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Global Biodiversity Outlook 2





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For further information, please contact:
Secretariat of the Convention on Biological Diversity
World Trade Centre
413 St. Jacques Street, Suite 800
Montreal, Quebec, Canada H2Y 1N9
Phone: 1(514) 288 2220
Fax: 1 (514) 288 6588
E-mail: secretariat@biodiv.org
Website: http://www.biodiv.org

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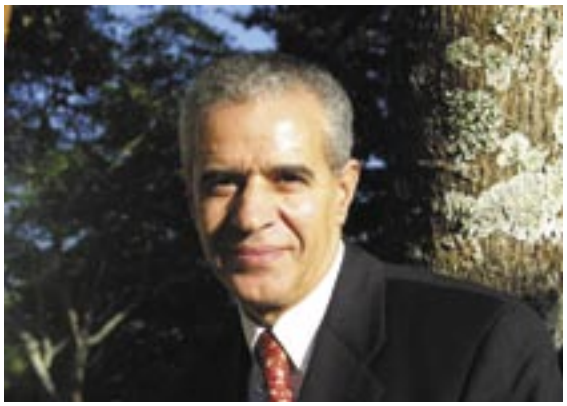
Foreword



Achieving the 2010 Biodiversity Target is ambitious, but success is vital. The target commits Parties to the Convention on Biological Diversity to achieve, by 2010, a significant reduction of the current rate of biodiversity loss at the global, regional and national level, as a contribution to poverty alleviation and for the greater benefit of all life on Earth. *Global Biodiversity Outlook 2* presents the clear information and suggestions for decisive action necessary for achieving the 2010 Biodiversity Target.

Biodiversity loss is rapid and ongoing. Over the last 50 years, humans have changed ecosystems faster and more extensively than in any comparable period of time in human history. Tropical forests, many wetlands and other natural habitats are shrinking in size. Species are going extinct at rates 1,000 times the background rates typical of Earth's past. The direct causes of biodiversity loss—habitat change, overexploitation, the introduction of invasive alien species, nutrient loading and climate change—show no sign of abating.

As biodiversity loss proceeds, our knowledge of its importance is growing. The Millennium Ecosystem Assessment confirms that biodiversity is the foundation on which human lives entirely depend. Biodiverse ecosystems not only provide essential goods (food, water, fibre, medicines) but also irreplaceable services, including regulation of disease and soil erosion, purification of air and water, and opportunities for spiritual reflection. Yet even as the Assessment describes these services, it finds that 15 of 24 examined are already in decline.

Furthermore, the contributions of ecosystems to human societies promise to become all the more apparent as environmental change accelerates. Biodiverse ecosystems tend to be more resilient, and can therefore better cope with an increasingly unpredictable world. Climate change will bring more extreme weather events, from which intact ecosystems can offer physical protection. Higher levels of pollution will call for more detoxification processes, a service provided by healthy wetlands.

Sadly, those already suffering from poverty will be most affected by biodiversity loss. The rural poor rely on ecosystems for their daily needs, and to see them through times of trouble. When the services provided from ecosystems are disrupted, the disadvantaged lack the means to replace them. With proper management, however, ecosystems could offer a path out of poverty. Improper management, in contrast, ensures that development goals will never be reached. The way forward is not easy. Achieving truly sustainable development requires rethinking current economic paradigms, and rejecting short-term, and ultimately empty, solutions.

Our increasing knowledge must now spur on efforts to preserve what riches of nature remain to us. The Convention is the framework under which this work must urgently proceed. From its beginning, the Convention has been a radical instrument for change, predicated on the belief that biodiversity

is essential to development, and that all people have equal rights to benefit from its conservation and sustainable use. Tools for advancing the objectives of the Convention are well developed, and include the programmes of work addressing each major biome and practical guidelines for action. The challenge now is to put these tools to wide use across all economic sectors—from fisheries to forestry, agriculture to industry, planning to trade.

Now is the time for cooperation and collaboration. The Convention has a toolkit for tackling a variety of globally-relevant issues, and the 2010 framework to guide strategies and achieve clear outcomes. It is up to the Parties to the Convention to enact national mechanisms for sustainable development that are mindful of the three objectives of the Convention. The citizens of the world are increasingly aware of environmental change, and concerned by all that stands to be lost. Together, we must take immediate and effective action. Why should all the good ideas and efforts of over a decade of meetings under the Convention remain only on paper? Why should we restrict ourselves to dialogue only within the environmental community, when all economic sectors have a stake in halting biodiversity loss? It is time to translate our hopes and energies into action, for the sake of all life on Earth. In this spirit, I invite you to read *Global Biodiversity Outlook* as an indication of where we stand now, and how we must move forward to achieve our goals.

Ahmed Djoghlaf
Executive Secretary
Convention on Biological Diversity

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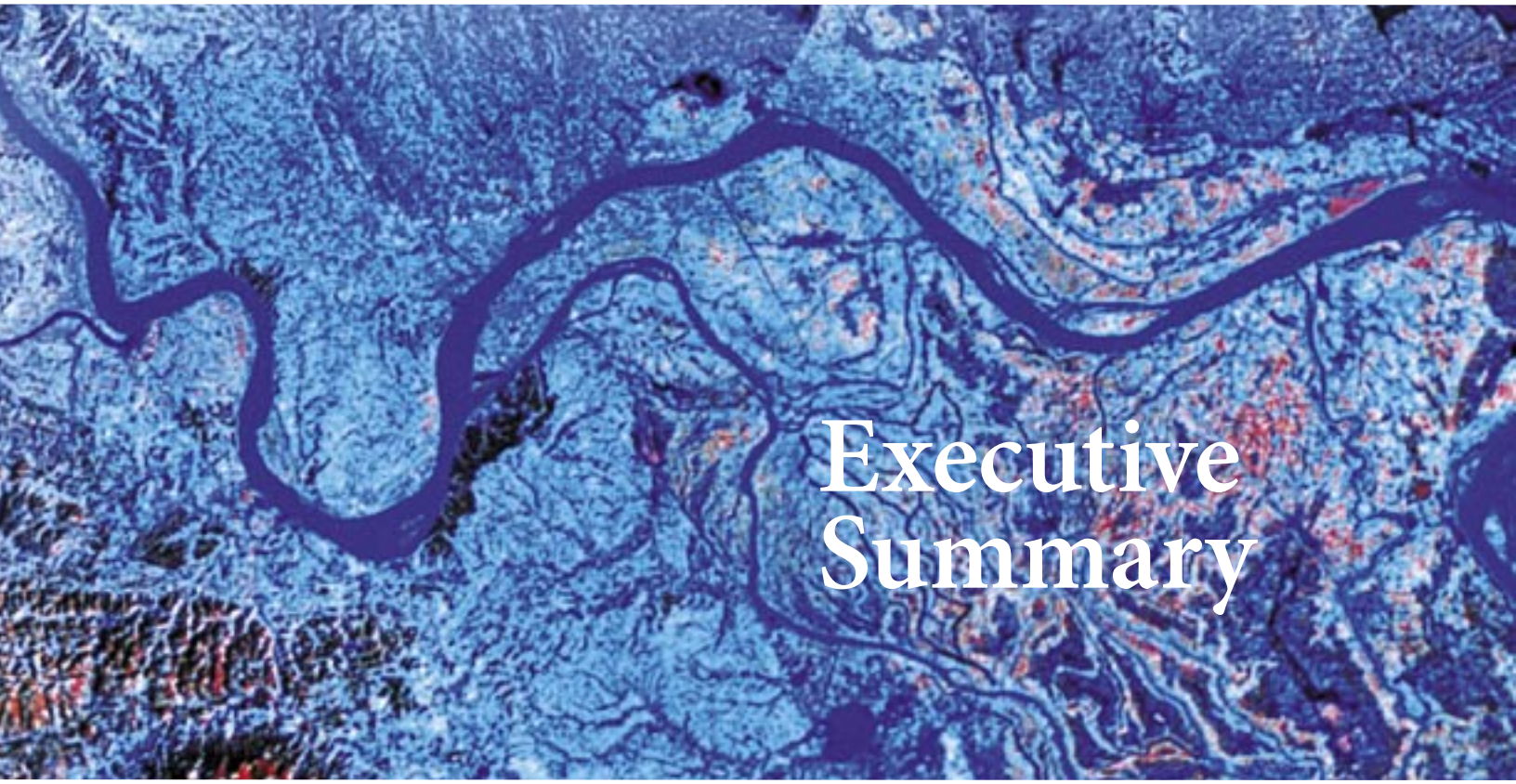
Naturally, the Secretariat accepts responsibility for any errors or omission in this work. None of the other contributors should be considered responsible for any such defects.

Three Gorges, China — Yangtze River / satellite image
QINETIQ LTD / Alpha Presse



Executive Summary

Biological diversity, or biodiversity, is the term given to the variety of life on Earth. It is the combination of life forms and their interactions with one another, and with the physical environment that has made Earth habitable for humans. Ecosystems provide the basic necessities of life, offer protection from natural disasters and disease, and are the foundation for human culture. The Millennium Ecosystem Assessment—a scientific undertaking involving over 1300 experts working in 95 countries—recently confirmed the overwhelming contributions made by natural ecosystems to human life and well-being. Yet even as we begin to better understand what is at stake, genes, species and habitats are rapidly being lost.

Concern over the loss of biodiversity and the recognition of its important role in supporting

human life motivated the creation, in 1992, of the Convention on Biological Diversity, a legally binding global treaty. The Convention encompasses three equally important and complementary objectives: the conservation of biodiversity, the sustainable use of its components, and the fair and equitable sharing of benefits arising out of the utilization of genetic resources. Participation in the Convention is nearly universal, a sign that our global society is well aware of the need to work together to ensure the survival of life on Earth.

In 2002, the Conference of the Parties of the Convention adopted a Strategic Plan, with the mission "to achieve, by 2010, a significant reduction of the current rate of biodiversity loss at the global, regional and national level, as a contribution to poverty alleviation and to the benefit of all life on Earth". This 2010 target was subsequently endorsed by the Heads of State and Government at the World Summit on Sustainable Development in Johannesburg, South Africa. Recently, world leaders meeting at the 2005 World Summit of the United Nations reiterated their commitment to meeting the 2010 target.

In order to assess progress towards the 2010 Biodiversity Target, the Conference of the Parties has established supporting goals and targets and identified indicators for evaluating biodiversity status and trends. The second edition of the *Global Biodiversity Outlook* makes use of these indicators and targets to describe current trends in biodiversity and prospects for achieving the 2010 target.

Why biodiversity loss is a concern

The services provided by healthy, biodiverse ecosystems are the foundation for human well-being. However, out of the 24 ecosystem services recently assessed by the Millennium Ecosystem Assessment, 15 are in decline. These include the provision of fresh water, marine fishery production, the number and quality of places of spiritual and religious value, the ability of the atmosphere to cleanse itself of pollutants, natural hazard regulation, pollination, and the capacity of agricultural ecosystems to provide pest control.

Biodiversity loss disrupts ecosystem functions, making ecosystems more vulnerable to shocks and disturbances, less resilient, and less able to supply humans with needed services. The damage to coastal communities from floods and storms, for example, can increase dramatically where protective wetland habitats have been lost or degraded.

The consequences of biodiversity loss and ecosystem disruption are often harshest for the rural poor, who depend most immediately upon local ecosystem services for their livelihoods and who are often the least able to access or afford substitutes when these become degraded. In fact, the Millennium Ecosystem Assessment has confirmed that biodiversity loss poses a significant barrier to meeting the needs of the world's poorest, as set out in the United Nations Millennium Development Goals.

Garnering the political will to halt ecosystem degradation will depend on clearly demonstrating to policy makers and society at large the full contribution made by ecosystems to poverty alleviation efforts and to national economic growth more generally.

Apart from nature's immediate usefulness to humankind, many would argue that every life form has an intrinsic right to exist, and deserves protection. We must also recognize the right of future generations to inherit, as we have, a planet thriving with life, and that continues to afford opportunities to reap the economic, cultural and spiritual benefits of nature.

The 2010 target: establishing current trends

In using the Convention's indicators to survey current trends, *Global Biodiversity Outlook 2* demonstrates that biodiversity is being lost at all levels, for example:

- Deforestation, mainly through conversion of forests to agricultural land, continues at an alarmingly high rate. The loss of primary forest since 2000 has been estimated at 6 million hectares annually. Coastal and marine ecosystems have been heavily impacted by human activities, with degradation leading to a reduced coverage of kelp forests, seagrasses and corals. In the Caribbean, average hard coral cover declined from about 50% to 10% in the last three decades. Some 35% of mangroves have been lost in the last two decades in countries for which adequate data are available.
- Trends of some 3,000 wild populations of species show a consistent decline in average species abundance of about 40% between 1970 and 2000; inland water species declined by 50%, while marine and terrestrial species both declined by around 30%. Studies of amphibians globally, African mammals, birds in agricultural lands, British butterflies,

Western Brazil, Acre State, near Xapuri town. Man collecting brazil nuts in the Amazon rainforest
Luiz C. Marigo/Alpha Presse

Caribbean and Indo-Pacific corals, and commonly harvested fish species show declines in the majority of species assessed.

- More species are becoming threatened with extinction. The status of bird species show a continuing deterioration across all biomes over the last two decades and preliminary findings for other major groups, such as amphibians and mammals, indicate that the situation is likely worse than for birds. Between 12% and 52% of species within well-studied higher taxa are threatened with extinction.

In addition, forests and other natural habitats are increasingly fragmented, affecting their ability to maintain biodiversity and deliver ecosystem goods and services. Within the 292 large river systems assessed, for instance, only 12% of river-basin area was unaffected by dam-based impacts.

The intensification of fishing has led to the decline in large high-value fishes, such as tuna, cod, sea bass and swordfish, which are high up in the food chain. In the North Atlantic, the number of large fish has declined by two-thirds in the last 50 years.

The threats to biodiversity are generally increasing. Humans contribute more reactive nitrogen to ecosystems globally than do all natural processes combined. The rate and risk of alien species introductions have increased significantly in the recent past, and will continue to rise as a result of increased travel, trade and tourism. Overall, unsustainable consumption continues, as indicated by our growing global ecological footprint. The global demand for resources now exceeds the biological capacity of the Earth to renew these resources by some 20%.

On the positive side, the number and area of protected areas is increasing, although most ecoregions fall well short of the target to protect 10% of their surface. Marine ecosystems in particular are poorly represented, with approximately 0.6% of the ocean's surface area and about 1.4% of the coastal shelf areas protected.

TABLE 1 | Status and trends of biodiversity-related parameters according to the 2010 indicators

Based on the assessment in chapter 2 of *Global Biodiversity Outlook 2*. Arrows indicate the direction of trends (broad arrows indicate a high level of confidence about the trend; narrow arrows indicate low confidence; red arrows indicate a trend that is negative for biodiversity; green arrows indicate a trend that is positive for biodiversity). The quality of the data and indicators are shown by the stars at the right hand side.

★★★ good indicator methodology with globally consistent time course data;
★★ good indicator, but no time course data;
★ indicator requires further development and/or limited data.

FOCAL AREA: Status and trends of the components of biological diversity		
↘	Trends in extent of selected biomes, ecosystems, and habitats	★★★†
↘	Trends in abundance and distribution of selected species	★★★
↘	Change in status of threatened species	★★★
↘	Trends in genetic diversity of domesticated animals, cultivated plants, and fish species of major socio-economic importance	★
↗	Coverage of protected areas	★★★
FOCAL AREA: Ecosystem integrity and ecosystem goods and services		
↘	Marine Trophic Index	★★★
↘	Connectivity – fragmentation of ecosystems	★★
↓ ↑	Water quality of aquatic ecosystems	★★★
FOCAL AREA: Threats to biodiversity		
↗	Nitrogen deposition	★★★
↗	Trends in invasive alien species	★
FOCAL AREA: Sustainable use		
↘	Area of forest, agricultural and aquaculture ecosystems under sustainable management	★
↗	Ecological footprint and related concepts	★★★
FOCAL AREA: Status of traditional knowledge, innovations and practices		
↘	Status and trends of linguistic diversity and numbers of speakers of indigenous languages	★
FOCAL AREA: Status of access and benefit sharing		
?	Indicator of access and benefit-sharing to be developed	
FOCAL AREA: Status of resources transfers		
↘	Official development assistance (ODA) provided in support of the Convention	★

† for forests; data not available globally for all biomes, ecosystems and habitats

On the basis of information available, a common message emerges: biodiversity is in decline at all levels and geographical scales. However, targeted response options—whether it be the creation of protected areas, or resource management and pollution prevention programmes—can reverse this trend for specific habitats or species.

