest logging has been a serious problem due to the reduction of wild fruits for local people and large mammals, and the intensification of commercial hunting in the Reserve. Animals are being hunted for sale primarily in towns and secondly in the forest sites. Timber logging has a negative impact on the medicinal value of the Dja forest, where about 80% of medicinal plants used by the local people are composed of ligneous species, with trees (50%) having the highest proportion. Due to the lack of a definitive Simple Management Plan for the reserve, forest logging is being conducted in the areas that are supposed to be considered as buffer zones. A Simple Management Plan (SMP) for the Dja Reserve is suggested and for each of the management forest units boundaring the reserve. The improvement of the life of local people can also have a positive impact on the conservation of the biodiversity of the Dja Reserve.

As a result of the policy of the National Board of Forestry in Sweden to preserve forest and woodland key habitats (very high conservation value forests), some 800,000 hectares of key habitat is estimated to exist (based on a sampling study). Of these, 250,000 – 300,000 hectares have been gazetted. It appears that the rate of cutting of key habitat forests has decreased sharply over the past ten year period. However, a rough estimate indicates that still 1,000 – 2,000 hectares are cut annually. The Zambesi Action Plan of the Southern African Development Community addresses habitat changes on a subregional landscape level (box III.9).

Box III.9: The Zambezi River Basin – habitat change and sustainable development

Source: Case study example1 - Principle 1: The Zambezi River Basin - "dialogue for building a common vision" Available at www.biodiv.org/doc/case-studies/esys/cs-esys-mz-01-summ-en.pdf

The Zambezi River Basin encompasses some 1,300 km^2 and includes a dense network of tributaries and associated wetland systems in eight countries. Approximately 26 million people are directly dependent on this basin for their livelihood, deriving benefits from its water, hydro-electric power, irrigation developments, fisheries and related natural resources, including grazing areas, wildlife and tourism. Over the past forty years, the communities and ecosystems of the lower Zambezi have been constrained by the management of large upstream dams. The toll is particularly high on Mozambique, being the last country on the Zambezi. Although these hydropower dams generate important revenues and support development, it is at the expense of other resource users. Subsistence fishing, farming, and grazing activities have collapsed with the loss of the annual flood. Changes in the flooding regime have also affected the availability of water supplies, fuel wood,

building materials and medicinal plants. Public health and the cultural relationship between local people and the river have also been altered.

In 1985 the Zambezi Action Plan was developed, with the objective to promote environmentally sound water resources management, while increasing long-term sustainable development in the basin. The Protocol on shared watercourse systems was drafted as a follow-up in 1991, and in 1994 the Permanent River Basin Water Commission was established. Key initiatives that have taken place include: drawing up regional legislation, establishing a unified monitoring system for water quality and quantity with set standards, environmental education, and developing integrated water management plans with broad stakeholder participation.

Stakeholders have reached consensus on an ecologically sustainable framework for managing the water resources of the lower Zambezi and improving the living standards of thousands of riverine households. The extensive dialogue has resulted in the political will and commitment necessary to take advantage of this unique window of opportunity to implement a common vision for future of the Zambezi system, both nationally and throughout the region.

Protected areas

'*In situ* conservation is currently being addressed through the establishment of protected areas'

Marshall Islands Second National Report

Protected area systems are well developed in many countries, while other countries are working towards such a system. 20% of the Small Island Developing State of Niue consists of a protected area. 2.6% of Brazil's territory consists of strictly protected areas, while 5.5% are protected areas for sustainable use. Iran has more than 5% of its land area protected and aims to increase this proportion to 10%. South Africa has established more than 50 Marine Protected Areas and a programme is underway to expand the number and extent of these areas, with a target of 20% of the coastline integrated in the system by 2010. Australia has divided its territory into 85 biogeographic regions, on the basis of which the National Reserve System is being developed. In the Netherlands, the Nature Policy Plan in 1999 established the 'Ecologische Hoofdstructuur', a national ecological network, which is aimed to be completed by 2020. It includes the 20% of the Netherland's territory under protection through the EU Habitats and Birds Directives. Lebanon has developed incentive measures for the protection of biological resources within its reserves, including, among others, plans to deduct taxes for people who donate to protected areas.

For transboundary ecosystems and habitats, several countries have taken measures to address the development of protected areas jointly. With support from Fauna & Flora International, Liberia is cooperating with Guinea and Côte d'Ivoire for the conservation and management of the Mount Nimba Massif and its biological resources. Liberia, Guinea and Sierra Leone are cooperating for the establishment of the Mano River Elephant Conservation Reserve. Brazil is cooperating with a number of neighbouring countries on transboundary protected areas, for example with Bolivia and Paraguay on the Mountains of Tumucumaque National Park. Box III.10 demonstrates transboundary cooperation on protected areas in a regional context.

Box III.10: Transboundary cooperation in southern Africa

Source: Botswana Third National Report

Regional cooperation on applying the ecosystem approach across borders has begun in Botswana. The Kalahari Transfrontier Park is the first cross border game reserve in Africa. Botswana and South Africa are cooperating to conserve the park, which is an important ecosystem where large populations of wild animals exist. The park protects their migratory routes. A similar project is being developed for the Shashe-Limpopo area between Botswana, Zimbabwe and South Africa. In the Okavango basin, regional cooperation is in the form of the Permanent Okavango River Basin Commission whose mandate is to oversee the safe management of the whole Okavango

Basin. This Commission is made up of representatives from the governments of the basin states and has resulted in many conservation programmes for the area.

Achieving biodiversity objectives through the management of the wider landscape outside of protected areas provides a great challenge for countries. Management measures in this respect are generally not well advanced compared to those for protected areas. Several countries are aiming to apply an ecosystem approach, for example for the management of their forests or their marine or coastal areas, the latter through integrated coastal zone management.

Sustainable use

'More than 80% of the surface area of South Africa is zoned for agricultural use'

South Africa Second National Report

Sustainable use is being promoted in many countries through legislative and policy measures. In the Philippines, for example, the framework for sustainable use is provided by the Philippine Council for Sustainable Development, the Philippine Agenda 21, the NBSAP and the national Environmental Impact Assessment system. In addition, the NBSAP is integrated in the national planning process of government agencies through a Memorandum Order from the President. The Botswana Community Based Natural Resources Management programme, being implemented through various government policies, encourages sustainable natural resource use. It targets in particular wildlife use, fisheries, and the use of specific plants. Several countries, in their national reports, have emphasized the need for integration of sustainable use policies with poverty alleviation and equity principles, recognising that sustainable resource use is essential for sustaining people's livelihoods. In Cameroon, the Ministry of Tourism has developed a policy to promote eco-tourism, in cooperation with the World Tourism Organization. Bangladesh has incorporated conservation and sustainable use of biodiversity in the Strategic Plan for Poverty Reduction. In addition, the country has set targets for sustainable use in the sectors of fishery, forestry, coastal and water policy. An example of how working with the private sector can allow for a much-improved use of natural resources is provided in box III.11.

Box III.11: The conservation of littoral forests in Madagascar

Source: IUCN and ICMM. 2004. *Integrating Mining and Biodiversity Conservation: Case studies from around the world.* Available at www.icmm.com/publications/501Biodiversity-report.pdf

QIT Madagascar Minerals (QMM), a Malagasy company jointly owned by Rio Tinto plc, UK, and the Malagasy State, is planning to mine titanium-rich sands in the coastal plains of south-eastern Madagascar in an area of about 6,000 hectares over the next 50-70 years. Most of the proposed mining area consists of heavily degraded ecosystems. But major deposits are also located underneath some of the last remnants of littoral forest. These forests are under severe pressure from the local populace, who depend on them for wood and charcoal for cooking and construction.

In light of the pressures on the littoral forests in the area of interest, QMM sought to establish a comprehensive environmental programme. Based on clearly defined and agreed upon objectives, conservation programmes have been put in place and monitoring programmes have been established to verify the efficiency of the conservation measures on the genetic, population, ecosystem and socio-economic levels. Activities include: planting industrial forests that can be used for charcoal production, easing the pressures on the natural forest ecosystem, the development of bee-keeping and training women in weaving using the reeds from restored wetlands. The human population is included at all levels and at all stages of the project, ranging from the villages affected by the pending mining operation to the company's participation in the regional development plan and in fundraising for socio-economic development outside and beyond the actual mining operation.

As these activities are evaluated and modified periodically, they will provide the quantitative bases for long-term monitoring of the conservation success of a large mining operation in a developing country while using and actually anticipating the standards formulated to achieve 'best practice' in mining operations.

The Netherlands has established a system of fiscal and non-fiscal measures aiming at promoting sustainable use of natural resources. Fiscal measures include taxes for groundwater extraction and on landfill, tax exemptions for forest conservation and for green investment funds, high VAT taxes on fertilizers and pesticides and accelerated depreciation for assets important to conservation. Non-fiscal measures include financial compensation to farmers for the conservation of natural and semi-natural biodiversity. Other countries have started research for appropriate fiscal incentives for biodiversity conservation and sustainable use, and in many countries national guidance in this regard still needs to be developed. Box III.12 highlights an example of how sustainable production of a major cash crop can be achieved alongside biodiversity conservation objectives.

Box III.12: Organic coffee production in Mexico by small farmers

Source*: Case study example - Principle 2: Organic coffee production in Mexico - "small farmers need extension support to successfully build their opportunities". Available at *www.biodiv.org/doc/case-studies/esys/cs-esys-mx-01-summ-en.pdf

Coffee is amongst the key cash crops in southern Mexico. Although the global price for a pound of beans has fallen to historic lows, making it simply no longer cost effective for small farmers to harvest their crops, the potential of organic coffee is being realised. The rapidly growing markets for especially organic shade-grown coffee are projected to potentially generate hundreds of millions of dollars in revenues for the Central American region, substantially contributing to the improvement of incomes for small farmers and indigenous people. Significant attention has been given to the positive relationship between small environmentally friendly coffee producers and biodiversity, increasing the livelihood opportunity of the former and conserving the latter. To further develop the industry in a biodiversity sensitive manner, management of the farming entities is left to the small farmers and producers, who are often organised in cooperatives. However, a number of key issues are currently impeding the successful further development of the industry. Government, research institutions and service organisations need to complete research on issues such as pest management, monitoring of organic shade-grown production systems, and the understanding of the ecological functioning, quality improvement and better opening of marketing opportunities. Further, government policies such as pesticide subsidies, tending to favour conventionally grown crops, need to be adapted to support the development of the organic coffee industry, to allow for more environmentally friendly practices. International trade deals, which will affect environmental offsets, will have to be managed at appropriate levels.

Overexploitation

Many countries have established threatened species legislation to counteract overexploitation of wild animal and plant populations. The National Biodiversity Strategy and Action Plan of Chile, for example, proposes to prioritize endangered species by enacting rules for threatened species classification, to define institutional structures needed for assigning species conservation responsibilities, and to set up an *ex situ* conservation programme. In Guayana, a range of fisheries acts and regulations regulate inland, coastal and marine fisheries, and a Fisheries Management and Development Plan for 1994-2004 has been drafted but not entered into force. The National Biodiversity Action Plan has recognised the need for fisheries and wildlife management plans and policies that address currently recognized issues of concern and integrate monitoring, management and enforcement.

The NBSAP of Burkina Faso acknowledges that overexploitation of game including through poaching and unsustainable collecting of medicinal plants contributes to biodiversity loss. Measures proposed include, amongst others, the active participation of local communities in wildlife conservation, with specific attention given to the involvement of women, incorporating traditional habits and customs, and building on environmental education, targeted in particular at hunters and collectors. A conservation strategy for threatened wild goats and sheep was introduced in Torghar, Pakistan (box III.13).

Box III.13: Conservation of wild goats and sheep by local tribesmen in Torghar, Pakistan

Source: Ahmed, J., Tareen, N. and Khan, P. *Conservation of Sulaiman Markhor and Afghan Urial by Local Tribesmen in Torghar, Pakistan.* Available at http://www.biodiv.org/doc/case-studies/suse/cs-suse-iucn-thorgar.pdf

The Pathan tribe in Torghar, a remote area in the province of Balochistan, Pakistan, are semi-nomadic sheep and goat herders for which hunting has been a tradition for a long time. From the late 1970s, with the onset of the Afghan War, automatic weapons and ammunition became readily available and led to overhunting and subsequently rapid decline of populations of Sulaiman Markhor *Capra falconeri jerdoni* and Afghan Urial *Ovis orientalis cycleros*. With initial assistance of the US Fish and Wildlife Service and later IUCN and UNDP/GEF, a comprehensive conservation programme was set up, managed by the Society for Torghar Environmental Protection (STEP). This is built on anti-poaching measures, employment of Pathan people as game guards and limited trophy-hunting, based on the principles of sustainable use and tribe involvement. Significantly, the programme has been extended to support economic development and social services. Today, numbers of Sulaiman Markhor and Afghan Urial have increased substantially and the economic and social infrastructure has significantly improved.

Invasive alien species

‘Invasive alien species are probably the greatest single threat to ecosystems, habitats and species in South Africa’

South Africa Second National Report

Several countries have introduced legislation to address invasive alien species. South Africa has amended the Conservation of Agricultural Resources Act (Act 43 of 1983) by regulations, which provide for three categories of invasive alien plants: those that must be removed, those that may only be grown in demarcated areas such as forestry plantations, and those that may be retained on land but may not be propagated and sold. In the Philippines, regulations implemented by the Department of Environment and Natural Resources and the Department of Agriculture aim to control the introduction and importation of invasive species.