Table 1 gives an overview of the state of indicator development and data. Several indicators have sufficient resolution to determine a change in the rate of biodiversity loss by 2010, including: habitat change in certain types of ecosystems; trends in abundance and distribution of selected species; the status of threatened species; the Marine Trophic Index; and nitrogen deposition. Others may be developed for use by 2010.

Tools of the Convention for addressing biodiversity loss

The Conference of the Parties has responded to the challenge of biodiversity loss by developing a comprehensive body of policy relating to the Convention's three objectives. Policy instruments include: thematic programmes of work of the Convention, covering seven major biomes; cross-cutting programmes of work on technology transfer, taxonomy and protected areas; and principles and guidelines on the ecosystem approach, sustainable use, invasive species, environmental impact assessment and other issues. In addition, the Cartagena Protocol on Biosafety, adopted as a legal instrument in its own right in 2000, aims to ensure that biotechnology does not adversely affect biodiversity or human health.

At the national level, provisions of the Convention and the policy decisions of the Conference of the Parties are translated into actions through national biodiversity strategies and action plans (NBSAPs). As Parties hold primary responsibility for implementation, NBSAPs are central to achieving the objectives of the Convention.

Ten years after entry into force of the Convention, and recognizing the need for more effective and coherent implementation, the Conference of the Parties adopted, in 2002, a Strategic Plan. Progress towards the four goals of the Strategic Plan is mixed:

Reasonable progress is being made towards Goal 1—to promote international cooperation in support of the Convention. The Convention is playing a major role in setting the agenda among biodiversity-related conventions and organizations. However, there remain opportunities to increase policy coherence with other international instruments, particularly under the trade regime;

Goal 2 is to ensure that Parties have improved financial, human, scientific, technical, and technological capacity to implement the Convention. Despite major efforts, progress towards this goal remains limited;

Progress towards Goal 3, which concerns the national-level planning and implementation necessary for achieving the objectives of the Convention, is critical. Although Parties are involved in the processes of the Convention, implementation is far from sufficient;

Goal 4 is to achieve a better understanding of the importance of biodiversity and of the Convention, leading to broader engagement across society in implementation. Progress towards this goal is mixed. Current communication, education and public-awareness programmes are not sufficient. Despite some progress, additional efforts are required to engage key actors and stakeholders to integrate biodiversity concerns into sectors outside the environment.

Prospects and challenges for achieving the 2010 Biodiversity Target

On the basis of both an analysis of current trends and by exploring scenarios of plausible futures, the Millennium Ecosystem Assessment projects that biodiversity loss, and in particular the loss of species diversity and transformation of habitats, is likely to continue for the foreseeable future, and certainly beyond 2010. This is largely due to inertia in ecological and human systems and to the fact that most of the direct drivers of biodiversity loss—habitat change, climate change, the introduction of invasive alien species, overexploitation and nutrient loading—are projected to either remain constant or to increase in the near future.

These findings leave no room for complacency, but neither do they suggest that progress towards the 2010 Biodiversity Target is impossible. Three conclusions of the Millennium Ecosystem Assessment are particularly pertinent in this regard:

- First, while "unprecedented additional efforts" will be needed to achieve the 2010 Biodiversity Target at national, regional and global levels, with appropriate responses it is possible to achieve, by 2010, a reduction in the rate of biodiversity loss for certain

components of biodiversity or for certain indicators, and in certain regions;

- Second, the majority of the targets that the Convention has established as part of its framework for assessing progress towards the 2010 target are achievable, provided that the necessary actions are taken;
- Third, for the most part, the tools needed to achieve the 2010 target, including programmes of work, principles and guidelines, have already been developed.

These conclusions should be seized upon, and should motivate Parties and civil society to act: by applying the tools already available under the Convention, real progress can be made. Biodiversity-related tools must be widely applied, however, in all relevant sectors, if the best possible outcomes for conservation and sustainable use are to be achieved.

The imperative to integrate biodiversity concerns into relevant sectoral or cross-sectoral plans, programmes and policies is enshrined in the Convention, highlighted in the Strategic Plan, and reinforced by the findings of the Millennium Ecosystem Assessment. Engaging the main actors in key economic sectors will not only serve to directly address the drivers of biodiversity loss, but will also ensure wider awareness of biodiversity issues. With wider awareness will come the increased political will and additional resources necessary to bring about positive change.

Global Biodiversity Outlook 2 outlines priority issues for engaging with the key sectors of food and agriculture, trade, poverty reduction, and development. The Outlook also notes the importance of integrating biodiversity concerns into the energy sector, given that climate change is an increasingly significant driver of biodiversity loss and that the conservation and sustainable use of biodiversity can contribute both to mitigation and adaptation measures.

The food and agriculture sector contributes to pressures on biodiversity primarily through land-use change—which is expected to remain the largest driver of biodiversity loss beyond 2010 and at least to 2050—but also through nutrient loading and over-exploitation of wild resources. These pressures point to a five-fold approach to minimizing biodiversity loss, encompassing actions to: improve agricultural efficiency; more effectively plan agricultural expansion to avoid encroaching on habitats of high biodiversity value; moderate demand for food (particularly for meat among affluent sectors of society); halt over-fishing and destructive fishing practices; and protect critical ecosystems and habitats. To implement this approach, a mix of planning, regulations and incentive measures will be required, building on existing tools developed under the Convention. In addition, creating markets for ecosystem services, where appropriate, will encourage producers and consumers to accurately value biodiversity, and plan for its sustainable use.

Since economic development, including food and agricultural production, is strongly affected by policies on trade, *Global Biodiversity Outlook 2* discusses the need to integrate biodiversity concerns into trade discussions. Whereas commitments under the Doha Development Agenda of the World Trade Organization (such as the removal of subsidies for fisheries and agriculture) have the potential to benefit biodiversity, trade liberalization is projected to lead, in the short term, to acceleration in the rate of biodiversity loss in some regions and countries, unless accompanied by proactive measures to conserve biodiversity.

Economic development is essential to meeting the Millennium Development Goals, yet long-term sustainability will be undermined if biodiversity issues are not taken into account. Furthermore, many of the actions that could be taken to eradicate extreme poverty are likely to accelerate biodiversity loss in the short-run. The existence of trade-offs, but also of potential synergies, implies that environmental considerations, including those related to biodiversity, should be integrated into the implementation of all of the relevant Millennium Development Goals.

As noted by the Millennium Ecosystem Assessment, there is substantial scope for better protection of biodiversity through actions justified on their economic merits. Realizing this potential requires making greater efforts towards understanding the total value of biodiversity and ecosystem services for human well-being, and taking into account this value in decision-making processes across all sectors.

Actions needed to achieve the 2010 target

Primary responsibility for meeting the 2010 target of significantly reducing the rate of biodiversity loss lies with Parties to the Convention. To give focus and impetus to this effort, all Parties should develop and implement comprehensive national biodiversity strategies and action plans (NBSAPs) that include

Honeybee (*Apis mellifera*) on *Cosmos* flower
C. Allan Morgan / Alpha Presse

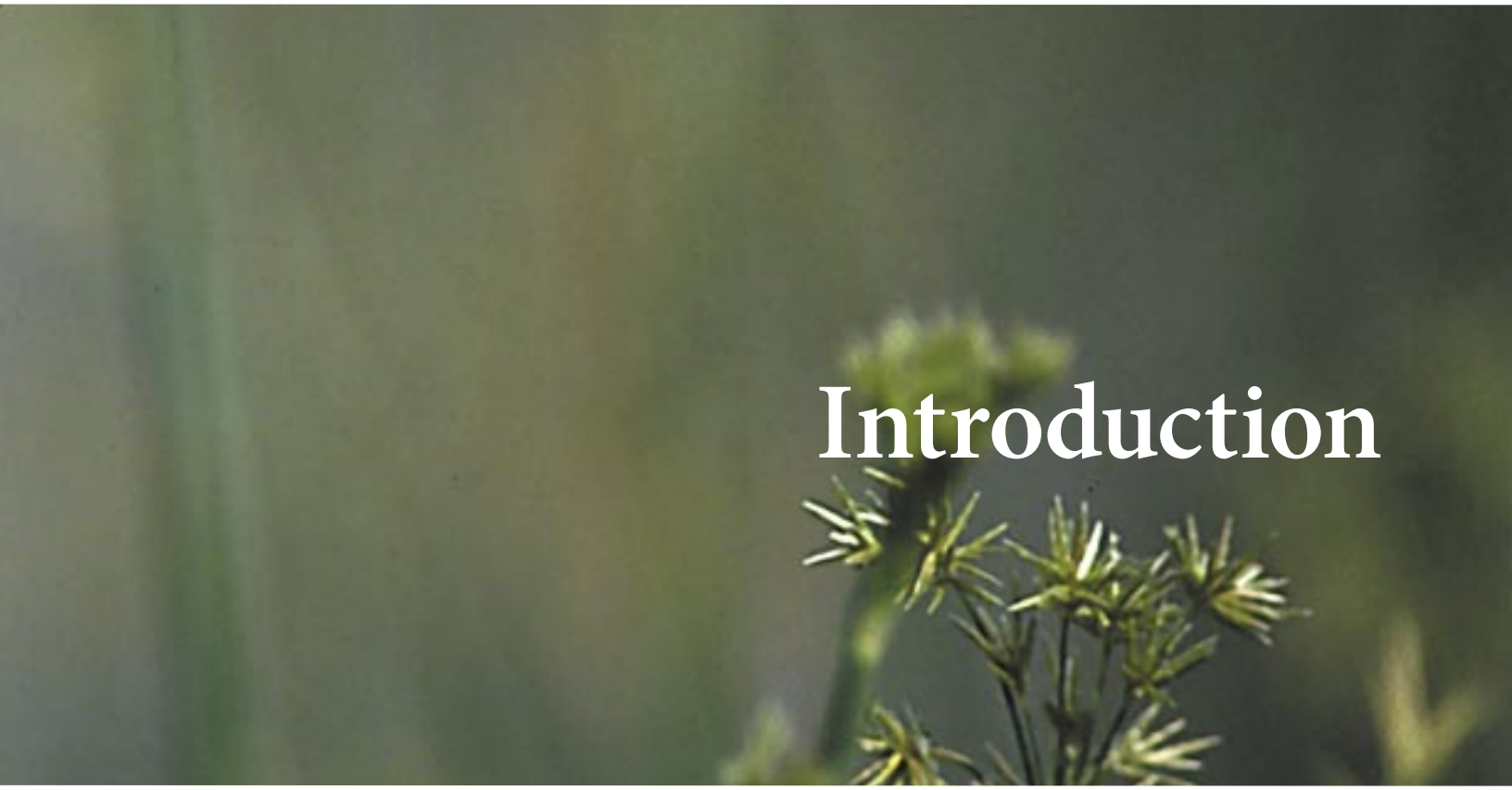
clear national targets for 2010. Implementation must occur across sectors, with biodiversity issues integrated into national policies, programmes and strategies on trade, agriculture, forestry and fisheries, and into development planning. To be effective in these efforts, Parties must mobilize sufficient human, financial, technical and technological resources. Finally, Parties should make all efforts to complete their fourth national reports to the Convention, as a means to report on progress towards their commitments under the 2010 target and determine what further actions are needed.

The Conference of the Parties should continue to support Parties in implementation, by reviewing progress in implementation and identifying concrete means for achieving the Convention's objectives. Even as the Conference of the Parties shifts its focus to implementation, however, some key policy issues remain to be resolved, including completion of an international regime on access and benefit sharing.

As citizens and actors in our own right, individuals have an essential part to play in promoting biodiversity conservation and sustainable use. We can demand action from all levels of government. Moreover, in our everyday choices, we all have direct impacts on biodiversity and the state of our planet's ecosystems. Options for sustainable consumption and waste reduction are increasing and should be supported.

Global Biodiversity Outlook 2 finds that meeting the 2010 target is a considerable challenge, but by no means an impossible one. Unprecedented additional efforts are needed, and these must be squarely focused on addressing the main drivers of biodiversity loss. The Convention already provides a set of policies, guidance and programmes that, with minimal adjustments, can guide action at the global, regional and national level to this end. For the best possible outcomes to be achieved, however, these tools must be put to immediate and widespread use in those sectors that give rise to the drivers of biodiversity loss. Many opportunities exist for mainstreaming biodiversity, as outlined above, but seizing these will depend on taking effective action at the national level.

Orange bishop (*Euplectes franciscanus*)
B. Van Damme/Alpha Presse



Introduction

Biological diversity, or biodiversity, is a term used to describe the myriad life forms found on Earth. These are the legacy of billions of years of evolution, shaped by natural processes and, increasingly, by the activities of humans.

Biodiversity is most often understood as the number of different species of plants, animals and microorganisms in existence. Our planet is home to millions of species—estimates range from two to over 10 million in total—the majority of which have yet to be identified. However, biodiversity also encompasses the specific genetic variations and traits within species as well as the assemblage of these species within ecosystems. At the genetic level, differences in DNA codes within species give rise to unique types including different varieties of crops and breeds of livestock.

Ghana, Kumasi area—Women harvesting cocoa
Ron Giling/Alpha Presse

Cultivated rice, for instance, belongs to only two species, yet includes over 120,000 genetically distinct varieties. At the ecosystem level, biodiversity refers to the varied assemblages of species that characterize deserts, forests, wetlands, grasslands, lakes, rivers, agricultural and other landscapes. Each ecosystem consists of living creatures interacting with one another and with the air, water, and soil around them. These multiple interconnections within and among ecosystems form the web of life, of which we humans are an integral part and upon which we entirely depend.

It is the combination of life forms and their interactions with one another, and with the physical environment, that has made Earth habitable for humans. Ecosystems provide the basic necessities of life (e.g., food, water and the very air we breathe), offer protection from natural disasters and disease (e.g., by regulating climate, floods and pests), provide a foundation for human cultures and inspire our spiritual beliefs and worldviews. These "ecosystem services" also support and maintain the essential life processes of the planet, such as primary production and nutrient cycling. Each of these supporting services is essential to human well-being, whether the services are considered at the local, regional or global level.

Even as we begin to understand better what is at stake, genes, species and habitats are rapidly being lost. The first comprehensive assessment of the status of the world's natural resources in terms of their contributions to human life and well-being confirms this. The Millennium Ecosystem Assessment, completed in 2005 by more than 1360 scientists working in 95 countries, found that changes in biodiversity due to human activities were occurring more rapidly in the past 50 years than at any time in human history, and that the direct causes (or drivers) of this loss are either remaining steady, showing no evidence of decline over time, or are increasing in intensity over time. In effect, we are currently responsible for the sixth major extinction event in the history of the Earth, and the greatest since the dinosaurs disappeared, 65 million years ago.

Deep concern over the rapid loss of biodiversity and the realization that it plays a fundamental role in supporting human life motivated the creation of the Convention on Biological Diversity, a legally binding global treaty. Opened for signature at the Earth Summit Rio de Janeiro in 1992 and entering into force in 1993, the Convention arose from an international dialogue begun a decade earlier by the World Commission on Environment and Development (known as the Brundtland Commission). The Convention is holistic, covering all aspects of biodiversity, and was the first international treaty to acknowledge the role of biodiversity in sustainable development.

Far more than simply a conservation treaty, the Convention encompasses three equally important and complementary objectives: the conservation of biodiversity, the sustainable use of its components, and the fair and equitable sharing of benefits arising out of the utilization of genetic resources. Underpinning the Convention's three objectives is the recognition that humans, themselves exhibiting a diversity of cultures, are an integral component of ecosystems. All people and nations, whether rich or poor, share the same planet and depend upon the same storehouse of biodiversity. The near universal participation rate in the Convention—187 countries and the European Community are presently Parties—is a sign that our global society is well aware of the need to work together to ensure the survival of life on Earth.

The 2010 Biodiversity Target

In 2002, 10 years after the entry into force of the Convention, member countries attending the sixth meeting of the Conference of the Parties to the Convention acknowledged that the rate of biodiversity loss was still accelerating and that, in order to reduce and halt this loss, threats to biodiversity must be addressed.

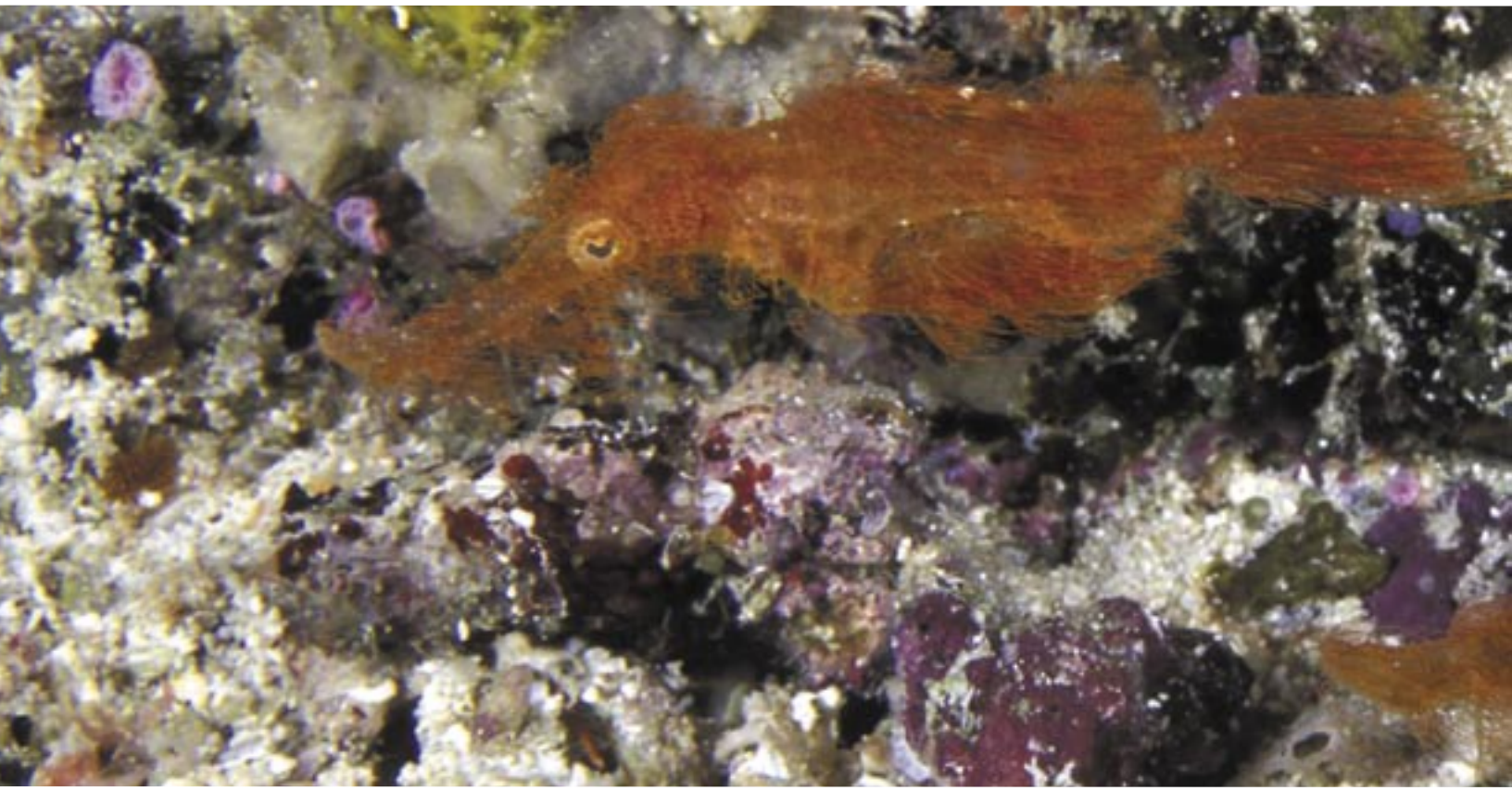
For these reasons, the Conference adopted a Strategic Plan, in which Parties committed themselves to a more effective and coherent implementation of the three objectives of the Convention in order to achieve, by 2010, a significant reduction of the current rate of biodiversity loss at the global, regional and national level, as a contribution to poverty alleviation and for the greater benefit of all life on Earth.[1] This target was subsequently endorsed by the Heads of State and Government at the World Summit on Sustainable Development in Johannesburg, South Africa, providing a rallying point for the activities of other biodiversity-related conventions, major international non-governmental organizations, and the scientific community. Recently, world leaders meeting at the 2005 World Summit of the United Nations agreed to fulfill the commitments of all States to meet the 2010 target.

To assess progress in achieving the goals of the Strategic Plan and its 2010 Biodiversity Target, and to help communicate the state of this progress to the public, Parties agreed on a framework of focal areas to guide action. The seven focal areas in decision VII/30, adopted at the 2004 Conference of the Parties include:

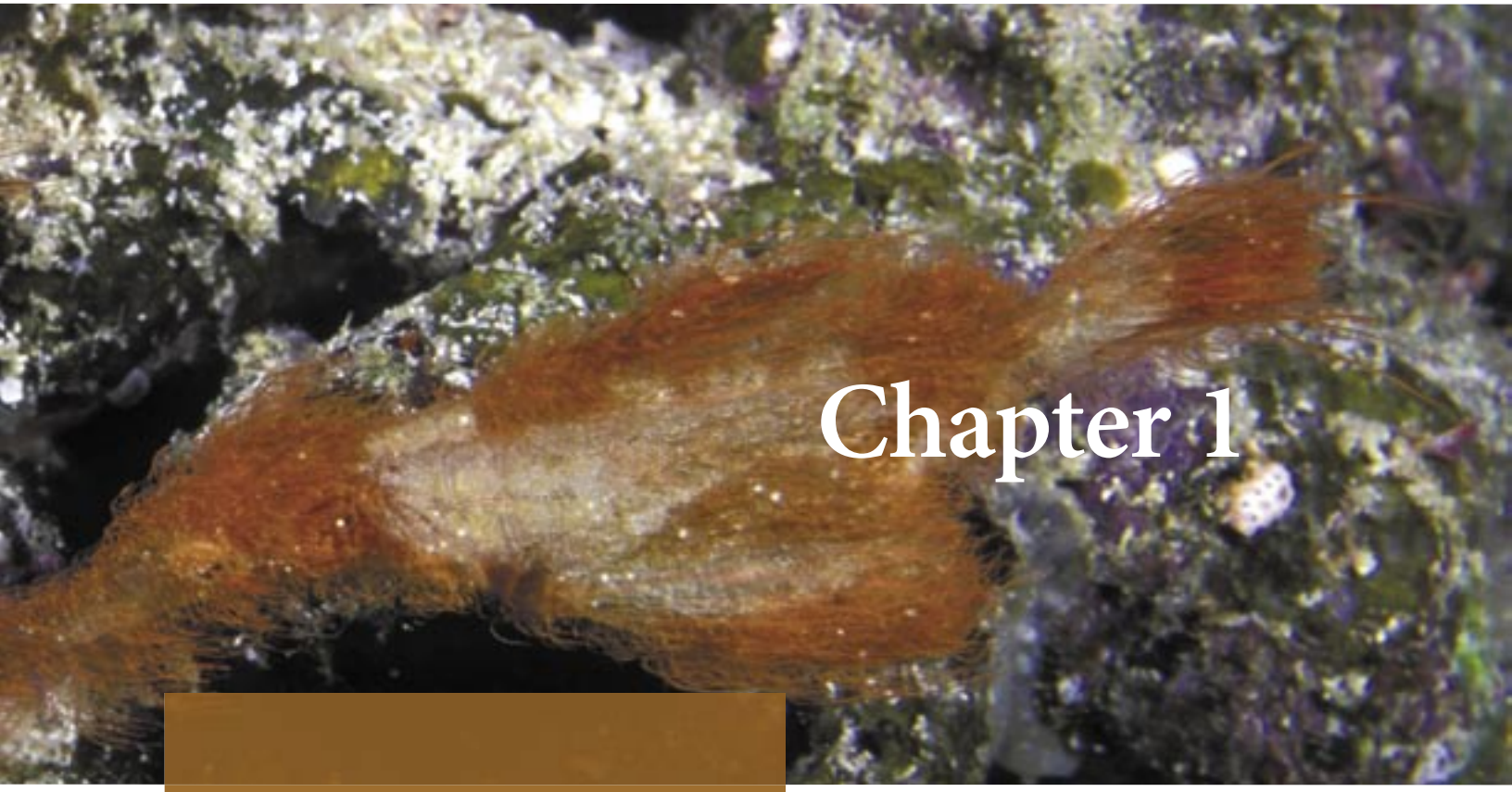
- Reducing the rate of loss of the components of biodiversity, including: (i) biomes, habitats and ecosystems; (ii) species and populations; and (iii) genetic diversity;
- Promoting sustainable use of biodiversity;
- Addressing the major threats to biodiversity, including those arising from invasive alien species, climate change, pollution, and habitat change;
- Maintaining ecosystem integrity, and the provision of goods and services provided by biodiversity in ecosystems, in support of human well-being;
- Protecting traditional knowledge, innovations and practices;
- Ensuring the fair and equitable sharing of benefits arising out of the use of genetic resources; and
- Mobilizing financial and technical resources, especially for developing countries, in particular least developed countries and small island developing states among them, and countries with economies in transition, for implementing the Convention and the Strategic Plan.

For each of the seven focal areas of the framework, the Conference of the Parties identified indicators for assessing biodiversity status and trends, and outcome-oriented goals and targets, which act as sub-targets to the overall 2010 Biodiversity Target. Such clear, stable, long-term targets, relating to concrete outcomes, can help shape expectations and create the conditions under which all actors, whether Governments, the private sector, or civil society, have the motivation to develop solutions for meeting agreed-upon challenges. Targets also form the core of the United Nations' Millennium Development Goals, providing a commonly agreed focus for activities by all countries and stakeholder groups to meet the needs of the world's poorest people. Similarly, the Kyoto Protocol is centred on meeting targets for reducing greenhouse gas emissions.

Global Biodiversity Outlook 2 reviews the key importance of biodiversity for human livelihoods and well-being (Chapter 1); provides an assessment of the current status and trends of biodiversity and of some of the key drivers of biodiversity loss (Chapter 2); reviews the progress to date in developing and implementing the Convention and its Strategic Plan (Chapter 3); and considers the prospects and challenges of meeting the 2010 Biodiversity Target (Chapter 4). Finally, key actions needed to reach the 2010 Biodiversity Target are provided in the conclusion.



Hairy ghost pipefish (*Solenostomus* sp.) camouflaged against red algae found on coral rubble—large female with smaller male.
Kelvin Aitken/Alpha Presse



Chapter 1

THE ESSENTIAL ROLE OF BIODIVERSITY

The impact of humans on the natural environment is significant and growing. There are currently well over six billion people on the planet; there will likely be nine billion by mid-century. Each person has the right to adequate clean water, food, shelter and energy, the provision of which has profound ecological implications.

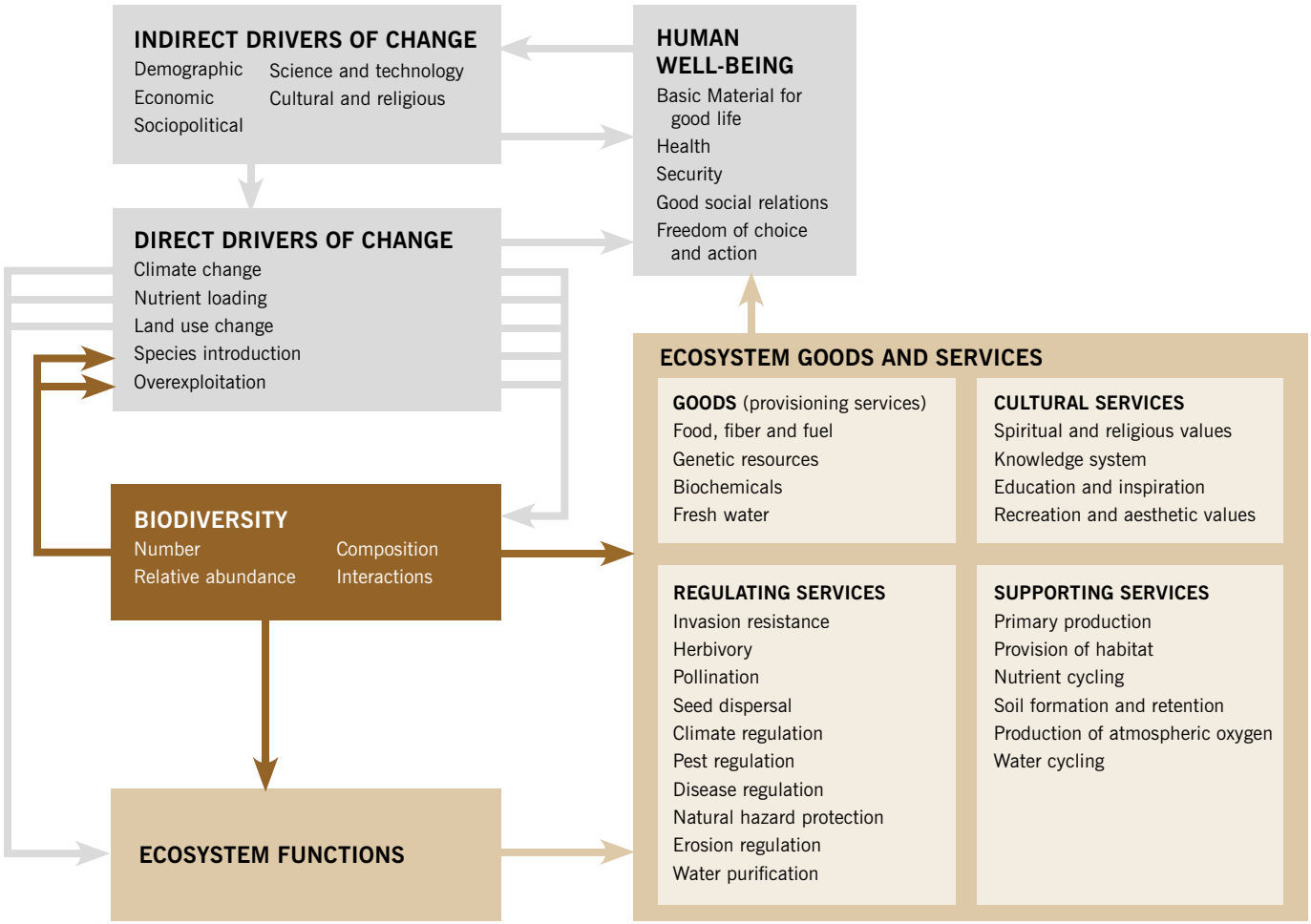
Human needs multiplied by a growing world population translate into increasing, and unprecedented, demands on the planet's productive capacity. The growing appetite for consumer goods and services beyond the necessities of survival and the wasteful consumption of available resources by the more privileged segment of global society are exacerbating the strain on the Earth, with consequences for all. As demographic pressures and consumption levels increase, biodiversity decreases, and the ability of the

natural world to continue delivering the goods and services on which humanity ultimately depends may be undermined.

Biodiversity underpins ecosystem functioning. The services provided by healthy ecosystems, in turn, are the foundation for human well-being. These ecosystem services not only deliver the basic material needs for survival, but also underlie other aspects of a good life, including health, security, good social relations and freedom of choice (see Figure 1.1).

The Millennium Ecosystem Assessment examined the state of 24 services that make a direct contribution to human well-being.[1] The Assessment concludes that 15 of 24 are in decline, including provision of fresh water, marine fishery production, the number and quality of places of spiritual and religious value, the ability of the atmosphere to cleanse itself of pollutants, natural hazard regulation, pollination, and the capacity of agricultural ecosystems to provide pest control.

FIGURE 1.1 | Biodiversity, ecosystem functioning, ecosystem services, and drivers of change



Biodiversity is affected by drivers of change and also is a factor modifying ecosystem function. It contributes directly and indirectly to the provision of ecosystem goods and services. These are divided into four main categories by the Millennium Ecosystem Assessment: goods (provisioning services) are the products obtained from ecosystems; and cultural services represent non-material benefits delivered by ecosystems. Both of these are directly related to human well-being. Regulating services are the benefits obtained from regulating ecosystem processes. Supporting services are those necessary for the production of all other ecosystem services.

The consequences of biodiversity loss and ecosystem disruption are often harshest for the rural poor, who depend most immediately upon local ecosystem services for their livelihoods.

Cracked earth, Thailand. Digging out pond snails *Werachai Wansamngan / UNEP/Alpha Presse*

By disrupting ecosystem functions, biodiversity loss makes ecosystems more vulnerable to shocks and disturbances, less resilient, and less able to supply humans with needed services. The damage to coastal communities from floods and storms, for example, can increase dramatically following conversion of wetland habitats, as the natural protection offered by these ecosystems against wave action, tidal surge, and water run-off from land is compromised. Recent natural disasters underline this reality (see Box 1.1).

Healthy ecosystems are critical to human well-being at all times, not only in times of catastrophe. For example, inland wetlands are the principal source of renewable fresh water for human use, storing water but also purifying it through the removal of excess nutrients and other pollutants. Disruption of wetland purification processes can have devastating impacts at the source and further downstream. The loss of wetlands in the Mississippi watershed of the United States, for example, combined with high nutrient loads from intensive agriculture in the region, has contributed to the creation of a low-oxygen "dead zone", incapable of supporting animal life, which extends, on average at mid-summer, some 16,000 square kilometres into the Gulf of Mexico.