Some countries are developing national strategies on invasive alien species, in many cases closely linked to the National Biodiversity Strategy and Action Plan. The latter often carries proposals for national action on invasive species. The Philippines have incorporated strategies on prevention and control of invasive species in development production programmes on agriculture and forestry. New Zealand has established a BioSecurity Authority to provide focus and coordination in the government’s programme to protect the health and welfare of animals and plants from alien invasions. The BioSecurity Authority employs over 80 technical experts and operates well-established frameworks for setting standards and managing associated risks.

In many countries, considerable action has been taken to remove invasive alien species or mitigate their impacts on native biodiversity, often following assessments of the scale of the problem. Clearance of habitats has been carried out, and quarantine systems have been put in place to control the introduction of alien species. The Seychelles has undertaken programmes for the eradication of rats, cats, mice, goats, pigs and chickens on several islands. Control and mitigation

efforts are also carried out against barn owls, Indian mynahs, vines and creepers such as Philodendron.

Australia has effectively controlled introduced foxes over 3.5 million hectares in south-west Western Australia, leading to the recovery of native fauna, including the removal of three mammal species from the threatened fauna list. Research is being undertaken on effective feral cat control. Box III.14 informs about a cooperative approach to weed and pest management in New South Wales.

Box III.14: Australia: Addressing invasive alien species in New South Wales

Source: Australia Thematic Report on Invasive Alien Species

The New South Wales (NSW) Biodiversity Strategy identifies the need to improve cooperative approaches to weed and pest management as a priority action. Building on the NSW Weeds Strategy, the threat abatement planning process and the ongoing work of the NSW Pest Animal Council, the NSW Government has provided additional funding for key weed and pest control programmes to implement this priority action ($1.1million over three years). An example of a project that is partially funded through the NSW Biodiversity Strategy is the strategic management of Bitou bush *Chrysanthemoides monilifera* on coastal ecosystems, which includes developing a state-wide Bitou bush strategy. Preparation of threat abatement plans for invasive species listed as threatening processes under the *Threatened Species Conservation Act 1995*, will ensure management of these species is targeted at minimising impacts on biodiversity.

Pollution

Since 1998, successful efforts have been made in Sweden to cut emissions of nitrogen oxides (NOx) and sulphur oxides (SOx) from ships, with a system of environmental differentiation of fairway dues. As of December 2004, the annual reduction of NOx is about 41,000 tonnes compared to conventional ships with no technological method to limit NOx emissions. As from 19 May 2006 the Baltic Sea will be a SOx emission control area in accordance with the International Convention for the Prevention of Pollution from Ships (MARPOL 73/78). The sulphur content of fuel oil used on board ships in a SOx emission control area shall not exceed 1.5% m/m. In Kyrgyzstan, a consortium of government, business and NGOs has addressed environmental problems including pollution from a gold mine (box III.15).

Box III.15: A community and business forum in Kyrgyzstan

Source: IUCN and ICMM. 2004. *Integrating Mining and Biodiversity Conservation: Case studies from around the world.* Available at www.icmm.com/publications/501Biodiversity-report.pdf

The Community & Business Forum (CBF) was established to help build good relations between Kyrgyz communities and international business interests co-existing in the fragile and diverse natural environment of Kyrgyzstan. The biodiversity of Kyrgyzstan includes endemic plant species, including tulips and Alliums; wild relatives of species that have since been propagated, including apples, walnuts, apricots, tulips and onions; and animal life such as migrating waterfowl, the threatened and regionally endemic Menzbier's marmot, ibex and the rare Marco Polo sheep. A number of problems threaten the unique and fragile environment of this country: extensive overgrazing and degradation of the fragile mountain pastures, use of forests as fuel for industry, pollution from both heavy metals and pesticides, pollution from unsealed uranium mines and radioactive tailings.

The CBF initially focused on the Kumtor Operating Company and the neighbouring communities in the Issyk-Kul and Naryn regions. The Kumtor gold mine is one of the largest businesses in the country and has large and widespread social and environmental effects and is therefore a good test case for how businesses in Kyrgyzstan may be able to bring sustainable benefits to surrounding communities. The CBF's activities are guided by a Steering Committee of

nine representatives from local and national NGOs, government and business. A staff of four Kyrgyz nationals handles day-to-day operations. CBF helped the public monitoring of the environmental and social impacts of Kumtor by identifying specific areas for further scientific investigation; reviewing key documents and making the findings public; and, identifying aspects of Kumtor's activities where the environment or public well-being was potentially at risk and then raising these issues with the company.

The lessons learned in the CBF include that it is important to build on existing initiatives, to provide appropriate information, to create space for discussion using a participatory approach, to build trust through action on the ground, to embrace both positive and negative unexpected outcomes and to take a holistic approach – understanding both biodiversity and mining in terms of wider issues, context and history. The CBF continues to operate independently to promote sustainable social, economic and environmental development in Kyrgyzstan.

Climate change

Available information suggests that Botswana is highly vulnerable to climate change. Temperatures are predicted to rise by 1–3 degrees while it is believed that rainfall will become more erratic. If this happens it is predicted that crop yields for sorghum and maize will be reduced by about 30%. Thus it is expected that climate change will adversely affect crop and livestock production.

Botswana Third National Report

Article 4.9 of the UNFCCC recognises the specific needs and special situation of the Least Developed Countries (LDCs). Decision 5/CP.7 established an LDC work programme that includes, amongst others, National Adaptation Programmes of Action (NAPAs). These programmes aim to identify priority activities that respond to the urgent and immediate needs with regard to adaptation to climate change. Many countries that are Parties to the UNFCCC and to the CBD are in the process of developing their NAPAs. The programmes are expected to provide guidelines for adaptation particularly in the foresty and agricultural sectors.

The NBSAP of the Federated States of Micronesia recognises amongst the major threats and constraints to biodiversity conservation the increased frequency and intensity of tropical storms, global climate changes and sea-level rise, the El Niño –Southern Oscillation phenomena, and the increased fluctuations in precipitation patterns, for example flooding and drought. Amongst the actions to be taken is the development and implementation of a programme for monitoring the impact on biodiversity from global warming and climate change, and to coordinate and integrate activities taken under the CBD, UNFCCC and other conventions.

South Africa has developed a country study on climate change that includes vulnerability and adaptation assessments for plant and animal biodiversity. For many countries, information on climate change and its presumed impacts is not available.

Maintaining ecosystem integrity and the provision of goods and services

Cameroon is jointly involved with the five other countries of the Gulf of Guinea to integrally manage the marine and coastal zones of the Gulf of Guinea, under the Large Marine Ecosystem of the Gulf of Guinea Project (GOG-LME). The project had a coordination centre in Abidjan in Côte d'Ivoire. A first phase, lasting for four years, has been completed; a second phase is planned already. The Project covered a coastal length of 3,650 km with mangroves covering 1.5 million hectares. It was managed under the supervision of the United Nations Industrial Development Organization (UNIDO). Information exchange has consisted of country case studies on coastal/marine biodiversity assessment; marine pollution; marine biology; the range of human activities along the Mangrove Survey; and the preparation of participatory country's 'Coastal Profile Document'. The various countries (Cameroon, Côte d'Ivoire, Ghana, Nigeria, Benin, Togo)

benefited particularly from exchange of information. Box III.16 provides another example for the transboundary management of a large ecosystem, the Mekong River Basin.

Box III.16: The Mekong River Commission, managing a shared resource for ecosystem integrity Source: Case study example - Principle 11: The Mekong River Commission - "including a broad range of knowledge and experiences in resources management". Available at www.biodiv.org/doc/case-studies/esys/cs-esys-vn-01-summ-en.pdf

The Mekong River Commission (MRC), established in 1995, consists of Cambodia, Lao PDR, Thailand and Viet Nam. The MRC agreed to cooperate in all fields of sustainable development, utilisation, management and conservation of the water and related resources of the Mekong River Basin, such as navigation, flood control, fisheries, agriculture, hydropower and environmental protection.

Previous initiatives of the fisheries programme have considerably enhanced awareness of the value of local ecological knowledge and the contribution that local communities can make in the research process. For example, one study of basin-wide fish migrations was based exclusively on using local knowledge and resulted in the development of ecosystem-based approaches to basin-management regarding water resources management issues. It is particularly notable because it involved a network of local fishers who were distributed throughout the four countries and collectively developed information on transboundary fish migrations and management issues. The longer-term plan is to involve relevant communities in the four countries collectively in the long-term monitoring of trends in species and the environment and to feed this information into regional planning and natural resources management. Local fishers have had a long-standing involvement in local research initiatives and are currently developing community-based indicators for sustainable fisheries management in the Lower Mekong Basin of LAO PDR. The overall objective of the project is to develop an affordable and effective method of evaluating fisheries sustainability. These and other regional experiences have recently prompted recommendations that local communities should be the focus of improving the reliability, relevance and sustainability of information systems for fisheries. Many of the fish migrate through the region from other countries and the MRC is also fostering further linkages with those countries under regional management initiatives.

The objectives of the MRC are essentially to manage the river basin along the lines of an ‘ecosystem approach’, which in this case include significant transboundary management aspects. Notable programmes based upon ecosystem approaches include the Water Utilisation Programme, Basin Development Plan and the Environment Programme.

The importance of ecosystem goods and services for human well-being is increasingly being taken into account at the national level. In Bangladesh, for example, freshwater ecosystems and open water fisheries provide the safety net for millions of people, and four out of five rural Bangladeshi depend to some extent on aquatic resources. Community-based conservation efforts have been undertaken in many parts of the country resulting in improved resource conservation. Critical ecosystems have been declared Ecologically Critical Areas to promote conservation and sustainable use of resources. The use of the ecosystem approach for maintaining forest ecosystems in Austria is described in box III.17.

Box III.17: Austrian Forest Ecosystems, maintaining ecosystem integrity

Source: Case study example - Principle 3: Austrian Forest Ecosystems - "looking beyond your own backyard ". Available at www.biodiv.org/doc/case-studies/esys/cs-esys-at-01-summ-en.pdf

The municipality of Dornbirn, a community situated in western Austria, used the ecosystem approach as a framework for the development of its forest use plan. One of the key concerns of the community has been that the interaction between various ecosystem types, related resource and land

uses may be conflicting. The forest areas are traditionally used for game management and hunting, commercial forestry including timber production, tourism and recreation, and conservation of forest ecosystems and related biodiversity. Adjacent un-forested areas are additionally being used for agriculture. When using a participatory process to develop a forest use plan all interests and uses of the forest areas were first identified, as well as those of neighbouring ecosystems. Obvious areas of use impacts and potential user conflict were highlighted. The different interests and their potential impacts were discussed, quantified and addressed during the early planning phase. Based on the finally agreed use proposals, impact studies were conducted to assess if the forests, from an ecosystem function point of view, could maintain the planned uses. The community, including various stakeholder groups, then identified priorities for land and resource uses for different forest areas, also considering impacts on adjacent areas including agriculturally used fields (e.g. a high population of game may cause damage to the harvest, if population numbers are not rigorously controlled; on the other hand tourists appreciate game sightings on agricultural areas). Together with experts from various disciplines guidelines for the use of the forest areas were defined, taking into consideration impacts on adjacent ecosystems, and are now being implemented.

The participatory planning process allowed stakeholders from various interest groups to voice their needs and aspirations, but also to listen and learn about other stakes. For all involved parties, the dialogue facilitated to look beyond their own backyard and to consider the impacts their intended use would have on adjacent ecosystems and uses.

In Sweden, ecosystem services are the key entry point for development cooperation, with clear linkages to poverty alleviation, minimising vulnerability and improving local livelihoods. Nevertheless, it has been found difficult to formulate national targets on the maintenance of ecosystems' capacity to deliver goods and services, since the scientific basis for the delivery of recommendations on specific biodiversity parameters that are crucial for ecosystem functioning do not yet exist. One reason for that is the complexity of ecosystems and the long timeframes that are necessarily involved for developing this basis.

Traditional knowledge, innovations and practices

Countries are increasingly recognising that there is a wealth of indigenous knowledge that relates to the conservation and sustainable use of biodiversity. Several Parties to the CBD give high priority to the implementation of Article 8j (see chapter III.2.5), but frequently lack the mechanisms for the protection of traditional knowledge. Some countries are in the process of developing policies and legal regimes for the protection of traditional knowledge. Botswana, for example, has established a multisectoral task force on indigenous knowledge, which aims to integrate indigenous knowledge into existing IPR legislation as an interim measure for the protection of indigenous knowledge. The Botswana NBSAP foresees a national policy framework for indigenous knowledge with special provision for traditional medicine research and use. In Colombia, as in many other countries, a proposal for a *sui generis* regime for the protection of traditional knowledge is being discussed. The proposal uses case studies produced by indigenous communities themselves. Bangladesh's NBSAP proposes a strategy for the promotion of use of traditional knowledge for the conservation, use and protection of local communities' intellectual property rights, and an approach to collecting and making available traditional knowledge from Brazil is highlighted in box III.18.

Box III.18: Synthesizing traditional knowledge in Brazil

Source: Brazil Second National Report

As a component of the National Biodiversity Strategy Project**,** the Ministry of Environment (MMA) supported research, which synthesizes traditional knowledge on Brazilian biodiversity. This study collated and analysed all the information on the knowledge and use of biodiversity by traditional populations in Brazil, which is available in books**,** theses**,** articles**,** reports**,** and collections. The relevant documentation was organized such as to make it accessible to the general

public. More than 3**,**000 titles concerning traditional knowledge were researched in databases and libraries throughout Brazil. In total**,** 868 titles were selected**,** of which 483 were related to non-indigenous populations and 385 to indigenous populations. The authors noted that the majority of the studies were published in periodicals, although specialist journals in Brazil, which relate to this subject are rare. More than 80% of the studies and reports have been published in the last two decades**,** demonstrating the growing social and academic interest in the subject**,** and probably also due to the increasing 'political and social visibility' of these populations. Studies in some form or other have been carried out on or with 106 tribes and communities of the 206 indigenous peoples existing in Brazil today. The authors concluded that studies providing information on traditional knowledge associated with biodiversity in Brazil are still incipient.