The consequences of biodiversity loss and ecosystem disruption are often harshest for the rural poor, who depend most immediately upon local ecosystem services for their livelihoods and who are often the least able to access or afford substitutes when

BOX 1.1 | The role of biodiversity in mitigating the impacts of natural disasters

The year 2005 witnessed the largest financial losses ever recorded as a result of natural disasters, with preliminary estimates of total economic losses reaching over US$ 200 billion. Many experts have suggested that better management of natural ecosystems could lessen the loss of human lives and damage to property caused by such disasters, as explored in the four examples presented here, compiled from various sources.

Aerial view of inundations of the Somme river, Picardie, France
Cyrill Ruoso/BIOS/Alpha Presse

ALTERED FLOODPLAINS AND THE FLOODS OF CENTRAL EUROPE: Heavy rains in August 2002 and 2005 triggered catastrophic floods across Central Europe. Most of the natural, meandering stream and river systems in the region have been dyked, straightened and deepened over the past century, altering the flow of water accordingly. The natural ability of the land to retain and store water has also been reduced by the loss of once extensive marshlands and floodplain forests, and by the use of intensive farming methods. Large fields encourage runoff and erosion, and heavy machinery compacts the soil, limiting the land's capacity to absorb excess water. Options for improved river basin management to reduce risks from floods are being explored.

Deforestation in the countryside, Haiti
Julio Etchart/Alpha Presse

DEFORESTATION AND TROPICAL STORMS IN THE CARIBBEAN: In 2004, tropical storm Jeanne hit the island of Hispaniola, killing close to 3,000 people in Haiti, but only 18 people across the border in the Dominican Republic. This difference in human suffering has been linked to extensive deforestation in Haiti, where political turmoil and extreme poverty have led to the destruction of all but some 2% of the country's original forest cover. Restoring forest ecosystems in Haiti would help to delay and reduce peak floodwater flows at local scales, making communities safe from the water torrents that now follow even normal rainfalls.

Destruction caused by tsunami, Koh Phi Phi (Loh Dalam Bay), Thailand
Hartmut Schwarzbach/Alpha Presse

MANGROVES AND THE ASIAN TSUNAMI: Mangrove forests have been rapidly disappearing from Southeast Asian coastlines in recent decades to make way for vast shrimp farms and tourist resorts. The tsunami that hit Asia in December 2004 revealed the devastating consequences of this loss. Although coastal vegetation could not have protected against catastrophic destruction in areas of maximum tsunami intensity, analysis of satellite images revealed that areas with mangrove or tree cover were significantly less likely to have experienced major damage. This underlines the protective role of coastal forests in reducing damage, including from regular storms, such as the typhoons that batter the Philippines every year. Efforts to replant mangroves are underway, but face challenges from coastal developers.

Hurricane Katrina overflowed Mobile Bay and downtown Mobile, Alabama with 3–5 metres of storm surge. August 29th, 2005
Weatherstock/Alpha Presse

COASTAL WETLANDS AND HURRICANE KATRINA IN THE UNITED STATES: Hurricane Katrina touched down on a coastal region of the United States that has been under environmental pressure for over a century. Re-engineering of the Mississippi River, accomplished through a system of canals and levees, has diverted natural sedimentation flows and steadily eroded coastal wetlands; Louisiana alone loses more than 65 km^2 of coastal wetlands every year. Development has also destroyed barrier islands and oyster reefs that buffered the coast. During the hurricane, the tidal surge was able to travel unimpeded up shipping canals and burst over the levees surrounding New Orleans. Although damage from the storm would have been considerable in any case, breaches occurred more often in areas where wetlands had been destroyed and levees were exposed to wave action.

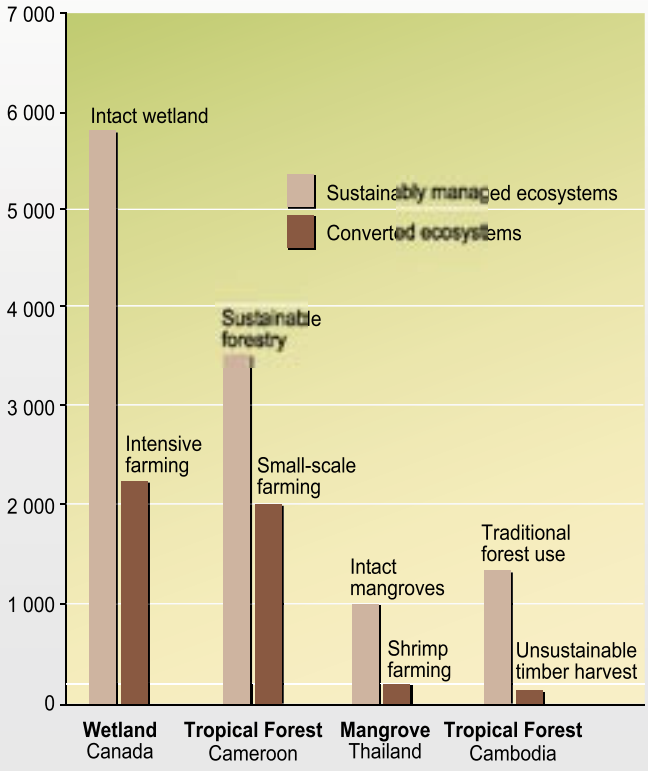
these become degraded. In daily life, rural households depend, to varying degrees, on farming, fishing, hunting and the harvest of wild products to help meet their subsistence and cash needs, complementing this environmental income with outside sources of earnings, such as wage labour or remittances. In times of crisis—during a drought or economic recession, for example—even those households not normally reliant on environmental income can turn to wild products as a last resort. Ecosystems then serve the additional function of social safety nets, insuring families against absolute poverty and starvation.

The marginal position of rural communities in society often allows more powerful interests to capture ecosystem benefits for private gain, frequently through the conversion of ecosystems to other uses. Although studies are few, in every case examined where the total economic value (i.e., market and non-market value combined) of ecosystems under alternative management regimes were compared, managing the ecosystem more sustainably yielded greater total benefits than conversion (Figure 1.2). In one of these studies, for instance, intact mangrove ecosystems along Thailand's coast were found to provide substantial benefits to society as a source of timber and non-timber forest products, in the production of charcoal, and by enhancing offshore fisheries and providing storm protection. When mangroves were converted to make way for private shrimp farms, these societal benefits fell to almost zero. Conversion of the natural ecosystem proceeded nonetheless, in part because those individuals standing to gain immediate private benefits did not have to bear the costs associated with the loss of ecosystem services. In some cases, government subsidies can exaggerate the private benefits of conversion, as ecosystems are degraded at public expense. The end result for the poor is further disenfranchisement.

Garnering the political will to halt ecosystem degradation will depend on clearly demonstrating to policy makers and society at large the full contribution made by ecosystems to national economies. A recent World Bank report estimates that natural capital, even when defined narrowly, constitutes a quarter (26%) of the total wealth (greater than the share of produced capital) of low-income countries. The report also suggests that better management of ecosystems and natural resources will be key to sustaining development while nations build other forms of wealth (i.e., infrastructure, but also human and institutional capital). Specific examples of the economic value derived from biodiversity are also available, and are increasing in number (see Box 1.2).

However, a more profound re-thinking of economic growth, and how it is measured, is also needed. Current measures of economic wealth, such as the gross domestic product (GDP), do not reflect the total economic value of ecosystems, and mistakenly treat nature's goods

FIGURE 1.2 | Economic benefits under alternative management practices



Relatively few studies have compared the total economic value of ecosystems under alternative management regimes. The results of several that attempted to do so are shown. In each case where the total economic value of sustainable management practices was compared with management regimes involving conversion of the ecosystem or unsustainable practices, the value of the sustainably managed ecosystem exceeded that of the converted ecosystem even though the private benefits—that is, the actual monetary benefits captured from the services entering the market—would favour conversion or unsustainable management. These studies are consistent with the understanding that market failures associated with ecosystem services lead to greater conversion of ecosystems than is economically justified.

Source: Millennium Ecosystem Assessment

We must also recognize the right of future generations to inherit, as we have, a planet thriving with life, and that continues to afford opportunities to reap the economic, cultural and spiritual benefits of nature.

BOX 1.2 | Contribution of ecosystem goods and services to national economies

Environmental income is important not only to the poor, but to national economies as well, although it is often overlooked in official statistics. The wildlife tourism industry is among the most important and rapidly growing sectors of the international tourism industry. In Kenya, wildlife tourism presently brings in approximately US$200 million every year, and is the country's largest earner of foreign currency. Each year in the Galapagos Islands of Ecuador, tourism raises as much as $60 million annually, and provides income for an estimated 80% of the islands' residents. The harvest of wild species can also make major contributions to national economies. Exports of medicinal plants are worth US$8.6 million annually to Nepal, where an estimated 1,500 species are used in traditional medicines. Among industrialized nations, Iceland's marine fisheries serve as a model for responsible management and, in 2003, marine products represented over 60% of the country's exported goods, by value. Increasingly, the demand for goods produced from sustainably managed ecosystems are creating new economic opportunities. Sales of certified organic coffee beans, for instance, which generally come from coffee plants grown under more traditional, tree-shaded and biodiversity-friendly conditions, are currently growing faster than sales of any other specialty coffee.

BOX 1.3 | Millennium Development Goals

The Millennium Development Goals were agreed upon at the United Nations Millennium Summit in 2000. Under each Goal, specific targets for 2015 were established.

GOAL 1: Eradicate extreme poverty and hunger

GOAL 2: Achieve universal primary education

GOAL 3: Promote gender equality and empower women

GOAL 4: Reduce child mortality

GOAL 5: Improve maternal health

GOAL 6: Combat HIV/AIDS, malaria and other diseases

GOAL 7: Ensure environmental sustainability

GOAL 8: Develop a Global Partnership for Development

San bushman elder showing grandchildren lizard tracks in sand, Kalahari Gemsbok National Park, South Africa
Nicole Duplaix/Alpha Presse

and services as free to use and limitless in abundance. As a result, countries that fell their forests for timber exports, dynamite reefs for fish, and degrade their land as a result of unsustainable agriculture can appear to be getting richer in the short-term. Applying better valuation methods to national economies, as indicated in the case study on conversion of mangrove to aquaculture in Thailand, would reveal that for many countries, and in a number of sectors, economic gains as traditionally measured are illusory.

World Bank figures suggest that, per capita, most low-income countries have experienced declines in both total and natural capital, jeopardizing both economic growth and the achievement of the Millennium Development Goals (MDGs) (see Box 1.3). In fact, the Millennium Ecosystem Assessment has already confirmed that the real costs of biodiversity loss pose a significant barrier to meeting the MDGs. Although policy-makers have generally focused narrowly on the contribution of biodiversity conservation and sustainable use to the achievement of Goal 7 ("Ensure environmental sustainability"), the wider role of ecosystem services in supporting livelihoods and human well-being reveals biodiversity to be the foundation for all development, and hence for meeting each of the Millennium Development Goals. Studies of food security and nutrition, for instance, have shown the importance of agricultural biodiversity to the elimination of hunger and malnutrition. In terms of human health, biodiversity also has a recognized role in controlling vector-based diseases and providing the natural sources of many traditional medicines and modern pharmaceutical drugs.

The challenge ahead of us lies in the fact that a number of the actions that could be implemented most quickly to promote economic growth and reduce hunger and poverty (e.g., intensification of agriculture or infrastructure developments) are harmful to biodiversity, at least in the short- to medium-term, and could undermine the sustainability of any development gains. Recognizing the trade-offs and synergies that exist between poverty alleviation, biodiversity conservation and sustainable use will therefore be essential to achieving many of the targets of the Millennium Development Goals, as discussed further in Chapter 4.

There are important additional reasons to care about the loss of biodiversity, quite apart from nature's immediate usefulness to humankind. Many would argue that every life form has an intrinsic right to exist. Species alive today are thousands to millions of years old and have each travelled unique evolutionary paths, never to be repeated, in order to reach their present form. We must also recognize the right of future generations to inherit, as we have, a planet thriving with life, and that continues to afford opportunities to reap the economic, cultural and spiritual benefits of nature.

Caribou running, Arctic National Wildlife Refuge, Alaska (United States of America)
S. J. Krasemann / Alpha Presse

Chapter 2

THE 2010 BIODIVERSITY TARGET: ESTABLISHING CURRENT TRENDS

To assess progress at the global level towards the 2010 Biodiversity Target, and to communicate effectively the trends related to the three objectives of the Convention and the seven focal areas referred to earlier, Parties to the Convention have established a number of indicators (Box 2.1).

Biodiversity indicators are communication tools that summarize data on complex environmental issues. They can be used to signal key issues to be addressed through policy or management interventions. Indicators, therefore, are important for monitoring the status and trends of biological diversity and, in turn, feeding back information on ways to continually improve the effectiveness of biodiversity policies and management programmes. When used to assess national, regional or global trends, they build

BOX 2.1 | Headline indicators for assessing progress towards the 2010 Biodiversity Target†

FOCAL AREA: Reducing the rate of loss of the components of biodiversity, including: (i) biomes, habitats and ecosystems; (ii) species and populations; and (iii) genetic diversity

- Trends in extent of selected biomes, ecosystems and habitats
- Trends in abundance and distribution of selected species
- Change in status of threatened species
- Trends in genetic diversity of domesticated animals, cultivated plants, and fish species of major socio-economic importance
- Coverage of protected areas

FOCAL AREA: Maintaining ecosystem integrity, and the provision of goods and services provided by biodiversity in ecosystems, in support of human well-being

- Marine Trophic Index
- Connectivity/fragmentation of ecosystems
- Water quality in aquatic ecosystems

FOCAL AREA: Addressing the major threats to biodiversity, including those arising from invasive alien species, climate change, pollution, and habitat change

- Nitrogen deposition
- Trends in invasive alien species

FOCAL AREA: Promoting sustainable use of biodiversity

- Area of forest, agricultural and aquaculture ecosystems under sustainable management
- Ecological footprint and related concepts

FOCAL AREA: Protecting traditional knowledge, innovations and practices

- Status and trends of linguistic diversity and numbers of speakers of indigenous languages

FOCAL AREA: Ensuring the fair and equitable sharing of benefits arising out of the use of genetic resources

- Indicator to be developed

FOCAL AREA: Mobilizing financial and technical resources, especially for developing countries, in particular, least developed countries and small island developing states among them, and countries with economies in transition, for implementing the Convention and the Strategic Plan

- Official development assistance provided in support of the Convention

† Focal areas and associated headline indicators are from decision VII/30, with refinements as recommended in SBSTTA recommendation X/5. This box lists only those headline indicators discussed in this edition of the *Global Biodiversity Outlook*, and the sequence of focal areas differs from decision VII/30.

a bridge between the fields of policy-making and science. Indicators that focus on key issues are referred to as "headline indicators".

The global headline indicators established under the Convention are applied in this edition of the *Global Biodiversity Outlook*. They provide a framework for assessing a broad cross-section of issues fundamental to the conservation and sustainable use of biodiversity, and to the equitable sharing of the benefits from the use of genetic resources. Although the indicators cannot cover all aspects of biodiversity, as a suite they assess key aspects of biodiversity from a number of different, complementary angles. Considering the suite of indicators in an integrated way allows for a more detailed analysis than the pure enumeration of the individual factors measured.

It should be noted that it is too early to determine whether progress is being made towards the 2010 target, since data collection generally does not have sufficient resolution to allow changes in rates of loss to be determined in the years since the target was adopted in 2002. This section therefore aims to establish current trends, against which progress can be judged in future editions of the *Global Biodiversity Outlook*.

FOCAL AREA | Reducing the rate of loss of the components of biodiversity, including: (i) biomes, habitats and ecosystems; (ii) species and populations; and (iii) genetic diversity

The first of seven focal areas of the 2010 framework is reducing the rate of biodiversity loss at ecosystem, species and genetic levels, with corresponding indicators established on trends within each of these levels. Indicators under this focal area also include trends in protected area coverage and status of threatened species.