The NBSAP of Sudan includes an action point on the documentation of indigenous knowledge, practices and technologies, focusing in particular on traditional agricultural practices by pastoralist nomads and their transhumance system. Hungary has prepared its National Agri-environment Programme, which aims to support environmentally-friendly agricultural production methods ensuring the preservation of the landscape and its elements, in which indigenous knowledge plays a major role. The Marshall Islands are taking up the traditional concept of 'mo' conservation sites (box III.19).

Box III.19: Marshall Islands: Traditional mo *conservation sites*

Source: Marshall Islands National Biodiversity Strategy and Action Plan

The word *mo* can be translated as 'conservation site'. It can mean the concept of conservation, as well as traditional skills and knowledge about the conservation of a particular site, including the way in which that conservation site is protected.

The National Biodiversity Strategy and Action Plan identifies the activation of traditional *mo* conservation sites as a goal under Strategic Theme A: Conservation of Biodiversity and Biological Resources. The following key actions are proposed for this goal.

- An awareness-raising programme to promote knowledge and awareness of *mo* among all stakeholders, especially youth. This would be part of the general programme of awareness-raising on biodiversity through workshops on all atolls and islands, building on the atoll consultations during the NBSAP process.
- Collecting of information on knowledge and practices of *mo*. During the preparation of the National Report, the NBSAP, and the atoll workshops the task of collecting information and knowledge about traditional practices of *mo* began. However, a more extensive effort is needed to ensure that this information is comprehensive and complete. This comprehensive information will need to be stored in a safe but accessible place. This will require a programme to strengthen the Alele Museum to enable them to archive knowledge and information about *mo* and other traditional systems of conservation and resource management.
- Starting a national consultation process to look at the relationship between *mo*, the sustainable use of natural resources, and land tenure systems. The result of this consultation would contribute to the revision of legislation and ordinances.
- Incorporating *mo* into legislation and ordinances so that those areas considered to be of biodiversity importance could be designated as conservation areas or *mo*. This would be done through a review and revision of existing legislation and ordinances to identify those that impact on resource management and biodiversity conservation.

Ensuring the fair and equitable sharing of benefits

Implementing access to genetic resources and the equitable sharing of benefits arising out of their use is a major priority for many Parties to the CBD. However, only limited action in this regard has been undertaken, and national systems for access and benefit-sharing are still widely

lacking. On the other hand, many agreements have been established that enable access to genetic resources to third parties from other countries, including private companies and research institutions. At the regional level, guidance has been developed by regional integration organisations (see chapter III.2.6).

The NBSAP of Sudan stresses that microbes are being frequently transferred from Sudan to industrial countries for research purposes and national legislation to regulate the access to genetic resources is urgently needed. In the Philippines, the Executive Order (EO) 247 is regulating access to genetic resources. It treats both foreign and local collectors equally in terms of requirements and opportunities for access, except for requirements that encourage technology transfer from foreign collectors to the local collaborators. EO 247 also requires that collectors engage the services of local universities and that some of the equipment used in research be donated to Philippine institutions or agencies. Regarding benefit sharing, EO 247 provides that all discoveries derived from Philippine materials be made available to the Philippine government and local communities concerned. A practical example for the sharing of benefits from genetic resources in India is provided in box III.20.

Box III.20: Benefit-sharing: An example from India

Source: India Thematic Report on Access and Benefit-sharing

This case study relates to benefit sharing arrangements arrived at between Tropical Botanical Garden and Research Institute (TBGRI) and the Kani tribals of Kerala for the development of a drug called *Jeevani* based on the knowledge of the Kani tribe. *Jeevani* is a restorative, immuno-enhancing, anti-stress and anti-fatigue agent, based on the herbal medicinal plant *arogyapaacha*, used by the Kani tribes in their traditional medicine. Within the Kani tribe, the customary rights to transfer and practice certain traditional medicinal knowledge are held by tribal healers, known as *Plathis*. The knowledge was divulged by Kani tribal members to the scientists of TBGRI who isolated 12 active compounds from *arogyappacha* (*Trichopus zeylanicus*), and developed the drug *Jeevani*. The technology was then licensed to the Arya Vaidya Pharmacy Ltd., an Indian pharmaceutical manufacturer pursuing the commercialisation of Ayurvedic herbal formulations. A Trust Fund was established to share the benefits arising from the commercialisation of the TK-based drug *Jeevani*. The operations of the fund with the involvement of all relevant stakeholders, as well as the sustainable harvesting of the *arogyappacha* plant, have posed certain problems, which offer lessons on benefit-sharing over genetic resources and associated traditional knowledge. This experience has provided insight for developing benefit-sharing provisions in the National Biodiversity Policy and Macrolevel Action Strategy as well as the legislation on biodiversity.

Legal and institutional arrangements

Legislation for the conservation and sustainable use of biodiversity has been a powerful tool in many countries and internationally for many decades. Starting from species legislation in a number of industrialised countries in the 19th century, the scope of laws and agreements has been widened to include habitats and ecosystems and increasingly genetic diversity. Many national laws regulate the taking of specimens of animals and plants, support the establishment of systems of protected areas and regulate the use of natural resources. Some Parties to the CBD report the lack of legislation, for example of specific legal frameworks for biodiversity. Other Parties note that whilst specific legislation for threatened species does not exist, other legislation addresses threats to the components of biodiversity.

Bangladesh has drafted a Biodiversity and Community Knowledge Protection Act, addressing all three objectives of the Convention. In South Africa, the National Environmental Management Protected Areas Act provides for the establishment of a national register of all national, provincial and local protected areas and the management of protected areas in accordance with national norms and standards. Norms, standards and indicators for the management and development of protected

areas are under consideration. Many Parties with coastlines are in the process of developing, or have already developed, institutional, administrative and legislative arrangements for the development of integrated marine and coastal area management.

In Slovenia, the field of biodiversity conservation is rather well regulated by statutory acts, in particular the Nature Conservation Act, the Environmental Protection Act and the Animal Protection Act. The key executive acts concerning biodiversity conservation are the Decree on the protection of endangered animal species, the Ordinance on the Protection of Rare or Endangered Plant Species and the Decree on the Protection of Wild Fungi. Several more executive acts will have to be adopted pursuant to the already enforced laws. Regulations concerning the establishment of protected areas and the designation of their management authorities play a significant role in the conservation of biodiversity.

Assessments of biodiversity

Countries have developed many different tools to assess status and trends in biodiversity. The majority of these focus on species – much less so on ecosystems or genetic diversity - and amongst species they tend to focus on vertebrates, reflecting the lack of knowledge on other taxa and on ecosystems and genetic diversity. Many national inventories of taxa and to a lesser extent of habitats and habitat types have been set up. In many cases, the assessment of status and trends is well advanced for vertebrate species, in particular mammals and birds, as well as higher plants, with major gaps existing for invertebrates and lower plants. From this knowledge base, many countries have published red lists for threatened species and Red Data Books.

In Latvia, the Institute of Biology of the University of Latvia fulfils the task of identification of the components of biodiversity. It focuses on two main directions: firstly, investigation of Latvian nature resources and their sustainable use, environmental and ecological issues, and nature conservation; secondly, investigation of life processes and biological productivity of plants and animals. In addition, several national habitats and species inventories have been established over the past decade.

South Africa has fairly well developed research programmes underway for identification and monitoring of components of biological diversity, particularly for higher order plants and vertebrates. However, government resources are limited and funding for such research from the central fiscus has declined in recent years, due to a focus on social spending. Many identification and monitoring programmes are financed by donors, the private sector and/or NGOs, including the 2003 update of the South African Mammal Red Data Book, compiled by the Endangered Wildlife Trust and the Conservation Breeding Specialist Group (CBSG) South Africa. A national Red Data Book for birds was compiled by BirdLife South Africa in 2000. Programmes such as the Southern African Bird Atlas, Southern African Frog Atlas and South African Protea Atlas, involve volunteers and special interest groups and encourage the involvement of the general public.

Over 30 subglobal assessments are ongoing, or have taken place, under the auspices of the Millennium Ecosystem Assessment. For example, regional assessments in the Caribbean Sea and Southern Africa, national assessments in Portugal, and sub-national assessments in India, China, Canada, and Brazil.

III.3.4 Understanding and communicating biodiversity

This chapter responds to the fourth strategic goal of the Strategic Plan of the Convention: addressing a better understanding of the importance of biodiversity and of the Convention, and broader engagement across civil society in implementation (box III.21). Two major issues are highlighted in this chapter: Communication, education and public awareness, and involvement of the private sector in the implementation of the Convention.

Box III.21: Strategic goal 4 of the Strategic Plan of the CBD and its objectives

Strategic goal 4: There is a better understanding of the importance of biodiversity and of the Convention, and this has lead to broader engagement across society in implementation.

***Objectives*:**

- All Parties are implementing a communication, education, and public awareness strategy and promoting public participation in support of the Convention.
- Every Party to the Cartagena Protocol on Biosafety is promoting and facilitating public awareness, education and participation in support of the Protocol.
- Indigenous and local communities are effectively involved in implementation and in the processes of the Convention, at national, regional and international levels.
- Key actors and stakeholders, including the private sector, are engaged in partnership to implement the Convention and are integrating biodiversity concerns into their relevant sectoral and cross-sectoral plans, programmes and policies.

III.3.4.1 Promoting communication, education and public awareness

'Without communication, education and public awareness, biodiversity experts, policy makers and managers risk continuing conflicts over biodiversity management, ongoing degradation and loss of ecosystems, their functions and services. Communication, education and public awareness provide the link from science and ecology to people's social and economic reality.'

Source: Van Boven, G. & F. Hesselink, 2002: *Mainstreaming Biological Diversity: The role of communication, education and public awareness.* Available at http://www.iucn.org/webfiles/doc/CEC/Public/Electronic/CEC/Brochures/CECMainstreaming_anglais.pdf

Communicating the biodiversity message to decision-makers, ecosystem managers, local communities and the general public is a major precondition for achieving biodiversity conservation and sustainable use. Only well-informed people can act responsibly and contribute to the efforts of curbing biodiversity loss. Communication, education and public awareness (CEPA) are now widely regarded as closely linked tools that need to be developed and strengthened at all levels.

The sixth Conference of the Parties to the CBD in 2002 adopted the programme of work for the Global Initiative on Communication, Education and Public Awareness. The programme of work aims to establish global as well as regional and national CEPA networks, to enable the exchange of knowledge and expertise, and to develop capacity of Parties, professionals and stakeholders in the area of CEPA. Supported by an Informal Advisory Committee, the Convention works closely with UNESCO, UNEP, IUCN Commission on Education and Communication, International Union of Biological Sciences, Ramsar Convention on Wetlands and other partners on CEPA issues. For the first years after its adoption, the programme of work has been recognised as being too broad and a process of prioritisation of activities has been initiated. In addition, inadequate funding has been identified as a major obstacle for implementing the programme of work.

In support of the implementation of the Convention, the German CBD Clearing-House Mechanism established an Internet-based nature observation project named Nature Detectives on the Internet. Children and pupils are asked to observe wild plants, animals and habitats and submit their findings to an Internet site. Each year, reporting pages for 12 themes are developed with text, images and audio files, which are updated throughout the year. Box III.22 informs about an approach to address decreasing knowledge of biodiversity in Arab countries.

Box III.22: Arab Region Ecotechnie Network – increasing environmental awareness in Arab countries

Source: Springuel, I. *Arab Region Ecotechnie Network: Notes on environmental awareness in Arab countries.* Available at http://www.biodiv.org/programmes/outreach/awareness/projects.asp?s=arab

In Arab countries, knowledge on biodiversity is rapidly dwindling with the decrease in rural populations. Particularly affected are the nomadic and semi-nomadic people of the region who traditionally have had a thorough understanding of the ecosystems as this is needed to survive in an extremely harsh environment.

In 1997, a UNESCO-Cousteau Ecotechnie Chair on Environmental Education and Sustainable Development was established at the Unit of Environmental Studies and Development, South Valley University, Aswan, Egypt. Biodiversity education, aimed at policy-makers, educators and the public, including urban and rural people, is one of the main components of the Chair's activities.

The project is part of the National Egyptian Ecotechnie Network, which has united several Egyptian universities and other national institutions and organizations in promoting cooperation among national bodies and regional centres working in the field of environmental education and training. This network itself belongs to the Arab Region Ecotechnie Network (AREN) between Arab Universities (Egypt, Bahrain, Jordan, Morocco, Sudan, Syria and Yemen) and similar advanced centres in the world. Universities within AREN are prepared to work together on biodiversity education issues as part of environmental education towards sustainable development.

Environmental sections, including issues such as native flora and fauna and endangered species and ecosystems, form part of the national secondary exams that students of the Government Schools of the Bahamas are required to sit. The Department of Education has established an education resource centre that runs environmental workshops for local educators. In Guatemala, the National Council of Protected Areas (CONAP) has established the Laguna del Tigre National Park Public Awareness Strategy. The strategy is addressing challenges such as illegal human settlements and other illegal activities within the Park. Activities include, amongst others, radio spots, and adverts in the media and at public places as well as distributing information material.

The Ramsar Convention on Wetlands, at COP 8 in 2002, adopted a Programme on Communication, Education and Public Awareness (CEPA) 2003-2008. It builds on the achievements of the first CEPA programme for 1999-2002. The Programme includes a vision and guiding principles as well as a number of general and operational objectives. The general objectives are as follows:

- To gain acceptance of the value and effectiveness of wetland-related communication, education and public awareness processes at all levels throughout the Convention
- To provide support and tools for the effective national and local implementation of wetland-related communication, education and public awareness activities
- To mainstream the wise use of wetlands within society and enable people to act.

The United Nations Decade of Education for Sustainable Development 2005-2014 (figure III.7) was established by the United Nations General Assembly's resolution 57/254. The resolution designated UNESCO as the leading agency for the promotion of the Decade. The Decade has its foundations in global acknowledgements of the key role of environmental education, for example through Agenda 21 of the World Summit on Sustainable Development. Biodiversity is one of the key action themes of the Decade.

Figure III.7: Logo of the UN Decade of Education for Sustainable Development (pending permission from UNESCO)

The IUCN Commission on Education and Communication (CEC), a global membership network of experts in learning, education, communication, capacity building and change

management has developed a wide range of tools including principles of good practice and a planning guide for projects. It is actively supporting conventions' CEPA activities, such as the CBD Programme of Work for the Global Initiative on Communication, Education and Public Awareness, as well as the United Nations Decade of Education for Sustainable Development and the World Conservation Learning Network. The latter is a global network of environmental faculties in higher education supporting professional development in conservation and sustainable development.

The MA has recently summarised conditions for success in communication, education and public awareness:

- Conduct research before implementation: Communication can only be applied successfully if the critical target group for effecting change has been properly assessed, including the underlying social factors.
- Manage reputation and relationships: It has been shown for protected areas that the relationship of park managers with local residents is of crucial significance to successful park management. This involves a meaningful personal connection to local people, local involvement in park-related decisions or initiatives, keeping up to promises by park authorities and organisations involved, and consistent communication and enforcement practices.
- Manage stakeholder processes effectively: Involving stakeholders requires making them aware of underlying assumptions and values of particular positions. Conflict resolution needs reassessing values in conflict and seeking out common values.
- To communicate effectively, deal with communication issues, not just with biodiversity issues: Technical information about a biodiversity issue needs to be accompanied by communication issues on how the people concerned relate to the biodiversity issue.
- Communicate in understandable terms: Jargon and technical terms should be replaced by terms close to the heart of the people concerned. Thus, talking about a healthy river or rich native bush land might be better terms than biodiversity or sustainability.
- Start with perceptions and motives of the people: It is important to build on people's concerns for conservation and sustainable use initiatives, in order to provide ownership of the process.
- Create pride and involve in action: Pride might be created by using a charismatic flagship species to stimulate conservation action. However, it needs to be ensured that the conservation action does not stop at the flagship species, but goes beyond it to include wider ecosystem concerns.

III.3.4.2 Involvement of the private sector in the implementation of the Convention

Amongst biodiversity-relevant stakeholders, business is the sector least involved in the CBD process. This has been recognised by the Convention in various decisions, and a 'Business and Biodiversity 2010 Challenge' initiative has recently been developed, facilitating a dialogue of the Convention with the business sector. The private sector has some of the greatest potential to positively impact on ecosystems on a global scale, if operating in a suitable framework established by governments. A number of options exist that could significantly enhance the contribution of the private sector to the implementation of the CBD and the 2010 target (box III.23).

Box III.23: Options for the contribution of the private sector to the implementation of the CBD and the 2010 target

- Awareness-raising materials and training workshops on business and biodiversity issues for the private sector
- Guidance on the integration of biodiversity considerations into existing voluntary or mandatory reporting and performance standards, guidelines, and indices in order to mainstream biodiversity considerations into business practice

- Certification schemes reflecting the full range of biodiversity-related issues to facilitate consumer choice based on companies' biodiversity performance
- Internationally agreed standards on activities that impact on biodiversity
- Guidance and tools to assist companies in implementing good practice with regard to biodiversity
- Biodiversity policies and action plans to define and operationalize companies' biodiversity commitments
- Biodiversity benchmarks to guide and assess companies' biodiversity management practices
- Biodiversity offsets to enable companies to fulfil their commitments by compensating for unavoidable adverse impacts of their operations on biodiversity
- Measures of biodiversity value, and models for decision-making based on those measures, to assist companies to operationalize their biodiversity commitments
- Partnerships to facilitate knowledge-sharing with regard to good practice

It remains of particular concern that the global community has been unable to establish effective links between the environment and the trade agenda. The World Trade Organization (WTO) remains largely uncommitted to environmental issues, including biodiversity concerns, despite Article XX of GATT, which provides for general exceptions, including environmental ones, and the CBD has so far not managed to establish a relationship with the WTO that would ensure that biodiversity concerns become an integral part of the WTO decision-making process. On the other hand, successful conclusion of the negotiations of the WTO Doha Development Round to eliminate harmful subsidies in fisheries and agriculture and to consider sustainable production methods would mitigate some of the drivers of biodiversity loss.

The challenges of engaging the private sector are widely reflected at the national and regional level. Encouraging signs come from the few, but increasing cases of cooperation with the private sector in biodiversity-related issues. For example governments, inter-governmental and non-governmental organisations, such as IUCN, UNEP's World Conservation Monitoring Centre, Fauna and Flora International, BirdLife International, Conservation International, Royal Botanic Gardens Kew and Earthwatch support the oil and gas industry in developing biodiversity strategies and action plans for areas of cooperation, rapid assessments and other issues.

IUCN has recently launched a Business and Biodiversity Initiative, and established the IUCN – ICMM (International Council for Mining and Minerals) dialogue. Furthermore, IUCN has embarked on a programme on trade and biodiversity, which aims to place biodiversity and livelihood concerns on the trade agenda and to raise awareness and understanding about trade and investment-related issues. IUCN has prepared guidance and information documents and has hold several events on the issue, including a Global Biodiversity Forum at the fifth Ministerial Conference of the WTO in September 2003 and, with a number of partners, a dialogue on Disclosure Requirements: Incorporating the CBD Principles in the TRIPS Agreement.

SECTION IV - BIODIVERSITY INTO THE FUTURE: PROSPECTS FOR 2010 AND BEYOND.

Main Messages

- An unprecedented effort would be required to reduce the rate of loss of biodiversity at the global, regional and national levels by 2010.
- Some scenarios in which future development paths show relatively good progress toward reducing poverty also show relatively high rates of biodiversity loss, indicating that many development activities aimed solely at poverty reduction are likely to have negative impacts on biodiversity, unless the value of biodiversity and related ecosystem services are factored in.
- If effectively implemented, the range of mechanisms currently developed under the CBD would be sufficient to significantly reduce the rate of biodiversity loss.
- Enhanced political will and support for the conservation of biodiversity, as well as increased awareness, and appropriate human and financial resources for biodiversity initiatives, will be required at the national level in order to fully implement the various commitments that Parties have made under the CBD.

This section considers the prospects for biodiversity into the future, looking through the 2010 target for reducing the rate of loss of biodiversity to longer-term plausible futures for biodiversity. It considers the future values and state of biodiversity, obstacles to reducing the loss of biodiversity, and the role of the Convention into the future. The section concludes that the 2010 target is unlikely to be met at the global level, and that significantly greater efforts will be needed to implement (and build capacity to implement) the current set of mechanisms under the CBD if we are to proactively reduce the rate of loss of biodiversity globally this century.

IV. 1. Prospects for meeting the 2010 target, and looking ahead.

An unprecedented effort would be necessary to meet the 2010 target for reducing the rate of loss of biodiversity at the global, regional and national levels. Meeting the 2010 target would require that the rate of biodiversity loss in 2010 would be less than the current or recent trends indicated in Sections II and III. For a variety of reasons, this is unlikely to be achieved globally: current trends in most components of biodiversity show few indications of slowing in their rate of loss; most of the drivers of biodiversity loss are increasing in intensity, and are projected to continue to do so, or remain stable in intensity; and inertia in both ecological and human systems implies lags of many years, decades or even centuries between some actions taken and their impact on biodiversity – there isn't time for many of the actions that could be taken today to result in a reduced rate of loss of biodiversity globally by 2010.

However, for some components of biodiversity, in some places at national and regional levels, rates of loss are declining, and in a few locations there have been increases in some components of biodiversity. The extent of temperate forest cover in the Northern hemisphere is currently increasing, for example, partly as a result of plantation forestry, but also largely due to the regrowth of native forests. Further appropriate interventions even at this stage would enable a range of sub-targets to be met by 2010 in many other parts of the world.

The rate of loss of habitat, which itself is a key component of biodiversity, and also remains the main driver of species loss in terrestrial and some aquatic ecosystems, is slowing in many temperate regions. Rates of habitat loss could slow globally if proactive approaches are taken, although are currently projected to continue to increase in most tropical areas. However, reduced

rates of habitat loss may not necessarily translate into lower rates of species loss, because of the nature of the relationship between numbers of species and area of habitat, because of the time lags involved before species extinctions reach equilibrium with habitat loss, and because other drivers of loss, such as climate change, nutrient loading, and invasive species, are continuing to increase.

The prospects for attaining the various 2010 sub-targets are shown in table IV.1.

INSERT TABLE IV.1 - Prospects for meeting 2010 sub-targets of the CBD.

Both direct and indirect drivers of change in biodiversity are almost all either constant or increasing in intensity in most parts of the world. Land cover change, including habitat loss and fragmentation has been the most significant direct driver of change over the last 50 years, although the spread of invasive species is currently increasing, and in particular climate change and nutrient loading are increasing rapidly in intensity (see section II).

The majority of indirect drivers (or root causes) of biodiversity loss are also continuing to increase in intensity. Global human population doubled in the last 40 years, reaching 6 billion in 2000, and is expected to peak at less than 10 billion before the end of the 21st Century. Most of the growth over the next several decades is expected to be concentrated in the poorest, urban communities in sub-Saharan Africa, South Asia, and the Middle East, although some high-income countries such as the USA still have high rates of growth.

Global economic activity increased nearly sevenfold between 1950 and 2000. Taking into account population growth, average income per person almost doubled during this period, with significant effects on patterns of consumption, for example of food and energy. Subsidies also continue to have a significant impact on trends in biodiversity. The 2001-2003 average subsidies paid to the agricultural sector of OECD countries were over $300 billion annually. Whilst there are likely to be changes to agricultural subsidies in the near future, many similar policy distortions are likely to remain.

Changes in socio-political and cultural drivers have also been significant in the recent past, and will continue to have an impact on trends in biodiversity. Changes in government structures, the declining importance of the State relative to the private sector, the role of women in society, increases in the average levels of education, and a rise in civil society in most parts of the world all influence the decision-making process relating to environmental issues, including biodiversity.

The development and diffusion of scientific knowledge and technologies have had profound implications for biodiversity. In particular, much of the increase in terrestrial food production in recent decades has come from improved yields, rather than expansion of cultivated areas into other ecosystems. On the other hand, advances in fishing technologies, coupled with subsidies for the adoption of such technologies, have led to significant declines in marine fish stocks across the world's oceans and seas.

The increasing intensity of indirect drivers leads to changes in direct drivers, which in turn lead to continued declining trends in components of biodiversity. Even if appropriate interventions were to be implemented now to reduce the intensity of direct and indirect drivers, lag times and inertia in biological systems mean that biodiversity will continue to be lost well into the future. For example, extinctions of species following habitat loss and fragmentation can take 100-1000 years to conclude, and following a lasting change in climate, it is estimated that it will take many tens or hundreds of thousands of years for species composition in a region to reach a new equilibrium. Time lags are also important in abiotic components of ecosystems. For example it can take up to 300 years for phosphorous to return to natural levels after its application is halted in agricultural systems.

Longer-term targets relating to biodiversity loss are needed in order to guide policy and action towards conservation and sustainable use. Targets also need to focus on the actions that are required

to reduce the rate of biodiversity loss. For example, in Europe, the adoption of the target, *that all European governments, at every level, have taken the necessary actions to halt the loss of biodiversity by 2010* provides a mechanism whereby the focus is placed on taking actions by 2010, with the consequences of implementing such actions playing out further into the future.

Biodiversity scenarios

Although the science is largely in its infancy, increasing numbers of scenarios have been developed in recent years that aim to explore plausible futures of biodiversity. Typically such scenarios are based on a combination of quantitative (data and modelling) and qualitative (storyline) analysis, and make use of a small number of indicators of biodiversity to explore the consequences of potential changes in drivers on the future state of biodiversity globally. Some regional scenarios have also been developed for terrestrial and marine systems. Each scenario tells a different story, depending on the various assumptions of future changes to drivers, and the relationships incorporated into models between such changes in drivers and their impact on biodiversity. Scenarios do not predict the future, but allow exploration of options, trade-offs and alternative futures. Particular insights can be gained from looking at the similarities and differences across a range of scenarios.

In each of the four scenarios developed in the Millennium Ecosystem Assessment (MA) (see Box IV.1)[i], habitat loss caused by land use changes continue to result in a decline in the local and global diversity of some taxa, and especially vascular plants. Habitat decline between 1970 and 2050 ranges from 13% to 20% (see Figure IV.1), leading to local and global extinctions as populations approach equilibrium within the remnant habitat. Analysis using the species-area relationship indicates that the number of species lost at equilibrium (this is, the number of species that can be supported by the habitat remaining by 2050) is likely to be approximately 10–15% of the species present in 1970, although due to time lags in the ecological system not all of these extinctions will have taken place by 2050. Amongst the MA scenarios, those in which a more proactive approach is taken to the environment have more success in reducing terrestrial biodiversity loss in the near future than scenarios that take a reactive approach to environmental issues. A focus on increased security through strengthening political boundaries results in the highest rate of biodiversity loss.

INSERT Box IV.1 - Outline of the four MA scenarios

INSERT Figure IV.1 - Conversion of terrestrial biomes 1950-2050.