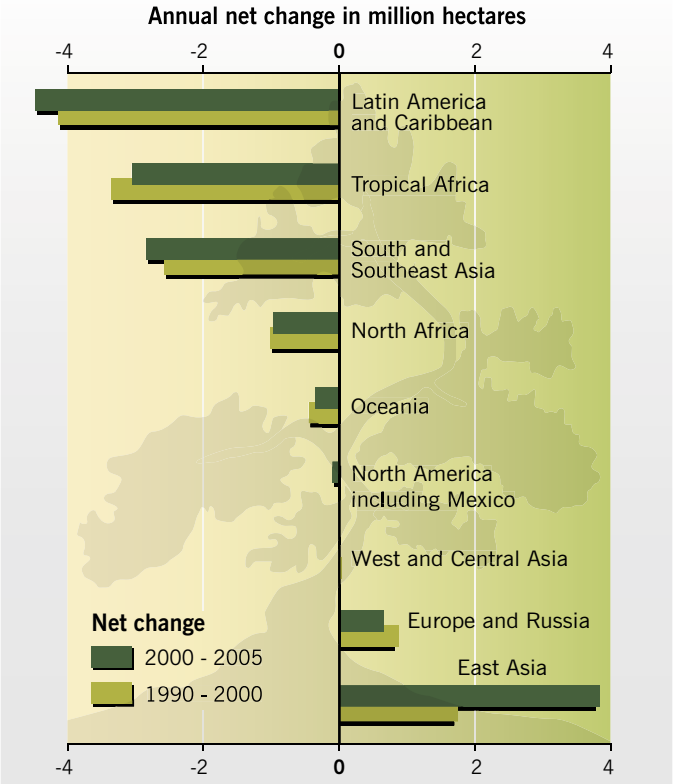
HEADLINE INDICATOR
Trends in extent of selected biomes, ecosystems and habitats

Ecosystems are dynamic and complex assemblages of organisms that interact with each other and with the physical environment. Conversion, degradation, or the unsustainable management of a natural ecosystem has far-reaching consequences: it results in a change of the relative abundance of individual species, and frequently the loss of populations, and also in the reduction or loss of ecosystem services. Over the last 50 years, humans have changed ecosystems more rapidly and extensively than in any comparable period of time in human history. Reducing the rate at which ecosystems are being degraded or lost is therefore a key contribution towards the achievement of the 2010 Biodiversity Target.

For most of the world's main habitats and ecosystems, neither the current global extent nor rates of change in that extent are known with high certainty. This is due in part to the challenges of measuring global habitat extent, differences in definitions and classification systems and the lack of historical data. The exception is forests, many of which have direct commercial and/or scientific value, and are therefore regularly inventoried and assessed in most countries. Even here, however, there are limitations in analyses to date that make it difficult to assess, for example, changes in primary forests.

In the absence of human influence, forests and woodlands covered approximately half of the Earth's land surface. However, thousands of years of human activity have reduced their extent to about 30% of total land area. Of this area only one-third is considered primary forest—forest of native species where ecological processes are not significantly disturbed by human activities. Deforestation, mainly conversion of forests to agricultural land and pasture, continues at an alarmingly high rate: about 13 million hectares—equivalent to the area of Greece or Nicaragua—are lost each year. At the same time, tree planting, landscape restoration and natural expansion of forests have significantly offset the loss of primary forest area. It should be borne in mind, however, that the biodiversity value of forest plantations and secondary forests is generally much lower than that of forests. Figure 2.1 presents the trends in net forest area by region. The net loss in forest area in the period 2000–2005 is estimated at 7.3 million hectares per year, equivalent to an annual loss of 0.18% of net forest area. This compares to 8.9 million hectares (0.22%) per year from the period 1990 to 2000. Over the last 15 years, primary forest has been lost or modified at a rate of approximately six million hectares a year.

FIGURE 2.1 | Annual net change in forest area by region (1990–2005)



Forest area includes primary forests, modified natural forests, semi-natural forests, productive forest plantations and protective forest plantations. Net change in forest area takes into account afforestation efforts and natural expansion of forests.

Source: Food and Agriculture Organization of the United Nations.[1]

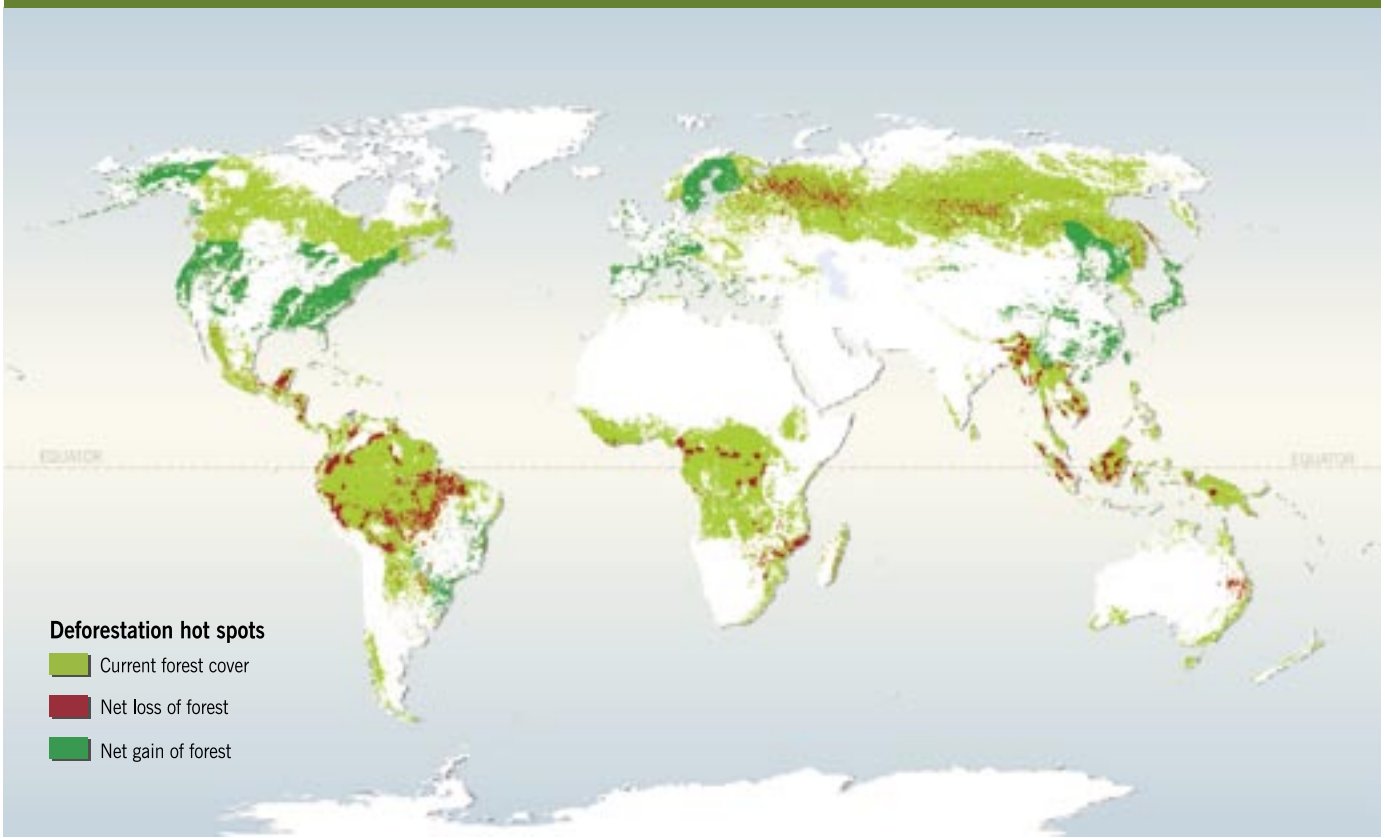
Africa and South America continue to have the largest net loss of forests. Oceania and North and Central America also show a net loss of forests. The forest area in Europe continued to expand, although at a slower rate. Asia, which had a net loss in the 1990s, reported a net gain of forests in the period 2000–2005, primarily due to large-scale afforestation reported by China. There is recent evidence, however, of increases in the frequency and extent of natural disturbances (fire, insect outbreaks and disease) in boreal forests, which negatively affect forest cover in those ecosystems.

Achievement of the 2010 Biodiversity Target requires a significant reduction in the current rate of reduction of the extent of ecosystems. With regard to forests, a 20% reduction in the current rate of net loss of forest extent (7.3 million ha/yr lost between 2000 and 2005) would require limiting forest loss to 5.84 million ha/yr by 2010, while a 50% reduction would mean no more than 3.65 million ha/yr of forest loss. At the same time, efforts would need to focus on conserving natural forest area, rather than replacing natural forests with plantations of low biodiversity value.

On the basis of various studies from the period of 1980 to 2000, the Millennium Ecosystem Assessment prepared a map showing the areas undergoing high rates of change in forest cover (Figure 2.2)

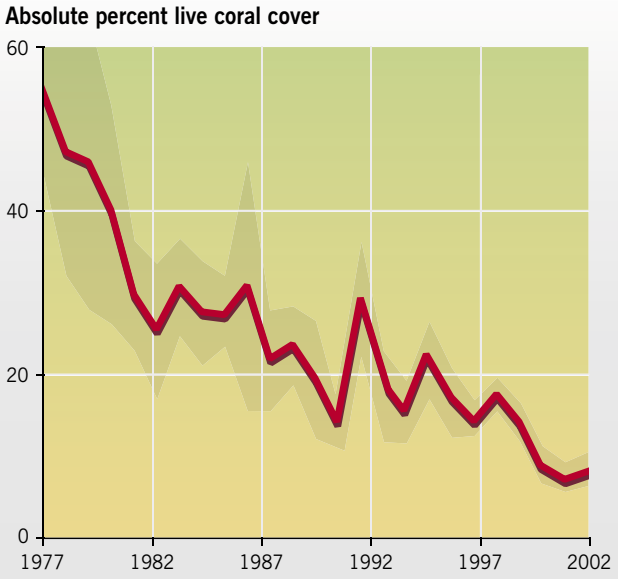
General patterns of change in the extent of ecosystems across other biomes besides forests show similar negative trends. The Millennium Ecosystem Assessment reported that almost 70% of Mediterranean forests, woodlands and scrub, 50% of tropical and sub-tropical grasslands, savannas and shrublands and 30% of desert ecosystems had been lost by 1990. Coastal and marine ecosystems have been heavily impacted by human activities, with degradation leading to a reduced coverage of kelp forests, seagrasses and corals. In the Caribbean, average hard coral cover declined from about 50% to 10% in the last three decades, equivalent to a loss of almost

FIGURE 2.2 | Locations reported by various studies as undergoing high rates of change in forest cover in the past few decades



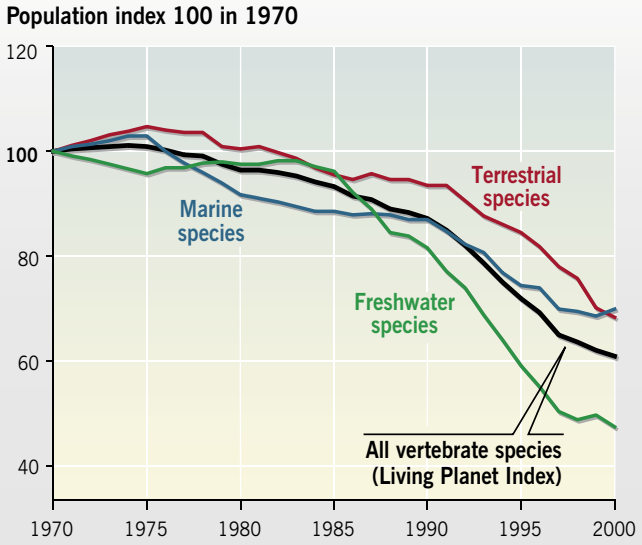
Source: Millennium Ecosystem Assessment [2]

FIGURE 2.3 | Change in live coral cover across the Caribbean basin (1977–2002)



Source: Gardner et al. 2003[3]

FIGURE 2.4 | The Living Planet Index: trends in populations of terrestrial, freshwater, and marine species worldwide



Source: World Wide Fund for Nature and UNEP World Conservation Monitoring Centre[4]

7% of remaining area covered by live coral each year since the 1970s (Figure 2.3). Some 35% of mangroves have been lost in the last two decades in countries for which adequate data are available. This is equivalent to an annual loss of 2% of the remaining area.

There has been a widespread retreat of mountain glaciers in non-polar regions during the 20th century, and decreases of about 10% in the extent of snow cover since the late 1960s. In the Arctic the average annual sea ice extent has declined by about 8% in the past 30 years, with a loss of 15 to 20% in summer sea ice extent over the same period.

HEADLINE INDICATOR

Trends in abundance and distribution of selected species

Species population trend indices are valuable tools for monitoring and communicating biodiversity change at global, regional and (sub-) national scales, or within biogeographic units. They can also be applied to taxonomic groups (e.g., birds), habitat-dependent species (e.g., waterfowl) or species with particular ecological characteristics (e.g., migratory species).

Trends in abundance and distribution of selected species is an indicator of ecosystem quality and complements the foregoing measures of ecosystem extent. Other indicators such as *connectivity/fragmentation of ecosystems* are also relevant in providing information about the quality of ecosystems.

A number of assessments have revealed that, across a range of taxonomic groups, the population size and/or geographic range of the majority of species assessed is declining. Studies of amphibians globally, African mammals, birds in agricultural lands, British butterflies, Caribbean and Indo-pacific corals, and commonly harvested fish species show declines in the majority of these species. Exceptions include species that have been protected through specific measures, that have had their specific threats reduced, and those that tend to thrive in modified landscapes.

Based on published data from around the world, the Living Planet Index aggregates trends of some 3,000 wild populations of species. It shows a consistent decline in average species abundance of about 40% between 1970 and 2000; inland water species declined by 50%, while marine and terrestrial species both declined by around 30% (Figure 2.4).

Because of limitations in data availability, species-rich tropical areas (particularly forests) are underrepresented in the Living Planet Index, and the data are limited to vertebrates. Efforts are underway to expand the data set and to include information on the distribution of selected populations of plant species. According to this analysis, wild populations of

species declined by an aggregated average of about 1.7% per year between 1970 and 2000, with a particularly significant decline in the early 1990s.

Similar trends have been observed for abundant and widespread farmland and forest-dependent bird species throughout Europe (Figure 2.5). European farmland birds declined by about 1.4% per year between 1970 and 2000 with a particularly severe decline of over 3% per year in the late 1970s and 1980s and a stabilization of populations in the 1990s. European forest birds show some signs of recovery since 2000.

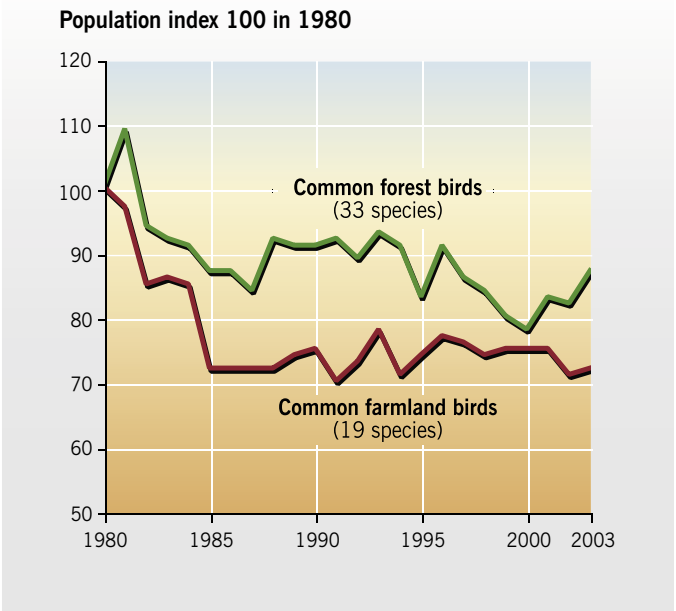
HEADLINE INDICATOR
Change in status of threatened species

Threatened species occur across all taxonomic groups and in all parts of the world. Over the past few hundred years, it is estimated that humans have increased species extinction rates by as much as 1,000 times the background rates typical over Earth's history. Between 12% and 52% of species within well-studied higher taxa are threatened with extinction, according to the IUCN Red List of Threatened Species.

On the basis of Red List data, a Red List Index can be calculated for different taxonomic groups or geographic regions to show trends in the proportion of species expected to remain extant in the near future without additional conservation interventions. The index is based on the number of species present in each Red List category, and on the number that change categories over time (i.e., between assessments), as a result of genuine improvement or deterioration in status. This index shows a continuing deterioration in the status of bird species, which have been completely assessed for the IUCN Red List four times over the last two decades, across all biomes (Figure 2.6). Despite limitations in our knowledge about the total number of species and their status, preliminary findings for other major groups, such as amphibians and mammals, indicate that the situation is likely worse than for birds.