Habitat and vascular plant populations are projected to be lost in the MA scenarios at the fastest rate in warm mixed forests, savannas, scrub, tropical forests, and tropical woodlands. In a few biomes, and particularly those in the tropics, expected changes post-1990 are greater than those seen in the past half-century, indicating an increase in the rate of loss of biodiversity. Regions that will lose species at the lowest rate include those with low human impact as well as those where major land use changes and human intervention have already occurred, such as the Palearctic. Tropical Africa is the region that will lose the most vascular plant species, mainly as a result of rapid population growth and strong increases in per capita food production in the region, much of which continues to rely on expansion of cultivated areas. The Indo-Malayan region closely follows, with significant losses in vascular plant species. Past and projected future trends in habitat change indicate that the biomes that have already suffered the greatest change (Mediterranean forests and temperate grasslands) show the highest recoveries over the next 50 years, while the biomes that suffered intermediate changes in the past have the highest rates of change in the near future. (See Figure IV.1) Finally, biomes at higher latitudes that had not been converted to agriculture in the past will continue to be relatively unchanged.

Four different scenarios developed by the GLOBIO project, examining the state of biodiversity through to 2030 suggest that unless conservation efforts increase dramatically, species richness may decline to less than 70% of those species present originally (see Figure IV.2), with the rate of biodiversity loss over the next 30 years potentially more than double the rate from the last century. As with other scenarios, the GLOBIO models allow for a separation of the effects of different drivers on biodiversity loss, which allows the relatively importance of different drivers to be examined, and therefore may help to prioritise appropriate responses. Under the GLOBIO scenarios, land use change continues to be responsible for the largest share of biodiversity loss.

INSERT Figure IV.2 - Global maps of mean remaining original species richness for 2000 2020 and 2050 from GLOBIO 3.0 under the scenario with the greatest impact on biodiversity.

In each of the four scenarios developed for GEO-3 (UNEP 2002), land use changes also lead to severe depletions of biodiversity in most regions over the next 30 years, particularly in areas in which the effects of climate change are likely to be most significant and natural vegetation is unable to adapt to the rates of changes in temperature and precipitation. Pressures also increase in coastal areas, from both land-based pollution and land use change, and from direct exploitation of resources. These pressures are particularly large in Asia and the Pacific. In Europe, the Mediterranean coast comes under special pressure through a combination of urban growth with inadequate wastewater treatment, tourism and agricultural activities near to estuaries. In the Americas and Africa, pressures grow rapidly over the next few decades, particularly around estuaries of large river systems.

In other projections, a series of special reports on the state of the planet in the journal *Science* predicts that by 2050, assuming no radical transformations in human behaviour, a considerable number of extinctions will have taken place, and forest habitat in the tropics will have been much reduced and fragmented[ii]. Even in areas where habitat remains, the species diversity of such habitats is projected to be greatly reduced. In marine systems, large species are likely to become extremely scarce, and some systems, such as coral reefs are likely to be heavily degraded in most places. Freshwater biodiversity will continue to decline at a faster rate than terrestrial or marine biodiversity.

Other scenarios of changes in biodiversity have been developed for the year 2100, based on scenarios of changes in atmospheric carbon dioxide, climate, vegetation, and land use, and the known or inferred sensitivity of biodiversity to these changes[iii]. Conclusions drawn from these scenarios include that for terrestrial ecosystems, land-use change probably will have the largest effect on biodiversity, followed by climate change, nitrogen deposition, invasive alien species, and elevated carbon dioxide concentration. For freshwater ecosystems, the spread of invasive species is likely to be much more important. Mediterranean climate and grassland ecosystems will likely experience the greatest proportional change in biodiversity because of the substantial influence of all drivers of biodiversity change. Northern temperate ecosystems are estimated to experience the least biodiversity change because major land-use change has already occurred historically. The study also concluded that plausible changes in biodiversity in other biomes will depend on interactions among the drivers of biodiversity change. In addition to uncertainties surrounding future trends in many drivers of change, interactions between these drivers represent one of the largest uncertainties in projections of future biodiversity change.

Various regional scenarios also project futures in which biodiversity is much reduced, and people are significantly affected by the associated decline in ecosystem services. Scenarios at the regional scale of terrestrial and marine systems, and at the national scale from both developing and industrial countries portray futures as varied as the global scenarios, but provide consistent messages. Scenarios developed for marine systems in the Gulf of Thailand, the Central North

Pacific, and the North Benguela Current system for example, vary in the extent to which species might be lost through to 2050, and in some cases, with significant shifts in fisheries management, biodiversity may be maintained. However, the widespread increasing demand for fish as food is likely to result in an increasing risk of major collapses of regional marine fisheries. The production of fish from aquaculture, rather than reducing the pressure on wild fish stocks, is projected to add to the risk of fisheries collapses, as aquaculture continues to rely on marine fish as a source of feed.

Although many of the specific outcomes of available scenarios vary considerably, they are nevertheless consistent in their general outcomes relating to biodiversity. No matter which, or how soon, interventions are implemented, the world in the future will contain less biodiversity than it does in the present. None of the scenarios developed to date has been sensitive enough to provide meaningful analysis of how different interventions may contribute towards reducing the rate of loss of biodiversity by 2010. However, over the longer term, the differences in assumptions and interventions incorporated into the various scenarios have significantly different outcomes relating to the rate of loss of biodiversity. Such differences strongly imply that although the target of reducing the rate of loss of biodiversity by 2010 is implausible in most parts of the world, there is significant opportunity to proactively reduce the rate of loss of biodiversity globally over the longer term, through significant changes in policies and practices (see figure IV.3). The further development of biodiversity scenarios, including exploring the specific actions required in order to meet future targets, would greatly assist in establishing future priorities in both setting targets, and implementing appropriate interventions in order to meet them.

INSERT Figure IV.3 - Scenarios of changes in relative species richness, showing the divergent plausible futures

IV. 2. The future contribution of biodiversity to poverty alleviation and sustainable development

It is clear that the world in the future will be less biodiverse than the world today. Many of the current trends in biodiversity and drivers of change in biodiversity will continue through the next several decades, and in most places the rate of loss of biodiversity is unlikely to be reduced in the near-term. However, whilst there is some agreement on various large-scale trends, such as the decrease in extent of tropical habitats, and the broad extent of species extinctions, rather little is known about exactly how much biodiversity is going to disappear, and from where. As such, predictions regarding the consequence of future changes in biodiversity for the functioning of ecosystems, and thereby for the supply of ecosystem services contributing to the well-being of people, remain highly uncertain.

There is a growing body of knowledge on the role of biodiversity in the supply of ecosystem services, and this can help to identify possible threats to livelihoods in the future, due to biodiversity loss. Some of the most important changes in biodiversity that directly affect people occur at the local level, and so the decline and loss of populations of species are therefore likely to be of most concern in terms of the future contribution of biodiversity to sustainable development. What might be lost is also critically important. Each individual of a species or population has particular functional characteristics – whether it be a plant transforming solar energy to produce oxygen and biomass, an invertebrate prey supporting populations of fish, or a microbe decomposing animal matter or waste to release nutrients into the soil. Such functions within an ecosystem are critically important for the overall health of the system, and losses of species that uniquely perform such functions are likely to have greater consequences on ecosystems than losses of species with similar functional characteristics to other species that remain – so called *functional redundancy*.

Human dependence on ecosystem services ensures that continued losses of biodiversity, and the subsequent deterioration of ecosystem services, will affect many people in the future. The

consequences of biodiversity loss are likely to be felt particularly by poor people, and particularly by the rural poor, as they are most directly dependent on biodiversity and ecosystem services for their livelihoods. However declines in biodiversity will not just affect the poor. Whether it be declines in productive forests, or fish stocks, or declines in the capacity of ecosystem to regulate regional climate, people far from the local populations of species are likely to be affected by declines in some elements of biodiversity. The widespread domestic and international trade in many components of biodiversity will in some cases compensate for local losses, and in other cases exaggerate the impacts of biodiversity declines, through sustained pressure of exploitation, and on the potential spread of invasive species.

Current trends in biodiversity loss are likely to lead to increasing likelihood and frequency of thresholds being reached and non-linear changes in biodiversity and ecosystem functioning, limiting options and increasing the potential for sudden, unexpected and dramatic declines in the availability of some ecosystem services. A number of thresholds have been observed in recent decades, including collapses of fish stocks after persistent harvesting pressure, and emergence of “dead zones” through excessive nutrient loading in freshwater and coastal systems. In each case, gradual declines in biodiversity, or gradual increases to the drivers of biodiversity loss in the case of nutrient loading, have led to sudden impacts that were largely unpredictable in both their timing and extent. Such sudden changes to biodiversity and the condition of ecosystems are predicted to occur with greater frequency in the future.

Despite increasing efforts to build and strengthen synergies between environmental and development objectives, trade-offs are inevitable between the mechanisms ideally suited to achieve development goals, such as the Millennium Development Goal (MDG) targets for 2015, and biodiversity goals, such as reducing the rate of biodiversity loss by 2010. For example, improving rural road networks—a common feature of development strategies—will likely accelerate rates of biodiversity loss both directly through habitat fragmentation and also indirectly, for example by facilitating expansion of cultivation or grazing into new areas of land, or by resulting in increased harvests of wild resources, e.g. bushmeat or medicinal plants, due to better access to markets. Moreover, some scenarios in which future development paths show relatively good progress toward the MDG of eradicating extreme poverty and improving health also showed relatively high rates of habitat loss and associated loss of species. This does not imply that biodiversity loss is, in itself, good for poverty reduction. Instead, it indicates that many economic development activities aimed solely at poverty reduction are likely to have negative impacts on biodiversity unless the value of biodiversity and related ecosystem services are factored in. Indeed some short-term improvements in material well-being and livelihoods due to actions that lead to the loss of biodiversity that is particularly important to the poor and vulnerable may actually make these gains temporary - and exacerbate all constituents of poverty over the longer term.

Over the longer term, the objectives of improved well-being and improved environmental sustainability go hand in hand. For a reduction in the rate of biodiversity loss to contribute to poverty alleviation, priority needs need to be given to protecting the biodiversity of particular importance to the well-being of poor and vulnerable people. Given that biodiversity underpins the provision of ecosystem services that are vital to human well-being and poverty alleviation, long-term sustainable achievement of the full suite of the Millennium Development Goals will require that biodiversity loss is reduced, and ecosystem services maintained.

Improved valuation of the services provided by biodiversity, and increased integration of efforts for the conservation and sustainable use of biodiversity into national poverty reduction strategies would significantly enhance the sustainability of development. Indeed, although issues of environmental degradation are frequently cited in national Poverty Reduction Strategy Papers, the implications of such degradation, or of declining biodiversity, are rarely elaborated. As such the links between changes in biodiversity and policy priorities for development are rarely incorporated into current poverty reduction strategies.

IV. 3. Overcoming obstacles to reducing the rate of loss of biodiversity

If effectively implemented, the range of responses highlighted in section III will lead to significant reductions in the rate of biodiversity loss. Despite the various time lags between implementation and effects on biodiversity, a range of scenarios has shown that actions taken now could significantly reduce the rate of biodiversity loss over the next few decades. However, there are many and significant obstacles that have so far hindered the implementation of otherwise promising responses, including economic, social, biological and political obstacles.

The third national reports of Parties to the CBD include identification of challenges and obstacles faced by Parties to implementing provisions of the convention's articles. Further submission of national reports would allow more meaningful analysis of such information to provide an assessment of the most important constraints faced by Parties to the implementation of the convention. However, Parties that have submitted reports to date have identified obstacles from the full range of the following:

- Political/societal obstacles, including the lack of political will and support, political instability, and the lack of mainstreaming biodiversity issues into other sectors.
- Institutional, technical and capacity-related obstacles, including lack of human resources, lack of transfer of technology and expertise, loss of traditional knowledge and lack of adequate scientific research capacities.
- Lack of accessible knowledge/information, including a lack of understanding of the consequences of biodiversity loss and declining ecosystem services.
- Economic policy and financial resources, including a lack of financial and human resources and economic incentive measures, lack of benefit-sharing, and fragmentation of GEF financing.
- Collaboration/cooperation obstacles, including lack of synergies at national and international levels, lack of partnerships, and lack of horizontal cooperation among stakeholders
- Legal/juridical impediments, including lack of appropriate policies and laws
- Socio-economic factors, such as poverty, population growth and unsustainable consumption and waste production patterns
- Natural phenomena and environmental change, such as climate change and natural disasters

Many of these obstacles are in need of considerable attention if actions to reduce the rate of loss of biodiversity are to be effective. Key to these at the national level is the need to enhance political will and support for the conservation of biodiversity. This will require increased awareness, and appropriate human and financial resources for biodiversity initiatives. The voice of environment ministries and departments needs to be strengthened in government, in order to stand alongside those of other departments such as agriculture, employment, trade and finance. In most countries the necessary capacity and resources need to be increased to fully implement the various biodiversity-related MEAs at the national level.

The importance of valuation and incentive measures

Improved information on the economic and other values of biodiversity would equip environment ministries with the tools with which to engage in meaningful dialogue with ministries of trade and finance, and better inform decisions on trade-offs as to the consequences of biodiversity loss. Ecosystem services provide a valuable framework with which the benefits of biodiversity conservation can be demonstrated, and there is an increasing body of knowledge on the valuation of ecosystem services themselves, and the role of biodiversity in providing such services.

However, even with better information on the value of biodiversity and ecosystem services, it is likely that incentive measures will form a key component of an effective response strategy.

Markets rarely reflect the true values of biodiversity, and do not reflect losses to society arising from biodiversity degradation. Such a market failure leads to unsustainable use biodiversity, whereby there are few if any incentives for individual actors to conserve biodiversity. Whilst costs have to be borne individually from conservation actions, most of the benefits accrue to wider society.

Incentive measures seek to redress this imbalance, to internalize as far as possible the societal values into private decision-making, and thereby to discourage behaviour that impacts negatively on biodiversity. Incentive measures can be new economic, policy, legal or social arrangements. However, their effectiveness depends largely upon support from the existing social, economic and policy environment, which must provide appropriate "enabling conditions". Stakeholder participation, capacity-building and information provision are recognised as key elements of a successful incentives measures implementation strategy.

A range of incentive measures is available to encourage the conservation or sustainable use of biological diversity. Positive incentive measures are designed to encourage beneficial activities, and include such measures as payments for organic farming, agricultural land set-aside schemes as well as public or grant-aided land purchases or conservation easements. Other incentive measures are designed to discourage harmful or unsustainable activities, such as user fees or pollution taxes. Incentive measures can also change the relative costs and benefits of specific activities in an indirect way, for example through trading mechanisms. Such indirect measures include individual transferable fishing quotas, property right mechanisms, species commercialisation, biodiversity prospecting, emissions trading schemes or certification and eco-labeling initiatives.

Improved understanding and awareness

Despite the growing body of science relating to biodiversity and ecosystems (see Figure IV.4), there remain significant gaps and uncertainties. Of the estimated 5-30 million species on the planet, less than 2 million have been named, and the conservation status of only a few thousand have been determined. Much less is known about the genetic variety of these species, and of the interactions between different species and between species and the abiotic environment that enable the functioning of ecosystems and the supply of ecosystem services. Information is also patchy at coarser scales. There are major gaps in global and national monitoring systems, that result in the absence of time-series information, and therefore on trends in many aspects of ecosystems. For example there remains a lack of accurate information on the rate of change of forest cover globally, or of the extent of wetlands in most parts of the world, despite decades of remote sensing activities and on-the-ground inventories.

INSERT Figure IV.4 – Trends in publications on biodiversity and ecosystems

There are also significant gaps in knowledge and understanding of the effectiveness of response options. Only recently has evaluation of the effectiveness of conservation projects and funding for biodiversity activities been incorporated into project design. Social science analysis of effectiveness of response options for biodiversity has been virtually non-existent, and there is a significant gap in information relating to the marginal costs and benefits of alternative policy options in terms of total economic value.

More comprehensive and systematic monitoring programmes for a range of attributes of biodiversity, and for the effectiveness of responses, are urgently needed, including for the range of selected indicators for the 2010 target. Although work is underway on developing many of these selected indicators independently, a coordinated approach is required to enable the information to be most useful for tracking progress towards the 2010 target, and communicating this progress to Parties of the CBD and other stakeholders.

Despite the gaps in knowledge and understanding, current knowledge is more than sufficient to indicate the need for urgent action to reduce the rate of loss of biodiversity, and certainly sufficient

to provide direction as to the most promising responses that could be implemented. However, awareness of biodiversity-related issues (and in particular benefits of biodiversity including human life-support functions) is limited in both decision-making fora, and amongst the public, globally. The CBD in particular remains little known outside of its direct community, for example within the private sector, or within many non-environmental government departments. Communication, education and public awareness efforts of biodiversity issues, and the mechanisms to address them, need to be significantly strengthened, and resources made available to do so. Regular reporting of progress towards reducing the rate of loss of biodiversity, and the framework of indicators adopted for this purpose will undoubtedly help in this regard, but needs to be accompanied by a wider outreach effort on biodiversity.

Improving capacity to implement biodiversity initiatives

One of the most significant constraints to reducing the rate of loss of biodiversity is the lack of capacity - both of human capacity and of financial and technical resources. From the outset, the CBD Conference of the Parties has identified strengthening national and local capacities as a priority, and there have been a range of efforts on capacity building, including many projects supported through the GEF. The UNEP Bali Strategic Plan for Technology Support and Capacity Building, adopted in 2005, also includes biodiversity issues.

Capacity to address biodiversity loss particularly needs to be improved at the national to local levels and across the range of response measures identified in Section III. Adequate capacity for these measures needs to be developed amongst many sectors of society, including politicians and government agencies and their technical advisers, local government, business leaders, non-government organisations, and civil society in general. Increasingly important areas for capacity development will include the integration of biodiversity into other sectors, measuring and promoting the success of response mechanisms, and building partnerships for biodiversity.

Capacity building activities are best developed from participatory assessments, such as those conducted by UNDP/GEF, so as to meet national and local needs. Capacity needs to be built at the organisational and individual levels (see Table IV.2). Organisational development can include providing increased resources and improving working procedures to achieve objectives. The development of the skills of individuals is equally necessary.

INSERT Table IV.2 Critical functional roles for conservation actors.

Whilst addressing biodiversity loss involves all sectors of society the implementation of the CBD provides a framework and focus for governments and other Parties to the Convention, as well as the activities of many NGOs. However, the capacity of governments to implement and influence the decisions of the Convention can be a significant bottleneck to progress. For example, in some developing countries the implementation of the CBD is entirely the responsibility of a single individual. Other challenges to CBD implementation requiring capacity building support include:

- Overcoming weak co-ordination or even competition between government departments, which hinders the development of synergies among global environmental agreements and between biodiversity concerns and other sectors.
- Encouraging continuity of technical experts and CBD focal points, to allow trained and experienced individuals to achieve an impact and to train others.
- Providing resources for the participation in international fora of developing country experts, including working with the prevalent use of the English language.

As considered in section III.3, increased and sustained funding is needed to build capacity and to facilitate implementation of many biodiversity initiatives, from field-based conservation and research through national biodiversity planning, policy making, to the implementation of international agreements.

Additional mechanisms

Many of the mechanisms required to reduce the rate of biodiversity loss are already incorporated in the programs of work of the CBD and other MEAs, and if fully implemented would significantly reduce the rate of biodiversity loss. However, even if fully implemented, existing mechanisms under the MEAs would be insufficient to halt the loss of biodiversity. Further mechanisms are required in order to reduce the intensity of indirect drivers of biodiversity loss, such as inequitable consumption patterns, poverty, and inappropriate market distortions such as perverse subsidies. There is also a need for further cross-sectoral integration of biodiversity issues, for example with regard to trade, and the implications of various trade agreements for biodiversity, and for the further consideration of biodiversity issues in the key production sectors, and the rapidly growing manufacturing sector of some economies.

The CBD recognizes the sovereign right of States to exploit their own resources pursuant to their own environmental policies and the responsibility to ensure that activities in their jurisdiction do not cause damage to the environment of other states. The convention therefore relies primarily on the voluntary participation and cooperation of Parties in the implementation of its work programs, and on the promotion of voluntary guidelines. Efforts to introduce a stronger regulatory component, such as a protocol on Protected Areas, have been largely resisted, with the exception of the adoption of the Cartegena Protocol of Biosafety. Overall progress in implementing the convention is largely determined by the commitment, voluntary participation, and cooperation of Parties, other nations, and relevant stakeholders from local to international levels, as well as the provision of adequate human and financial resources necessary for the conservation of biodiversity. Such commitments will need to be strengthened if the rate of biodiversity loss is to be reduced.

Although other mechanisms will be required to fully address current biodiversity loss, the CBD encompasses a comprehensive range of detailed response strategies within its work programs. If progress made is to be sustained, and built upon in the future, this wide range of responses within the framework of the CBD will need to adapt to the changing conditions of, and threats to, biodiversity.

IV. 4. The future role of the Convention on Biological Diversity

Despite progress made in many countries in recent years, there remains substantial opportunity for strengthening the implementation of the CBD at the national level. Many of the necessary actions to reduce the rate of biodiversity loss are already clearly identified in the decisions and programmes of work of the CBD, and if fully implemented these would lead to significant progress to be made in achieving the 2010 target and in meeting the three objectives of the Convention.

Perhaps the most significant role of the Convention in the coming years will be to provide increased support to Parties in ensuring implementation at the national level. This would include further analysing obstacles to implementation, initiating further dialogues and exchanges of information, and helping to develop national capacity for biodiversity management. The Convention is likely to further develop its guidance and support with respect to development and implementation of NBSAP as frameworks for national implementation of the three objectives of the CBD. In addition it will help to define guidance for the GEF in supporting national implementation, which is more targeted to national needs and challenges.

In the context of national implementation, the ecosystem approach is likely to become an ever more important focus for action in the future, as understanding improves on the importance of maintaining viable natural ecosystems and ecological processes, and for developing integrated management approaches that take these into account.

National capacity for implementing the Convention includes capacity for managing and using biodiversity-relevant information in an efficient way, and for exchanging lessons learned with other Parties. The Clearing-House Mechanism will have an increasingly important role to play in the

future. At the same time, national reporting processes need to be further developed and streamlined to provide focus for the assembling of information on the outcomes of national implementation that is useful at national and international levels, and to identify for other Parties successful approaches to conservation, sustainable use and benefit-sharing.

The wide range of obligations and expectations placed on Parties by CBD articles and COP decisions (including the many work programmes, guidelines and principles) can be overwhelming. The Convention is working to find more efficient ways of dealing with its very wide remit and prioritising the focus of its action, for example through further developing the multi-year programme of work of the Conference of the Parties, and consolidating decisions and work programmes. The 2010 (and longer-term) targets are likely to be very helpful in steering prioritisation.

Increased collaboration between Parties is likely to have particularly beneficial impacts, especially relating to shared learning of local intervention successes, and the transfer of new and additional resources (financial, capacity-building, technology transfer) to developing countries to enable them to fulfil obligations under the Convention. The further development of regional collaboration of Parties is likely to be particularly helpful in this regard.

It is extremely important for the Convention to strengthen processes for building working partnerships with other conventions and intergovernmental bodies. While the Convention is beginning to work well with the other global biodiversity-related conventions and the Rio treaties, relationships with other multilateral agreements can be weak, exemplified by the problems faced in achieving observer status to the WTO. This mirrors the overall challenges that must be faced in the future implementation of article 6b of the Convention, relating to integration of biodiversity into other relevant sectors.

Major efforts are required, with support from UN agencies, to strengthen the visibility of biodiversity in multilateral agreements in other sectors, and the role and influence of processes under the CBD in such agreements. The Convention cannot achieve this in isolation, and therefore cooperation with the other biodiversity-related conventions, the other Rio Conventions, UN agencies as well as indigenous peoples and non-governmental organisations, and business and academia needs to be further strengthened. A Global Biodiversity Partnership could ultimately result in a considerably strengthened biodiversity voice in the wider world of business, finance and development.

The year 2010 is drawing close, and whilst progress is being made through the CBD, further targets will need to be defined and adopted to guide and focus action beyond 2010. Strengthening national targets within the flexible framework that the CBD has provided, and focussing national efforts on achieving these will likely lead to greater progress in the future. The indicators, data and monitoring systems that are required and starting to be developed in the context of monitoring achievement of the 2010 target will also be required for assessing progress beyond 2010. In addition, further indicators need to be developed, to more fully take into account the various attributes of biodiversity, and the full range of important threats as well as the success or failure of activities to implement the Convention.

While the focus of the Convention now is on progress towards the 2010 target, it must also look beyond this. More effective implementation of the Convention will rely on a consideration of both what is needed now, and what is likely to be needed into the future, beyond 2010.

IV. 5. Conclusions

Despite current efforts to conserve and sustainably use biodiversity, it is being lost at unprecedented rates, in most parts of the world, and at all levels of organisation. The extent of natural ecosystems is being reduced, and the condition of almost all ecosystems is being degraded. The number of species on the planet is declining at rates not seen since the last mass extinction,

populations of wild species are in decline in most parts of the world, and we are likely to be loosing genetic diversity of both wild and cultivated species. Many of these losses have come about through deliberate actions to change ecosystems for the benefit of people, such as through forest clearance or wetland drainage for agriculture, or through the harvest of fish, birds and mammals for consumption. Other losses have occurred due to the unforeseen consequences of other activities, such as the extinctions caused by the spread of invasive alien species introduced through international trade, or the eutrophication of coastal waters due to high applications of fertilising nutrients far inland.

Although many people have benefited from the changes that have been made to biodiversity in the recent past, the loss of genes, species and ecosystems has in many cases led to a reduction in the overall benefits that people derive from the biosphere, through a degradation in the majority of ecosystem services. This has led to a reduction in the sustainability of human systems, and in particular on progress made in poverty reduction. The loss of biodiversity has had disproportionate affects on the poor, who are most directly dependent on the condition of local biodiversity and the ecosystem services that it supplies.

In most scenarios, current changes to biodiversity are anticipated to continue, and in many cases get worse. The world in the future will be less biodiverse at a global level, and more similar across landscapes and continents. Although an unprecedented effort would be required to meet the target of reducing the rate of loss of biodiversity by 2010, analysis of various scenarios and options for intervention with appropriate responses demonstrates that the goal of reducing biodiversity loss is achievable over the longer-term. Such a goal is all the more pressing by the increasingly realised importance and value of biodiversity for people, and for the reduction of poverty. Further implementation of existing mechanisms and programmes for the conservation and sustainable use of biodiversity is required, and political, economic and social obstacles must be overcome. Increased funding will be required, but also a shift in individual, societal, private sector and government policies and actions.

The CBD has a strong role to play in reducing the rate of biodiversity loss, but will require increased implementation by Parties, and in particular increased activities at the national level to support the implementation of the strategic plan. The work of the convention will also be more effective if there is increasing integration with other international environmental agreements and with other sectors at all scales, from where many of the influences and impacts on biodiversity will derive in the future. Existing agreements and institutions can not work in isolation to achieve biodiversity objectives, and there is a need to build upon the current range of cooperative initiatives between the environmental conventions, UN agencies and other institutions.