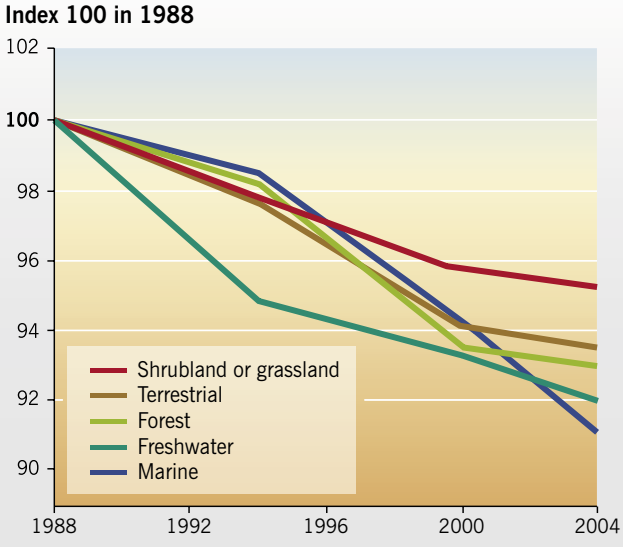
The Red List Index is highly representative, being based on assessments of a high proportion of species in a taxonomic group across the world, but it shows a coarse level of resolution because of the width of the Red List categories. Some of the Red List criteria are based on absolute population size or range size, while others are based on rates of decline in these values or combinations of absolute size and rates of

FIGURE 2.5 | Trends in European common birds in farmland and forest habitats



Source: European Bird Census Council, Royal Society for the Protection of Birds, BirdLife International and Statistics Netherlands[5]

FIGURE 2.6 | Red List Index for birds in marine, freshwater and terrestrial ecosystems, and in forest and shrubland / grassland habitats (1988–2004)



Source: Butchart et al. 2005[6]

decline. Because the Red List Index is based on a proportional change in a measure and its values relate to the rate at which species are slipping towards extinction at particular points in time, a downward trend, even if becoming less steep, shows that the slide of the species towards extinction is accelerating, rather than slowing down. The 2010 Biodiversity Target would therefore only be met when a positive trend is achieved.

HEADLINE INDICATOR

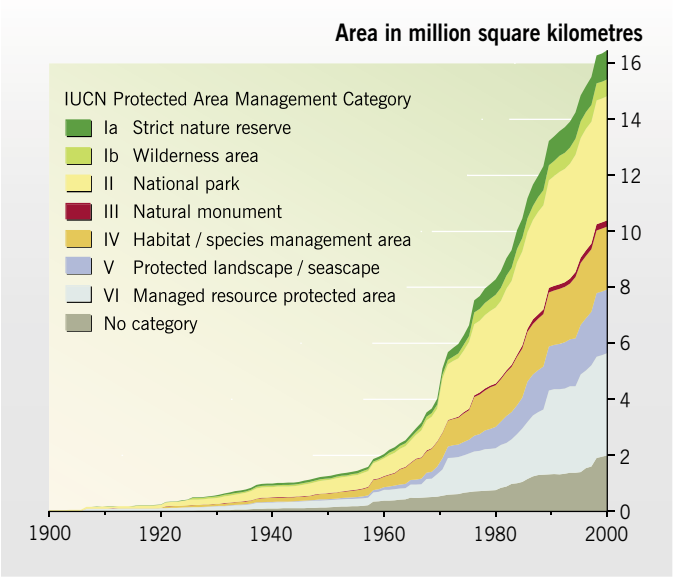
Trends in genetic diversity of domesticated animals, cultivated plants, and fish species of major socio-economic importance

From a human perspective, genetic diversity is of particular importance in cultivated and domesticated species. Only a relatively small number of species are used in this way: a few dozen domesticated animals, a few hundred crop plants (if ornamental plants are excluded), and a few dozen major plantation timber species.

An analysis of trends in the varieties of species that underpin human livelihood, while sketchy, provides an alarming picture. Genetic variation is important for maintaining fitness and adaptability of species, and of direct importance for people through the maintenance of goods and services provided by cultivated and domesticated species: high yields, disease resistance and resilience to changing environmental conditions. Human well-being, particularly food security, depends at present on a small group of crops and domestic animals; failure of one individual crop can have far-reaching consequences. Loss of genetic diversity through the disappearance of locally adapted varieties and land-races of crops and livestock breeds is widely reported but difficult to quantify. It has been estimated that one third of the 6,500 recognized domesticated animal breeds are currently threatened with extinction.

Beyond cultivated systems, over-exploitation of wild harvested species, including several marine fish species, has led to decline of population size and distribution and as a consequence has contributed to the loss of genetic diversity. Selective trophy hunting of game and selective removal of valuable timber trees can change the genetic profile of the remaining populations. More generally, loss of genetic diversity is associated with the decline in population abundance and distribution that result from habitat destruction and fragmentation.

FIGURE 2.7 | Trends in terrestrial surface under protected areas



Source: UNEP World Conservation Monitoring Centre, World Database on Protected Areas[7]

HEADLINE INDICATOR

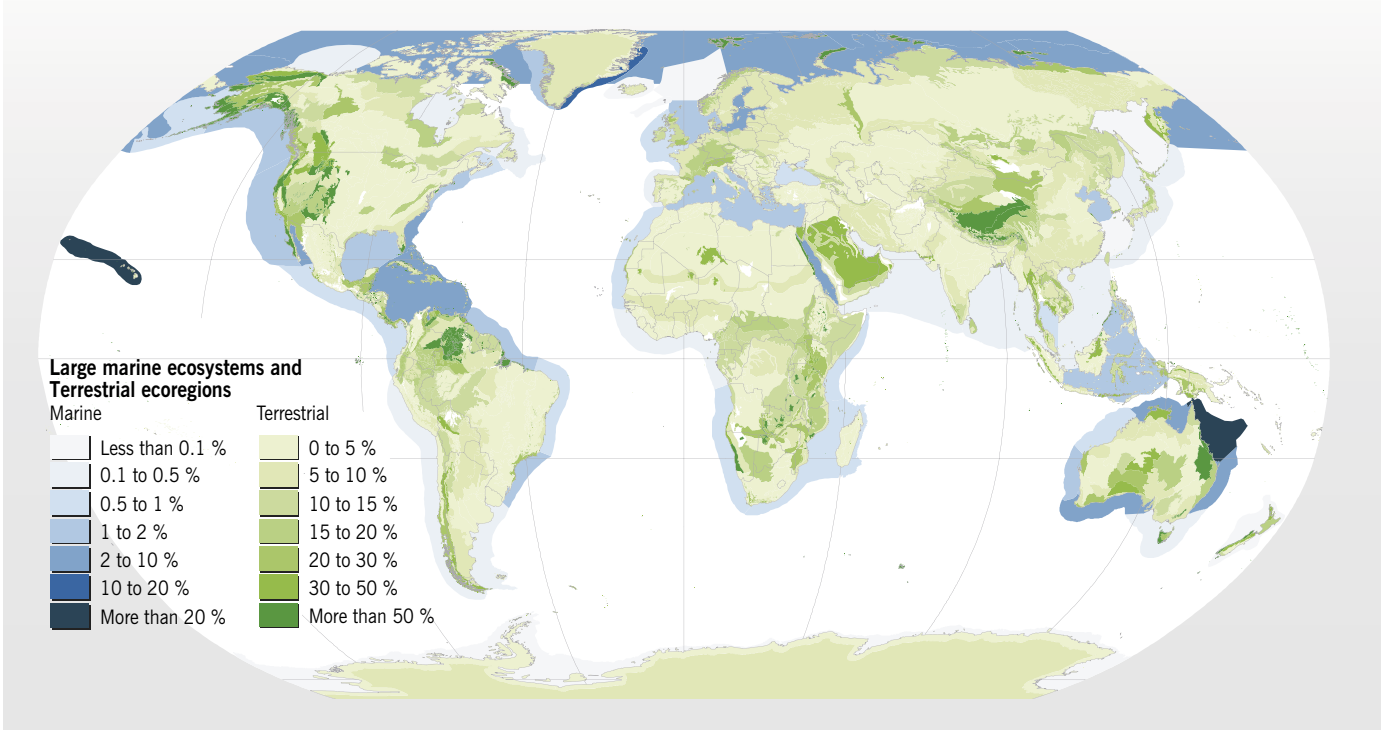
Coverage of protected areas

A key tool to counter the continuing loss of ecosystems and species is the establishment of protected areas. Protected areas currently cover about 12% of the Earth's land surface, constituting one of the largest planned changes of land use. Of more than 105,000 protected areas listed in the World Database on Protected Areas about 60% have a known date of establishment. Figure 2.7 presents the trends in surface under protection by IUCN Protected Area Management Categories. About 12% of the area under protection has not been assigned a Protected Area Management Category. Among all categories, National Parks (category II) and Managed Resource Protected Area (category VI) show a particularly high increase in recent decades.

Moreover, there are substantial differences in coverage between different biomes, ecosystems and habitats. Only 5% of the world's temperate needle-leaf forests and woodlands, 4.4% of temperate grasslands and 2.2% of lake systems are protected. Moreover, marine coverage lags far behind terrestrial coverage, with approximately 0.6% of the ocean's surface area and about 1.4% of the coastal shelf areas protected.

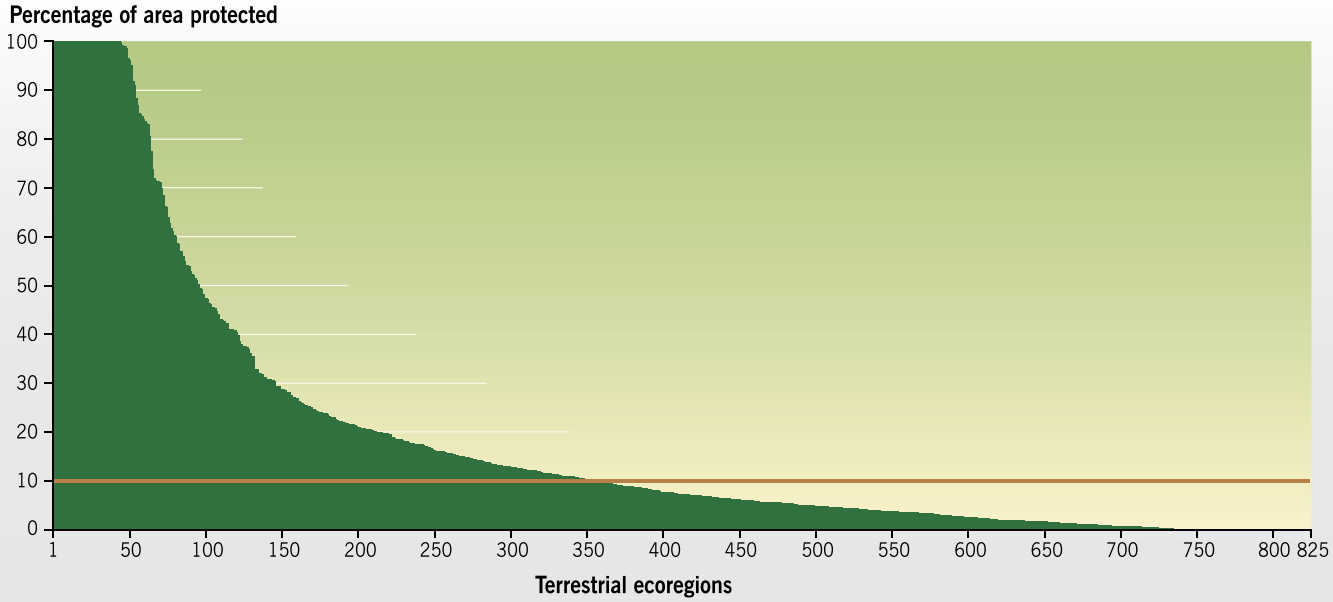
A more detailed analysis of the 825 terrestrial ecoregions and 64 large marine ecosystems shows that for a large percentage of these ecosystems, which are characterized by distinct populations of species,

FIGURE 2.8 | Degree of protection of terrestrial ecoregions and large marine ecosystems (all IUCN Protected Area Management Categories combined)



Source: UNEP-WCMC and World Database on Protected Areas for terrestrial ecoregions as identified by the World Wide Fund for Nature (WWF); Sea Around Us Project, University of British Columbia Fisheries Centre, in collaboration with WWF and UNEP-WCMC for large marine ecosystems[8]

FIGURE 2.9 | Frequency distribution of terrestrial ecoregions by percentage surface area under protection



Source: UNEP-WCMC and World Database on Protected Areas, using World Wide Fund for Nature ecoregions[9]

the target of 10% protected area coverage is yet to be achieved (Figure 2.8).

In Figure 2.9 terrestrial ecoregions are ordered by percentage under protection. While over 5% of ecoregions are completely protected, in three out of five ecoregions less than 10% of the surface is protected. In 140 ecoregions, equivalent to 17% of all ecoregions, less than 1% of the surface is designated as a protected area.

However, the growth in number and area of protected areas is a fairly crude indicator in itself, and needs to be complemented by further information on the level of protection afforded to biodiversity and the effectiveness of management. Various methodologies are being used to measure effectiveness of protected area management and are contributing enormously to an understanding of the role of protected areas in reducing the rate of loss of biodiversity but systematic data are not yet available.

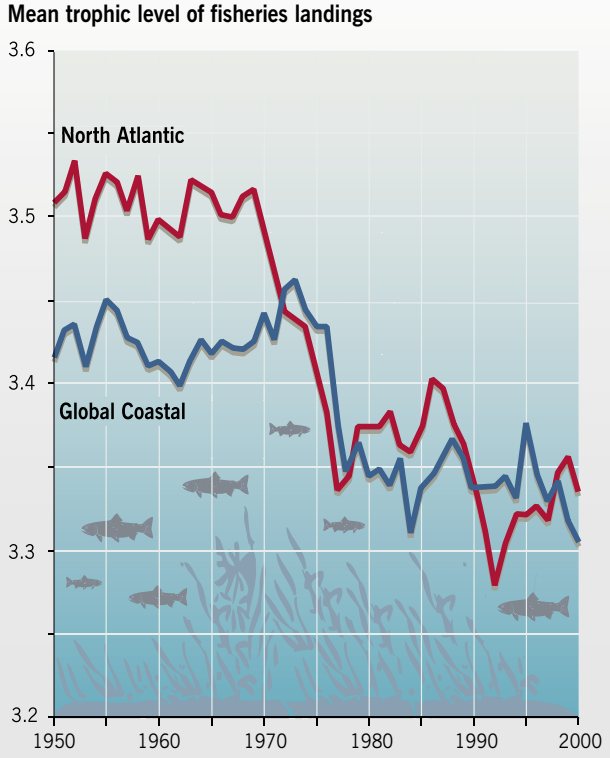
FOCAL AREA | Maintaining ecosystem integrity, and the provision of goods and services provided by biodiversity in ecosystems, in support of human well-being

Closely related to the assessment of biodiversity components is that of the integrity of ecosystems and their ability to support human livelihoods. The Millennium Ecosystem Assessment has placed particular emphasis on ecosystem goods and services because these provide the basis for human well-being and the ultimate rationale for maintaining ecosystem health. Although the framework for assessing progress towards the 2010 target includes several indicators that link the integrity of ecosystems to human well-being, only a few have suitably developed methodologies and comprehensive global data to allow for their present use.