As called for in CBD decision VII/26, a framework is required between all relevant actors, in order to enhance cooperation to make progress towards reducing the rate of loss of biodiversity. For maximum cooperation, such a partnership would need to include relevant conventions, intergovernmental agencies, scientific and research institutions, indigenous and non-governmental organisations. Such a global biodiversity partnership could promote both policy coherence and implementation. Policy coherence could be facilitated through the implementation of agreed objectives and targets, and information-sharing. Mainstreaming biodiversity into other fora and sectors would be a major aim of the partnership, through reaching out to non-environmental agreements, development organisations and the private sector. In order to have the greatest impact on reducing the rate of loss of biodiversity, a global partnership for biodiversity would need to focus on actions at local and national levels.

Environmental sustainability, including the conservation and sustainable use of biodiversity, is a key pillar of sustainable development, and recognised as such in the MDGs. Along with key economic and social considerations, it is biodiversity that supports life and livelihoods. But biodiversity is more than that. Biodiversity is life, in all the various shapes and forms. Although current knowledge on biodiversity is patchy, and the true values of biodiversity and ecosystem

services have not been recognised in current economic systems, enough is known to indicate the need for urgent decisions and actions to be made if the rate of loss of biodiversity is to be reduced, by 2010 or beyond.

TABLES, FIGURES AND BOXES SECTION 4

Table IV.1. Prospects for Achieving the 2010 Sub-targets Agreed to by Parties to the CBD (modified from MA Biodiversity Synthesis report)**.**

Goals and Targets	**Prospects for Progress by 2010**
Protect the components of biodiversity	
Goal 1. Promote the conservation of the biological diversity of ecosystems, habitats, and biomes. **Target 1.1: At least 10% of each of the world's ecological regions effectively conserved.** **Target 1.2: Areas of particular importance to biodiversity protected.**	**Good prospects for most terrestrial regions. Major challenge to achieve for marine regions. Difficult to provide adequate protection of inland water systems.**
Goal 2. Promote the conservation of species diversity. **Target 2.1: Restore, maintain, or reduce the decline of populations of species of selected taxonomic groups.** **Target 2.2: Status of threatened species improved.**	**Many species will continue to decline in abundance and distribution, but restoration and maintenance of priority species possible.** **More species will become threatened, but species-based actions will improve status of some.**
Goal 3. Promote the conservation of genetic diversity. **Target 3.1: Genetic diversity of crops, livestock, and harvested species of trees, fish, and wildlife and other valuable species conserved, and associated indigenous and local knowledge maintained.**	**Good prospects for ex situ conservation. Overall, agricultural systems likely to continue to be simplified. Significant losses of fish genetic diversity likely. Genetic resources in situ and traditional knowledge will be protected through some projects, but likely to decline overall.**
Promote sustainable use	
Goal 4. Promote sustainable use and consumption.	**Progress expected for some components of biodiversity. Sustainable use unlikely to be a large share of total products and production areas.** **Unsustainable consumption likely to increase.** **Progress possible, for example through increased implementation of CITES.**
Target 4.1: Biodiversity-based products derived from sources that are sustainably managed, and production areas managed consistent with the conservation of biodiversity.	
Target 4.2: Unsustainable consumption of biological resources or that has an impact on biodiversity reduced.	
Target 4.3: No species of wild flora or fauna endangered by international trade.	

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Address threats to biodiversity	
Goal 5. Pressures from habitat loss, land use change and degradation, and unsustainable water use reduced. **Target 5.1: Rate of loss and degradation of natural habitats decreased**	**Unlikely to reduce overall pressures in the most biodiversity-sensitive regions. However, proactive protection of some of the most important sites is possible.**
Goal 6. Control threats from invasive alien species. **Target 6.1: Pathways for major potential alien invasive species controlled.** **Target 6.2: Management plans in place for major alien species that threaten ecosystems, habitats, or species.**	**Pressure is likely to increase (from greater transport, trade, and tourism). Measures to address major pathways could be put in place.** **Management plans could be developed, but are currently lacking for many alien species.**
Goal 7. Address challenges to biodiversity from climate change and pollution. **Target 7.1: Maintain and enhance resilience of the components of biodiversity to adapt to climate change.** **Target 7.2: Reduce pollution and its impacts on biodiversity.**	**Pressures from both climate change and pollution, especially N deposition, will increase. These increases can be mitigated under UNFCCC for climate change and through agricultural and trade policy, as well as through energy policy for nitrogen pollution. Mitigation measures include carbon sequestration through LULUCF and use of wetlands to sequester or denitrify reactive nitrogen.** **Proactive measures to reduce impacts on biodiversity possible, but challenging given other pressures.**
Maintain goods and services from biodiversity to support human well-being	
Goal 8. Maintain capacity of ecosystems to deliver goods and services and support livelihoods. **Target 8.1: Capacity of ecosystems to deliver goods and services maintained.** **Target 8.2: Biological resources that support sustainable livelihoods, local food security, and health care, especially of poor people, maintained.**	**Given expected increases in drivers, can probably be achieved only on a selective basis by 2010. Attainment of target 8.2 would contribute to the achievement of the MDG 2015 targets, especially targets 1, 2, and 9.**
Protect traditional knowledge, innovations and practices	
Goal 9. Maintain sociocultural diversity of indigenous and local communities. **Target 9.1: Protect traditional knowledge, innovations, and practices.**	**Possible to take measures to protect traditional knowledge and rights, but continued long-term decline in traditional**

Target 9.2: Protect the rights of indigenous and local communities over their traditional knowledge, innovations, and practices, including their rights to benefit sharing.	**knowledge likely.**

1

Ensure the fair and equitable sharing of benefits arising out of the use of genetic resources	
Goal 10. Ensure the fair and equitable sharing of benefits arising out of the use of genetic resources. **Target 10.1: All transfers of genetic resources are in line with the CBD, the International Treaty on Plant Genetic Resources for Food and Agriculture, and other applicable agreements.** **Target 10.2: Benefits arising from the commercial and other utilization of genetic resources shared with the countries providing such resources.**	**Progress is possible, but currently not on target**
Ensure provision of adequate resources	
Goal 11. Parties have improved financial, human, scientific, technical, and technological capacity to implement the Convention. **Target 11.1: New and additional financial resources are transferred to developing-country Parties to allow for the effective implementation of their commitments under the Convention, in accordance with Article 20.** Target 11.2: Technology is transferred to developing-country Parties to allow for the effective implementation of their commitments under the Convention, in accordance with Article 20.	**Progress is possible, but currently not on target**

2

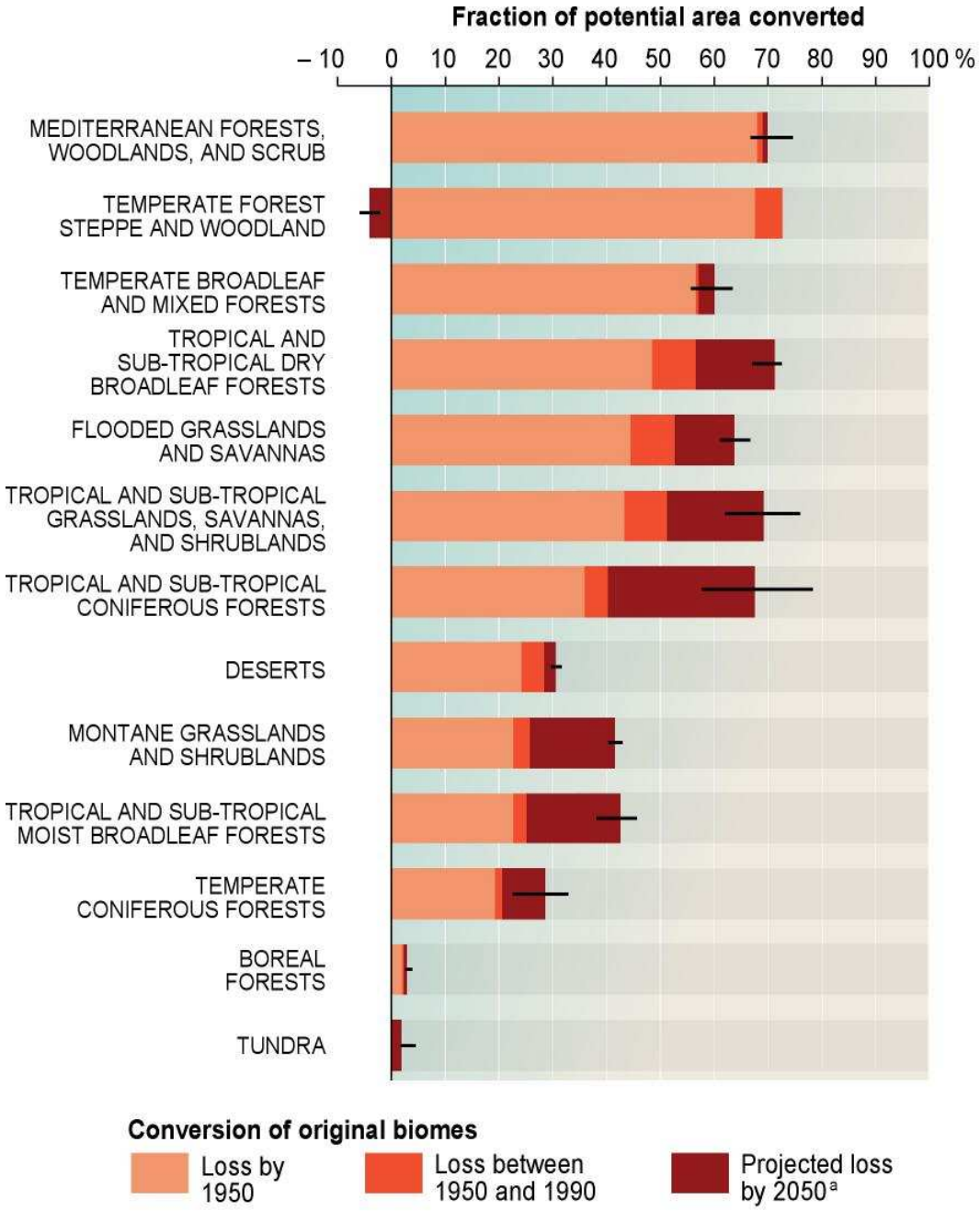
Table IV.2 Critical functional roles for conservation practitioners.

(Source: Salafsky, Nick, Richard Margoluis, Kent Redford, and John Robinson. 2002. Improving the Practice of Conservation: A Conceptual Framework and Agenda for Conservation Science. *Conservation Biology* 16: 1469-1479.)

SKILL TYPE	FUNCTIONAL ROLE				
	Design	Management	Monitoring	Analysis	Communications
Knowledge & General Aptitudes	**Conceptualization** - systems thinking - model development - problem setting	**Strategic Thinking** - visioning - weighing alternatives	**Assumption Testing** - experimental design - cause-and-effect thinking	**Analytical Thinking** - statistics - computer skills	**Strategic Communications** - strategic thinking - writing & design skills - conflict resolution skills
Programmatic Skills	**Situation Analysis** - site assessment - capacity assessments	**Strategic Planning** - setting targets - goals, objectives, activities	**Develop Monitoring Plan** - monitoring strategy - indicators and methods	**Information Management** - data processing and storage - data cleaning and	**Product Planning** - audience & media identification - needs assessment
	Project Design - planning - scenario evaluation	**Project Implementation** - developing workplans - setting budgets	**Assess Methods** - effectiveness - cost-effectiveness/practicality	**Data Analysis** - qualitative data - quantitative data	**Product Development** - pilot testing techniques - production skills
Administrative Skills	**Coordination** - facilitation - partnership development - proposal development	**Organizational Management** - personnel management - financial management - organizational development	**Evaluation** - performance evaluations - financial evaluations - process tracking	**Information Systems** - develop and run systems - database management - cost-benefit analysis	**Routine Communications** - internal systems - external reporting - public relations

Figure IV.1 Conversion of terrestrial biomes, 1950-2050.

It is not possible to estimate accurately the extent of different biomes prior to significant human impact, but it is possible to determine the "potential" area of biomes based on soil and climatic conditions. This figure shows how much of that potential area is estimated to have been converted by 1950 (*medium certainty*), how much was converted between 1950 and 1990 (*medium certainty*), and how much would be converted under the four MA scenarios (*low certainty*) between 1990 and 2050



[a] According to the four MA scenarios. For 2050 projections, the average value of the projections under the four scenarios is plotted and the error bars (black lines) represent the range of values from the different scenarios.