HEADLINE INDICATOR
Marine Trophic Index

Oceans cover over 70% of the globe. The primary source of food from the oceans is from capture fisheries. Preferred fish catches consist of large, high value, predatory fishes, such as tuna, cod, sea-bass and swordfishes. The intensification of fishing has led to the decline in these large fishes, which are high up in the food chain (e.g., in the North Atlantic, large fish have declined by two-thirds in the last 50 years). As predators are removed, the relative number of small fish and invertebrates lower on the food chain increases, and the mean trophic level (i.e., the mean position of the catch in the food chain) of fisheries landings, declines. Mean trophic levels, upon which the Marine Trophic Index is based, have consequently declined globally at a rate of approximately 0.1 per decade from the 1970s, when landings peaked and the Marine Trophic Index averaged over 4 in many areas, to approximately 3.5 at the present time. In the North Atlantic the Marine Trophic Index peaked earlier in the 1960s and the decline was more rapid (Figure 2.10). From an average of over 4 historically, the Marine Trophic Index has declined If the global decline in trophic levels continues at this rate, the preferred fish for human consumption (which are between trophic levels of 4 and 3) will become increasingly rare, forcing a shift in fisheries and human consumption patterns to smaller fish and invertebrates. In addition, the resulting shortened food chains leave marine ecosystems increasingly vulnerable to natural-

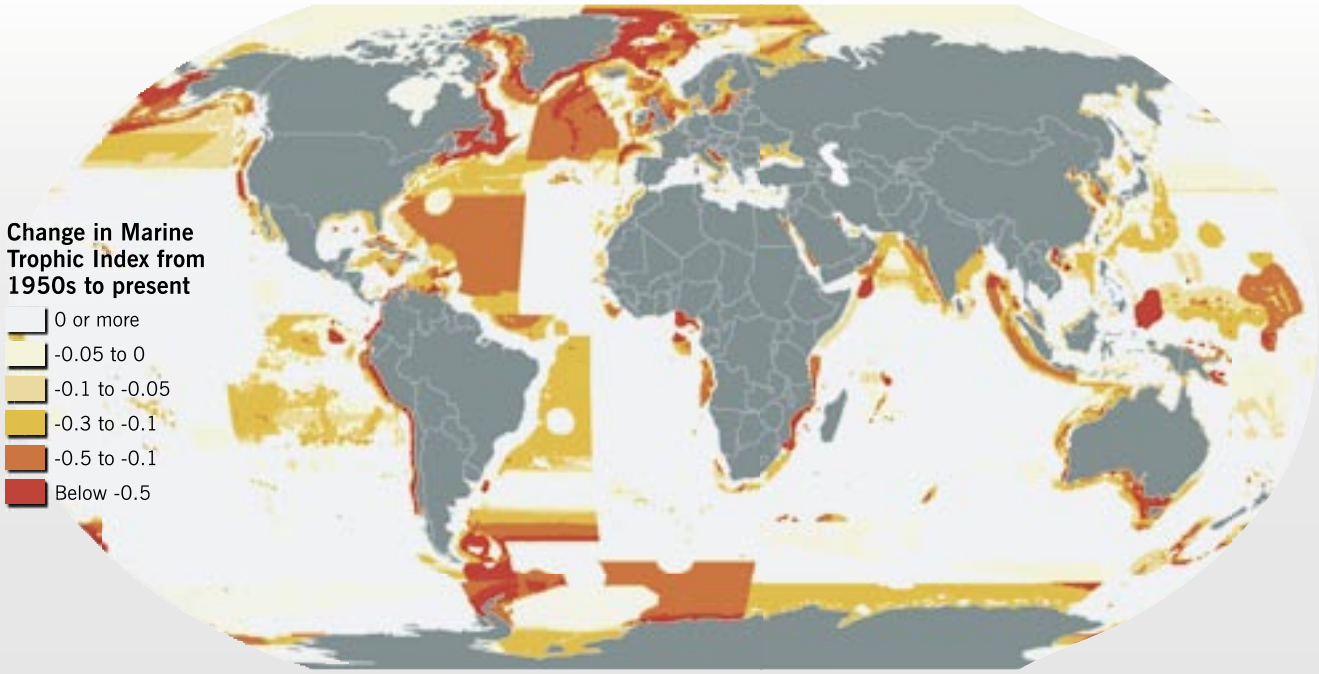
FIGURE 2.10 | Trends in mean trophic levels of fisheries landings (1950–2000)



Based on aggregation of data from over 180,000 half-degree latitude/longitude cells. Data for the North Atlantic are shown in red and for coastal waters in blue. Note: strong decline, particularly in the North Atlantic.

Source: Pauly and Watson 2005[10]

FIGURE 2.11 | Changes in the Marine Trophic Index (early 1950s to the present)



The dark red colouring represents areas of greatest change in the marine trophic index.
Note: The straight borders between colours represent artefacts of the underlying statistics.

Source: Watson et al. 2004[11]

and human-induced stresses, and reduce the overall supply of fish for human consumption.

The Marine Trophic Index can be calculated from existing fish catch data and is therefore a widely applicable indicator of both ecosystem integrity and the sustainable use of living resources. Changes in the Marine Trophic Index have also been mapped (Figure 2.11).

Since 1970, when landings and the Marine Trophic Index peaked, the Index has decreased by an average of 0.005 per year in coastal waters, and by 1.5 times that amount in the North Atlantic. If action were taken to better manage fisheries, declines in the Marine Trophic Index could be halted, as seen in Alaska, where the Index has stabilized with the sound management of most Alaskan fish stocks.

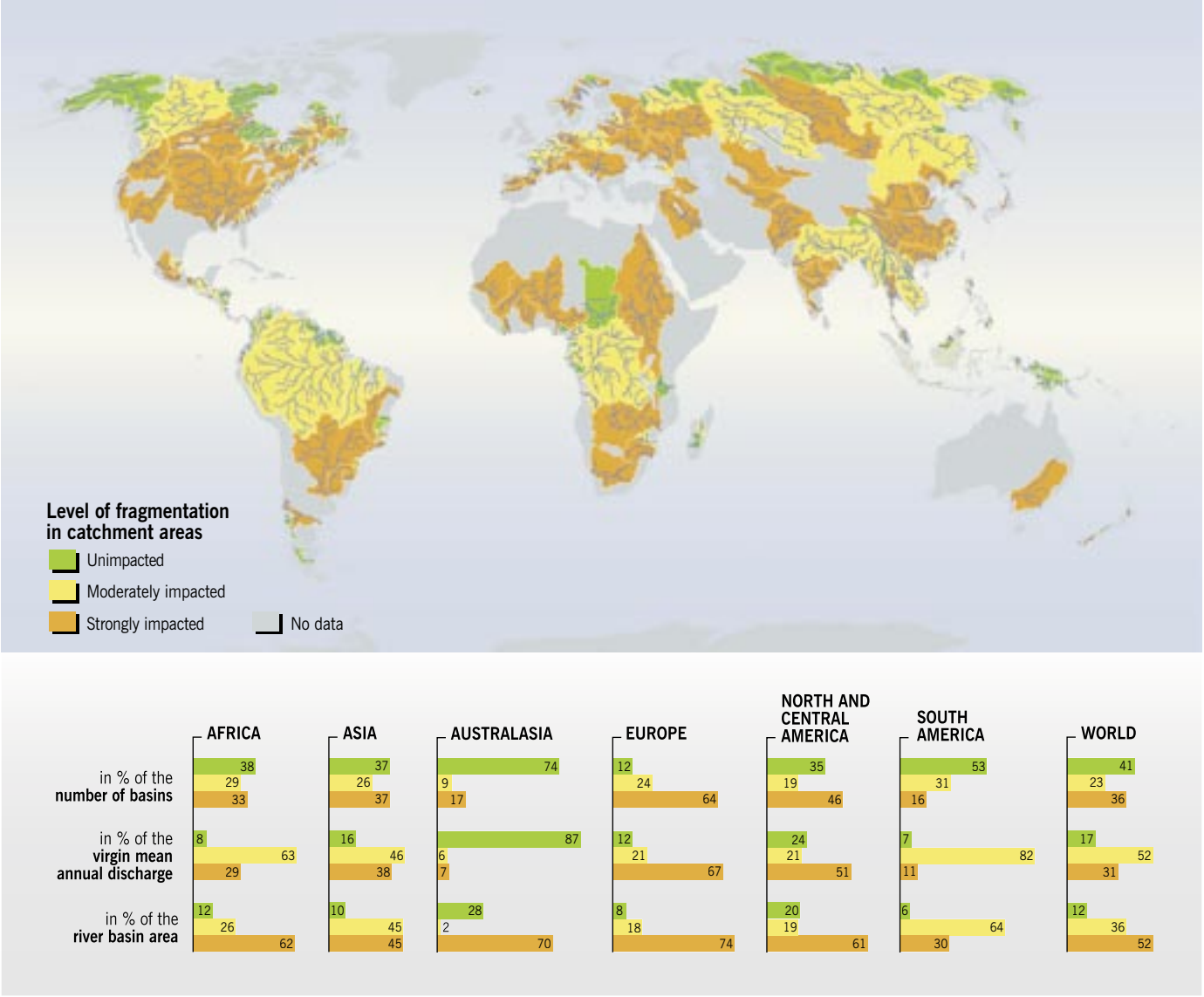
Despite increasing fishing efforts, as evidenced by the increase in average fishing depth from 170 m in 1950 to about 280 m in 2000, landings of marine catch decreased throughout the 1990s.

HEADLINE INDICATOR
Connectivity/fragmentation of ecosystems

In terrestrial and inland water ecosystems, human activities often lead to the fragmentation of habitats. Previously contiguous areas are divided into a number of smaller patches that are much more vulnerable to outside influence than large ones and that support smaller populations of species, which are consequently more vulnerable to local extinction. Global information on the status of anthropogenic fragmentation is available for large river systems and forests.

In riverine systems, the creation of impoundments to form reservoirs, either for water storage or to generate hydroelectric power, have significant effects on the hydrology and water quality of the affected river system and its biodiversity, particularly that of migratory species. Catchment-scale impacts of dams on ecosystems stem from inundation, flow manipulation, and fragmentation. Known effects include the destruction of terrestrial ecosystems through inundation, greenhouse gas emission, sedimentation, an upsurge of nutrient release in new reservoirs, substantial changes in land-use patterns and an extensive modification of aquatic communities. A global overview of dam-based impacts assessed fragmentation and flow regulation in 292 large river systems representing 60% of the world's river runoff. Over half of the large river systems that were assessed are affected by dams, and more than one-third, representing more than 50% of

FIGURE 2.12 | Impact classification based on river channel fragmentation and water flow regulation by dams on 292 of the world's large river systems



Source: Nilsson et al. 2005[12]

the river basin area, are strongly affected by river fragmentation and flow regulation. Only 12% of the area is unaffected (Figure 2.12).

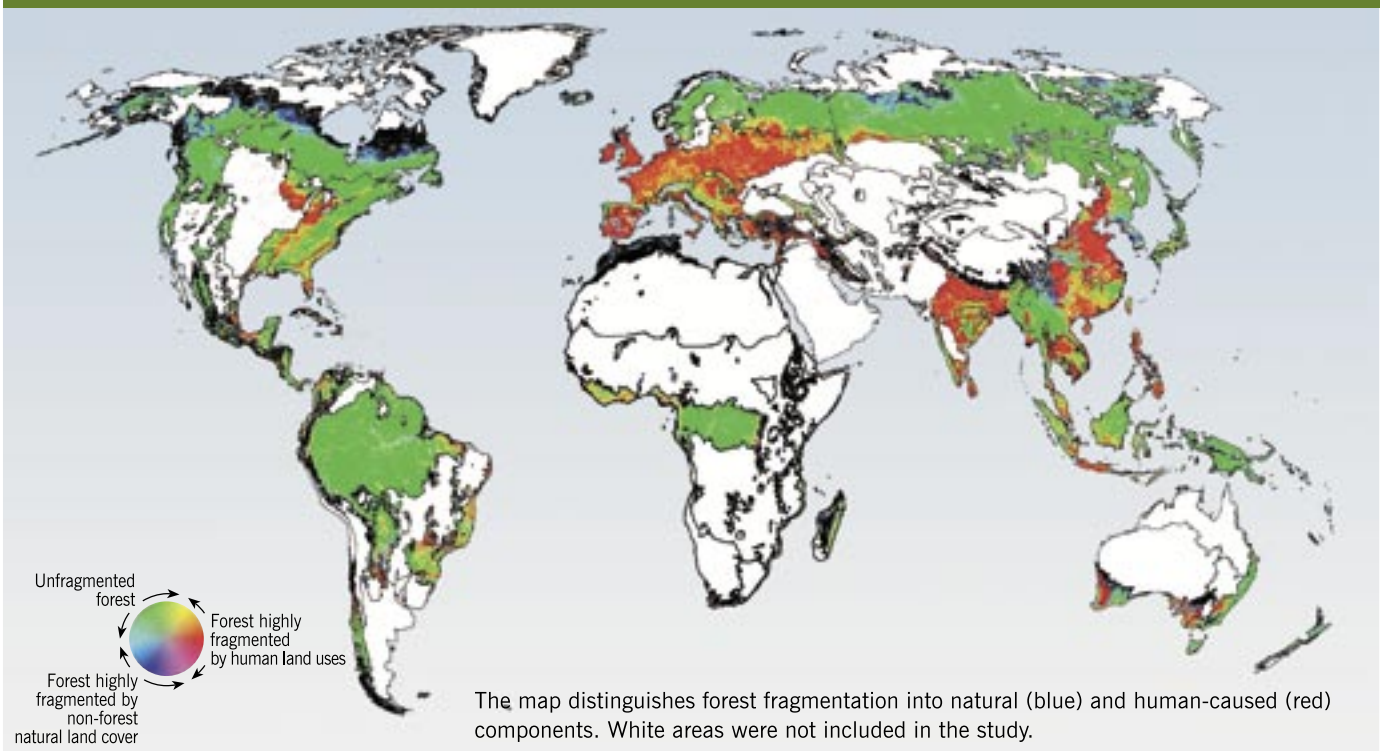
The great advances in remote sensing techniques in recent years make it much easier than before to monitor the degree of forest fragmentation. The size and connectivity of forests are important in determining the value of any given area of forest in maintaining biodiversity and in its capacity to deliver ecosystem goods and services. Fragmentation is associated with a decrease in patch size and increasing isolation between habitat patches. Also, the size of core areas decreases, and the size of edge areas increases. Figure 2.13 presents a global analysis of forest fragmentation caused by human influence. It shows highly fragmented forests in Europe and parts of Southeast Asia, whereas forests in other continents are less fragmented overall, or fragmentation is more localized.

HEADLINE INDICATOR

Water quality in aquatic ecosystems

Observations of physical, chemical and/or biological parameters over time indicate that the water quality of inland water bodies and their catchments has changed. The integrity of inland waters is affected by a series of

FIGURE 2.13 | Estimates of forest fragmentation due to anthropogenic causes



The map distinguishes forest fragmentation into natural (blue) and human-caused (red) components. White areas were not included in the study.

Source: Wade et al., 2003[13]

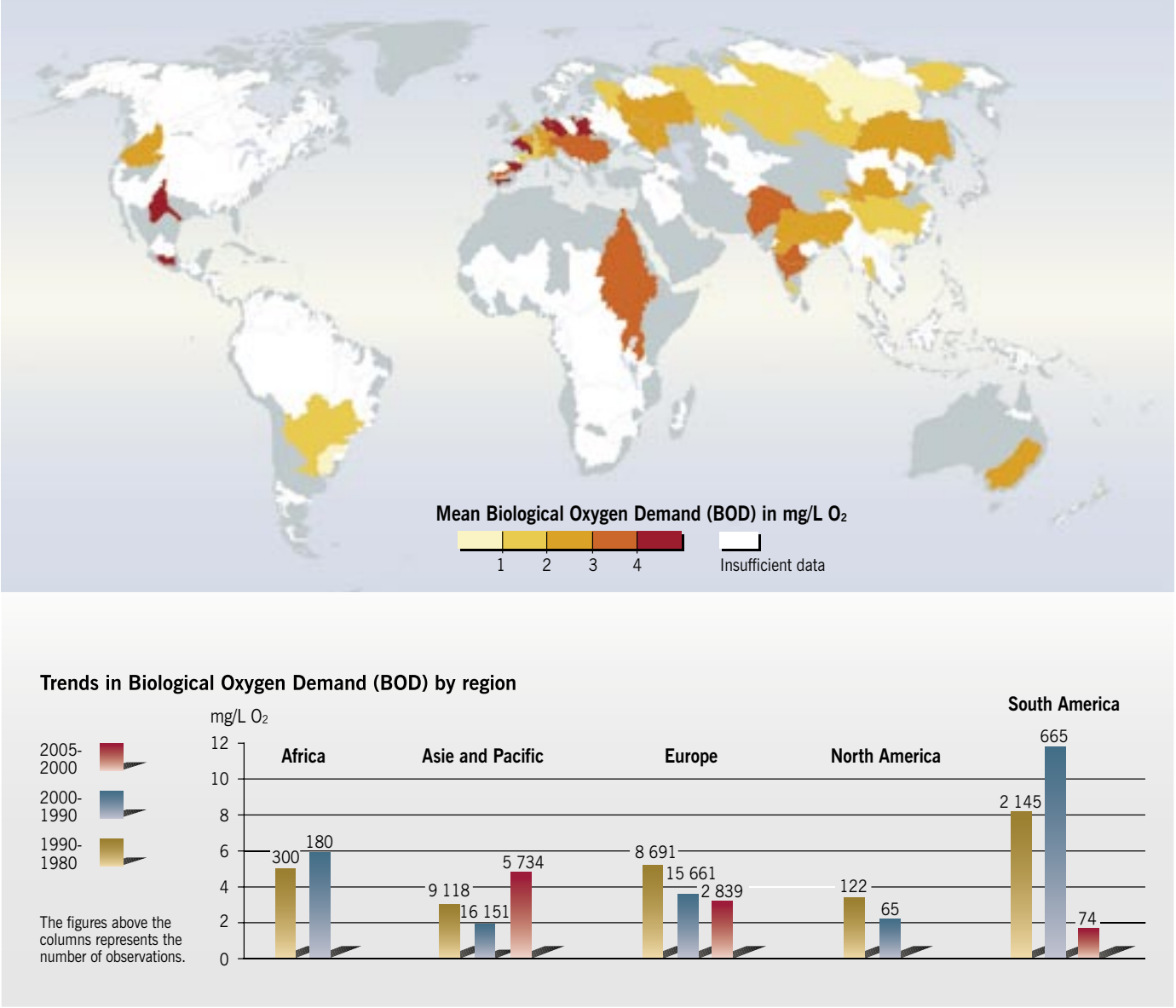
factors, in particular the extraction of fresh water for agricultural, industrial and human consumption, and the physical alteration of the ecosystem, for example through the diversion and canalization of watercourses, the creation of impoundments or drainage. Human activities are also impacting upon the quality of fresh water available, through pollution, increased sedimentation and climate change. Inorganic nitrogen pollution of inland waterways, for example, has more than doubled since 1960 and has increased tenfold in many industrial parts of the world.