Source: Millennium Ecosystem Assessment

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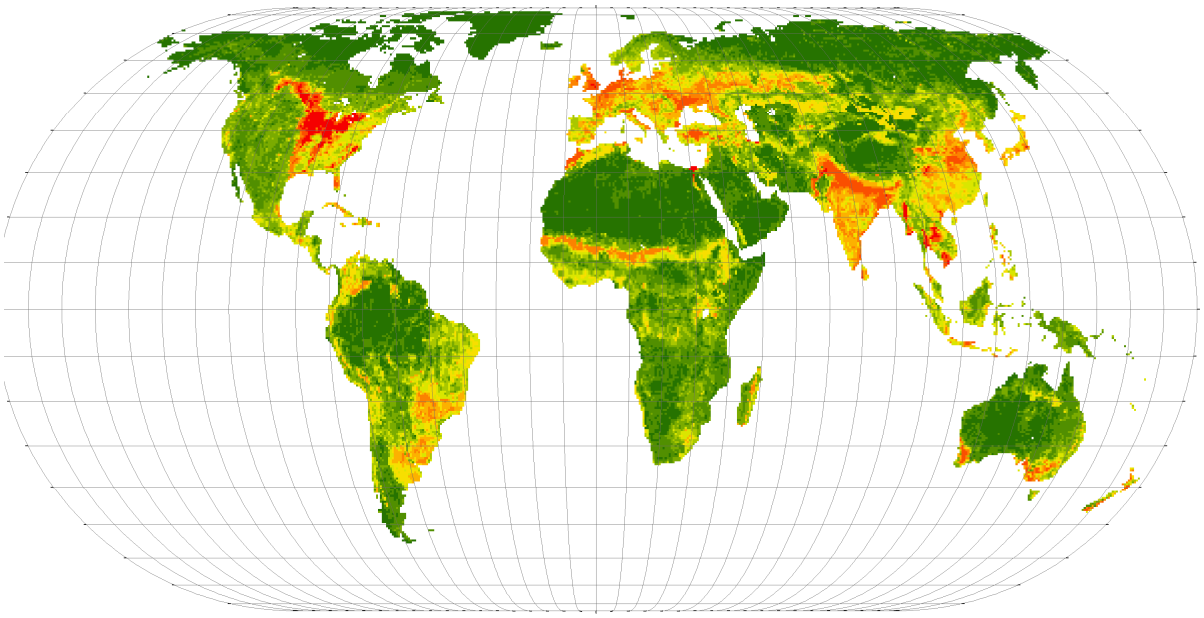
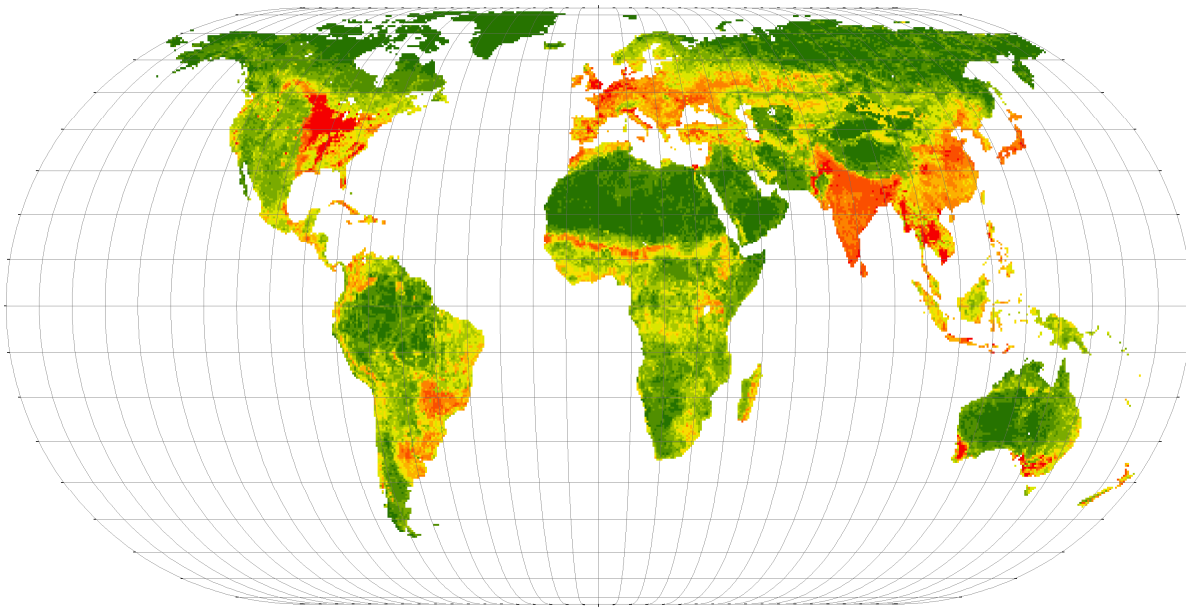
Figure IV.2 Global maps of average remaining species richness for 2000, 2030, and 2050 under the SRES scenario with the most significant impact on species richness (developed by GLOBIO).

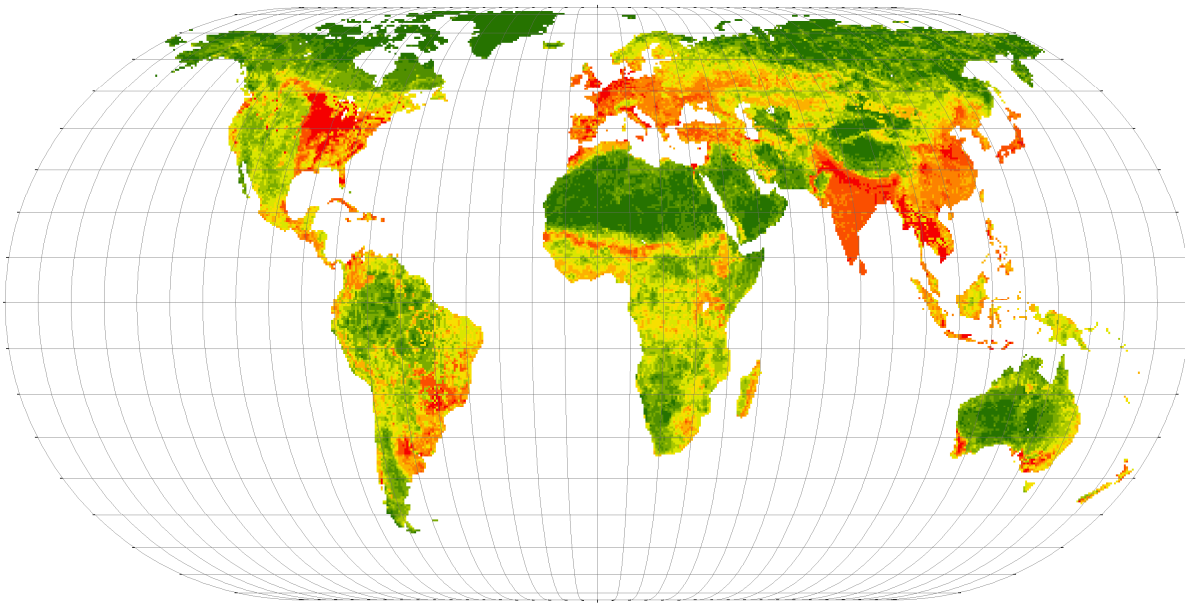
2000



2030



2050



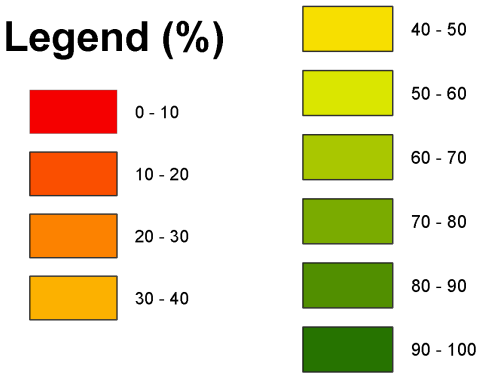


Figure IV.3 Scenarios of changes in relative species richness, showing the divergent plausible futures. (Source: GLOBIO).

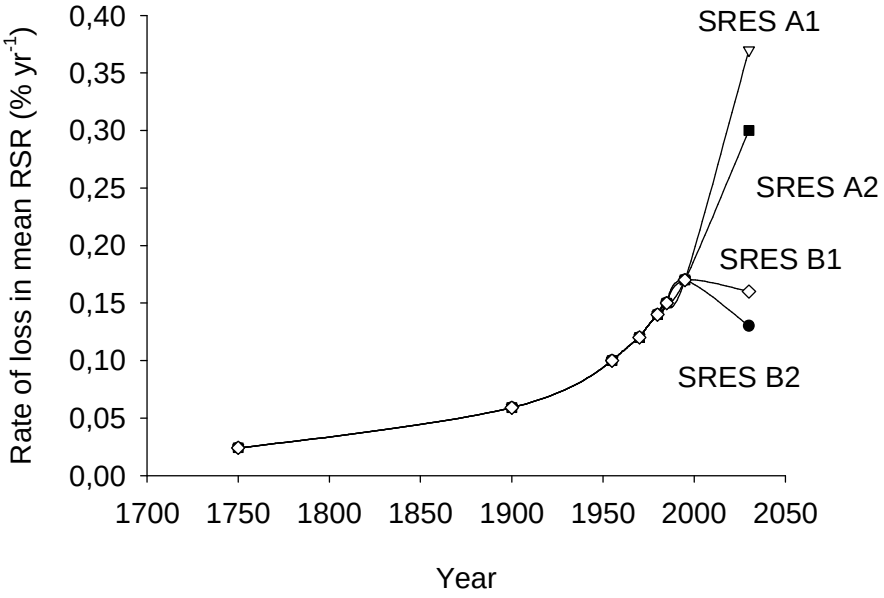
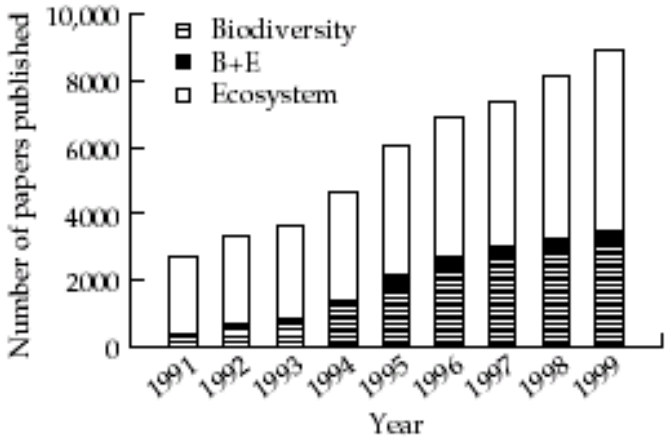


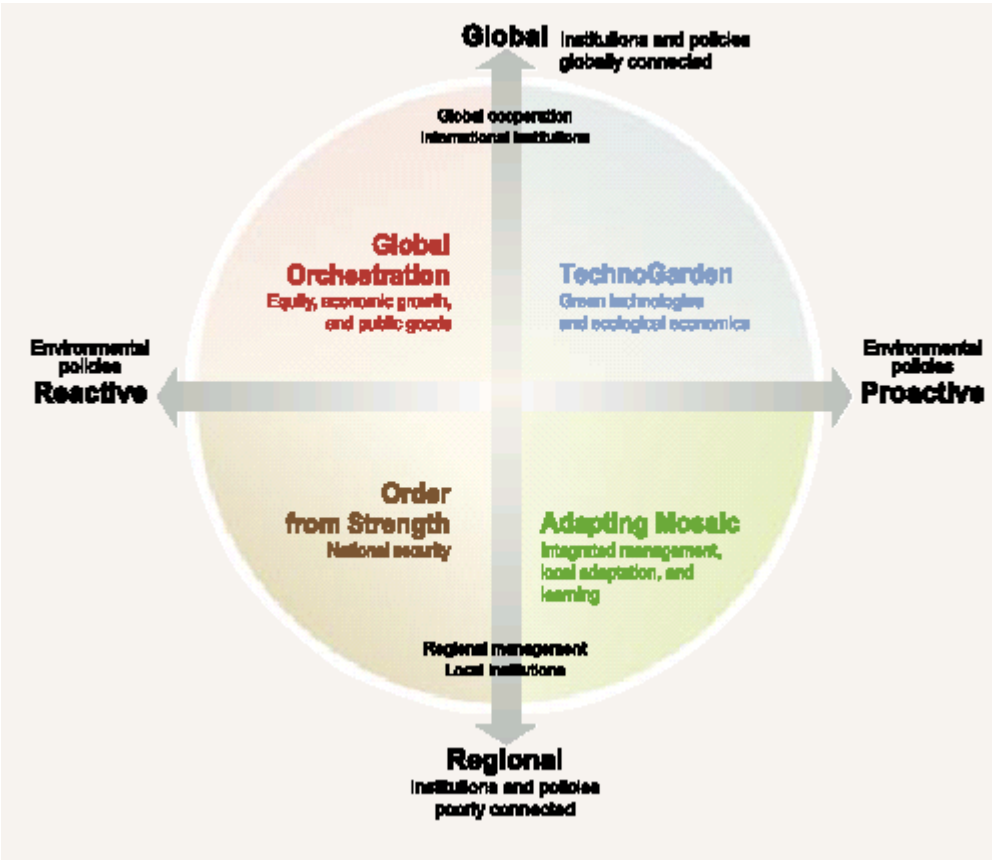
Figure IV.4. The number of publications that included "biodiversity", "ecosystem", or both (B+E) in their titles or abstracts

1991-1999 (from Naeem et al). TO BE UPDATED



Box IV.1 Scenarios framework of the Millennium Ecosystem Assessment

The four scenarios developed in the MA are distinct from previous global exercises due to their focus on ecosystem services and the effects of ecosystem change on society and human well-being. The scenarios begin in 2000 and run until 2050 and were constructed along two main dimensions: contrasting transitions of global society (regionalization versus globalization) and contrasting approaches to governance and the implementation of policies related to ecosystems and their services (proactive versus reactive). (See Figure) No scenario represents "business as usual," although all begin from current conditions. None of the scenarios represents a "best" or a "worst" path. Instead, they illustrate different choices that may be made and some of the trade-offs that will be faced. There could be combinations of policies that produce significantly better, or worse, outcomes than any of the four scenarios.



[i] Millennium Ecosystem Assessment (2005) *Ecosystems and Human Well-being: Synthesis*. Island Press, Washington, DC.

[ii] Jenkins (2003) Prospects for biodiversity. *Science* 302: 1175-1177.

[iii] Sala et al (2000) Global biodiversity scenarios for the year 2100. *Science* 287: 1770-1774