Biological oxygen demand (BOD), an indicator of the organic pollution of freshwater, has been analysed over the last three decades using data from 528 stations in 51 countries. While water quality in rivers in Europe, North America, and Latin America and the Caribbean has improved since the 1980s, it has deteriorated over the same period in Africa and in the Asia and Pacific region. Mean BOD concentrations typical of moderately polluted waters (~ 5-7 mg/l) were documented in Europe and Africa in the 1980s and 1990s, but have improved in European rivers to levels typical of light pollution (~ 3-4 mg/l) since 2000 (Figure 2.14). BOD concentrations typical of unpolluted waters (~ 2 mg/l) were documented in North America and in the Asia and Pacific region in the 1990s and in Latin America and the Caribbean since 2000. Very high mean BOD concentrations in Latin America and the Caribbean in the 1990s reflect values observed at several stations that were near pollution point sources, and that were not monitored after 2000.

Many countries have stopped or reduced the monitoring of BOD in freshwater ecosystems in recent years. As such, comparatively few, or no, data were available to assess recent trends in BOD in some regions since 2000. Other water quality variables such as dissolved oxygen and inorganic nitrogen are therefore being evaluated for their utility as indicators of the state of freshwater ecosystems.

Water quality monitoring indicates both major direct threats to the sustainability of inland waters and the effects of unsustainable activities outside that ecosystem. In fact, the health and integrity of inland waters is an excellent indicator of the health of terrestrial ecosystems. It can also indicate the impact of responses to environmental problems, such as successful policy interventions leading to improved water quality. Improving water quality in all regions, both by reducing water pollution and by increasing efforts at water purification, appears to be a tangible, though challenging, contribution to the achievement of the 2010 Biodiversity Target.

FIGURE 2.14 | Status and trends in biological oxygen demand (BOD) of major rivers in five regions (1980–2005)



Source: UNEP-GEMS/Water Programme 2006[14]

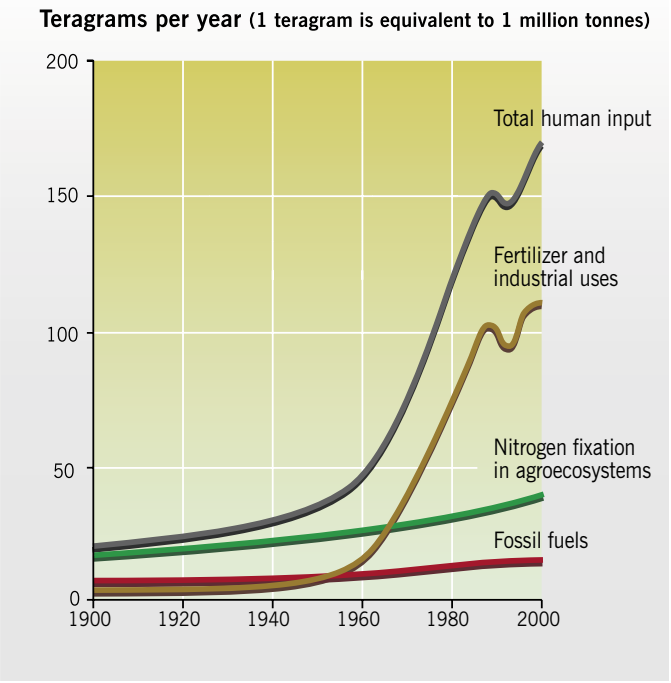
FOCAL AREA | Addressing the major threats to biodiversity, including those arising from invasive alien species, climate change, pollution, and habitat change

Five main threats to biodiversity are commonly recognized in the programmes of work of the Convention: invasive alien species, climate change, nutrient loading and pollution, habitat change, and overexploitation. Unless we successfully mitigate the impacts of these direct drivers of change on biodiversity, they will contribute to the loss of biodiversity components, negatively affect ecosystem integrity and hamper aspirations towards sustainable use.

In discussing threats to biodiversity it is important to keep in mind that, behind these direct drivers of biodiversity loss, there are a number of indirect drivers that interact in complex ways to cause human-induced changes in biodiversity. They include demographic, economic, socio-political, cultural, religious, scientific and technological factors, which influence human activities that directly impact on biodiversity.

Indicators for trends in nutrient loading and invasive alien species have been identified under the focal area addressed here, and are described below. Information on habitat change is provided by the indicator *trends in extent of selected biomes, ecosystems and*

FIGURE 2.15 | Global trends in the creation of reactive nitrogen on Earth by human activity



Source: Millennium Ecosystem Assessment[15]

habitats (see page 23). Overexploitation is discussed under the focal area on sustainable use (see page 36). While there is no single indicator of the impacts of climate change on biodiversity, a number of indicators, including those on *trends in extent of selected biomes, ecosystems and habitats* (particularly applied to coral reefs, polar ice and glaciers, and certain types of forests and drylands), *abundance and distribution of selected species* (see page 25), and *incidence of human-induced ecosystem failure*, can serve to derive trends where specific data are available. Because small, fragmented ecosystems are more affected by changes in temperature and humidity than large contiguous ecosystems with a more balanced micro-climate, trends in *connectivity/fragmentation of ecosystems* (see page 30) provide an indicator of the vulnerability of ecosystems to climate change.

HEADLINE INDICATOR
Nitrogen deposition

The ability of agriculture to produce far greater quantities of food and fibre than ever before can be attributed to a number of factors, including the availability of fertilizers on a commercial scale. However, excessive levels of the plant nutrients nitrogen and phosphorus in natural ecosystems are now causing concern. While reactive nitrogen occurs naturally in all ecosystems, the production of reactive nitrogen by humans, mostly from manufacturing synthetic fertilizer to increase agricultural production, has changed ecological balances, both locally and in far-distant ecosystems. Anthropogenic production of reactive nitrogen leads to the release of nitrogen compounds into the atmosphere, which are subsequently deposited onto the biosphere. Aerial deposition of nitrogen increases levels in ecosystems such that those slow-growing species that thrive in nitrogen-poor environments cannot compete with faster-growing species that depend on higher nutrient levels. Temperate grasslands are particularly vulnerable in this respect. Moreover, soluble nitrogen leaches from soils into groundwater, resulting in increased eutrophication—excess nutrients in inland and coastal waters that stimulate excessive plant growth—algal blooms and the creation of anoxic (oxygen-free) zones in inshore marine areas.

Anthropogenic sources of nitrogen—from the manufacturing of synthetic fertilizer, fossil fuel combustion and by nitrogen-fixing crops and trees in agroecosystems—now exceed natural terrestrial sources, such that more than half of all reactive nitrogen in ecosystems globally now comes from human sources. The rate of increase in the production of reactive nitrogen has accelerated sharply since 1960 (Figure 2.15).

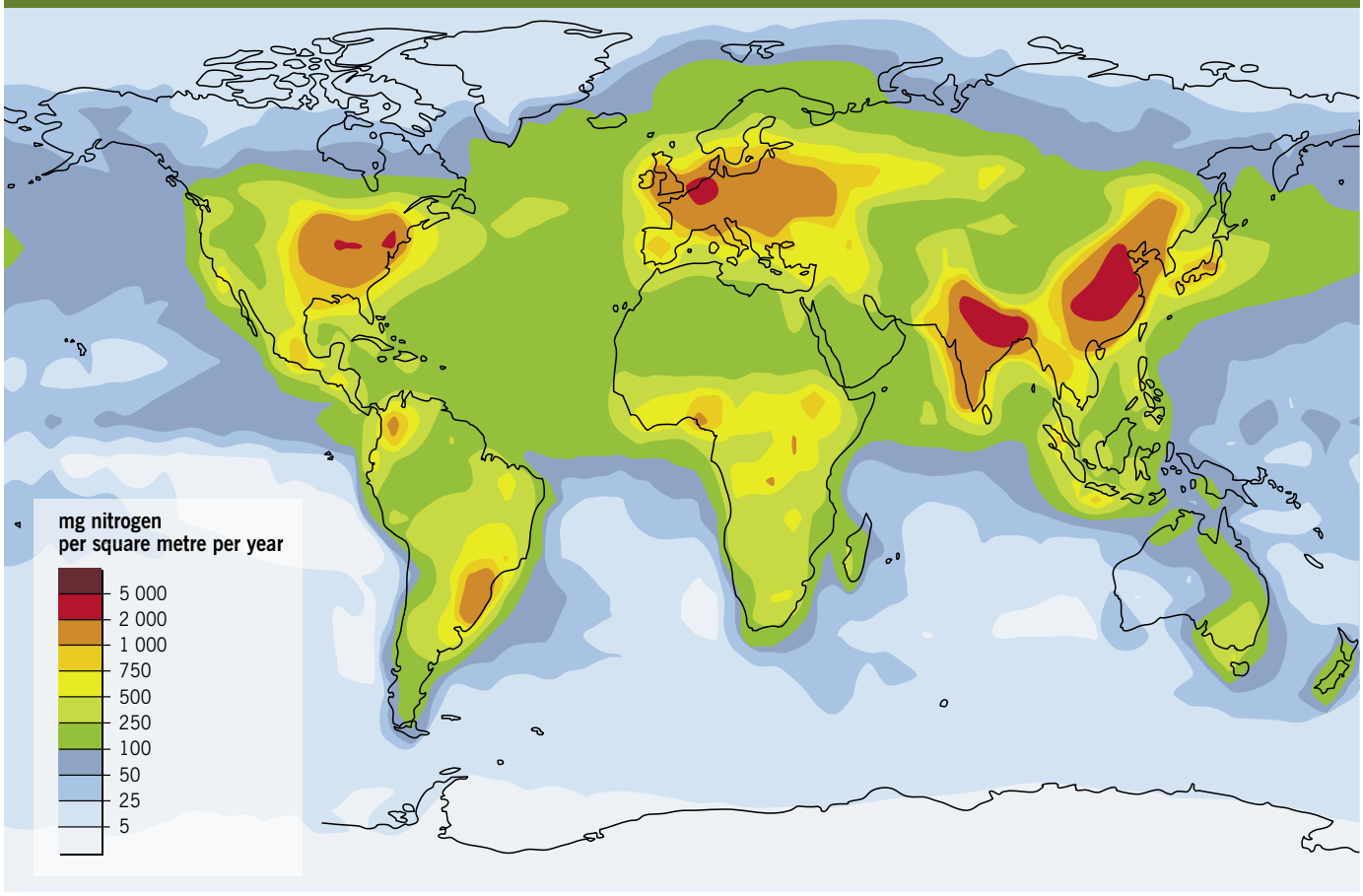
Atmospheric deposition currently accounts for about 12% of the reactive nitrogen entering terrestrial and coastal marine ecosystems globally, although in some regions, this percentage is much higher (Figure 2.16).

To continue to meet global demand for food and fibre and minimize environmental problems, significant improvements are required in the efficiency with which nitrogen fertilizer is utilized within production systems. A 20% increase in nitrogen-use efficiency in the world's cereal production systems would reduce the global production of reactive nitrogen by approximately 6% and lead to reduced expenditure for fertilizers equivalent to a value of about US$ 5 billion annually.

HEADLINE INDICATOR
Trends in invasive alien species

Invasive alien species can have devastating impacts on native biota, causing extinctions and affecting natural and cultivated ecosystems. Since the 17th century, invasive alien species have contributed to nearly

FIGURE 2.16 | Estimated total reactive nitrogen deposition from the atmosphere (wet and dry) (early 1990s)



Source: Galloway et al. 2004[16]

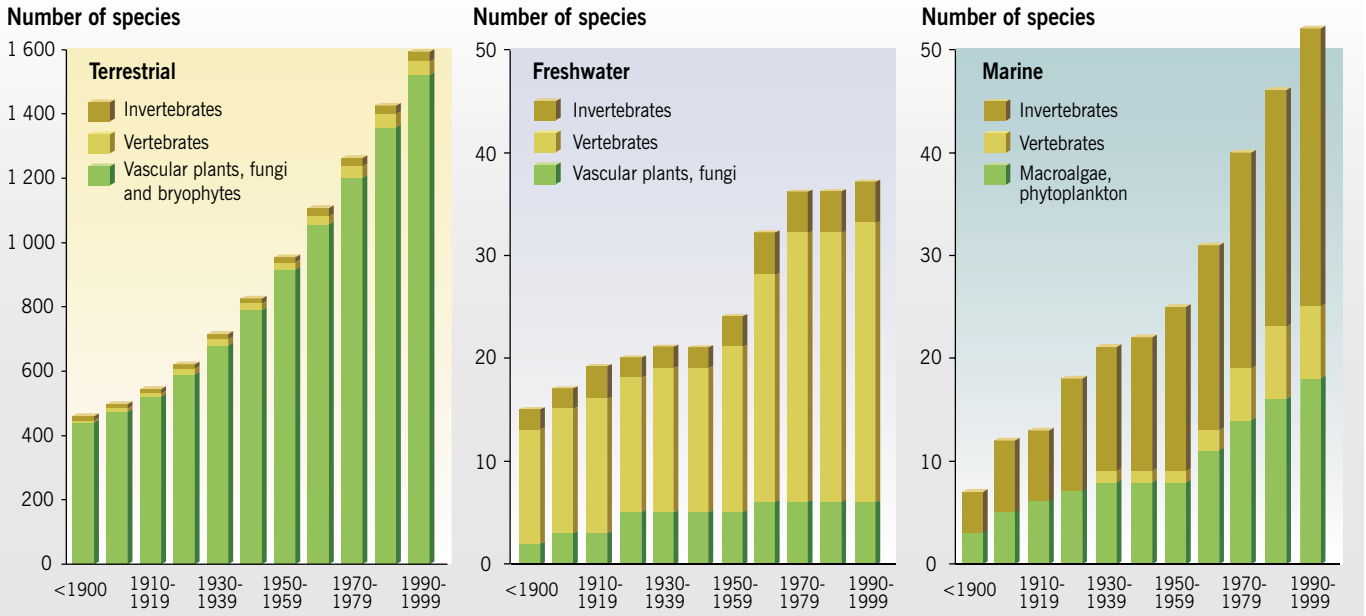
40% of all animal extinctions for which the cause is known. In the Fynbos biome of South Africa, 80% of the threatened species are endangered because of invading alien species.

A proportion of invasive alien species are important pests or pathogens that can cause enormous economic costs. The annual environmental losses caused by introduced pests in the United States, United Kingdom, Australia, South Africa, India and Brazil have been calculated at over US$ 100 billion. Invasive alien species can transform the structure and species composition of ecosystems by repressing or excluding native species. Because invasive species are often one of a whole suite of factors affecting particular sites or ecosystems, it is not always easy to determine the proportion of the impact that can be attributed to them. In the recent past, the rate and risk associated with alien species introductions have increased significantly because human population growth and human activities altering the environment have escalated rapidly, combined with the higher likelihood of species being spread as a result of increased travel, trade and tourism.

A major source of marine introductions of alien species is hull fouling and the release of ballast water from ships, although other vectors, such as aquaculture and aquarium releases, are also important and less well regulated than ballast water. In the marine ecosystem, the movement of non-native species has been well studied. Of the 150 species that have recently arrived in the Great Lakes, 75% originated from the Baltic Sea. Similarly, migration flow from the Red Sea to the Mediterranean through the Suez Canal continues unabated with nearly 300 species of these Lessepsian migrants, including decapod crustaceans, molluscs and fishes, having entered the Mediterranean since 1891.

Equally long-term data available from five Nordic countries (Iceland, Denmark, Norway, Sweden and Finland) that have recorded the cumulative number of alien species in freshwater, marine and terrestrial environments since 1900 demonstrate the continuing

FIGURE 2.17 | Number of alien species recorded in the Nordic terrestrial, freshwater and marine environment



Source: Nordic/Baltic Network on Invasive Alien Species (NOBANIS)[17]

arrival of new immigrants of plants, vertebrates and invertebrates (Figure 2.17).

Invasive alien species are a global problem requiring responses at all levels. Many countries have established systems to prevent and control invasive alien species and, as part of risk assessments, to predict the likelihood of alien species becoming invasive and the potential ecological and economic cost they may incur. To effectively communicate the challenges posed by invasive alien species there is a need to develop a methodology for integrating information quantifying the threat and its impacts on biodiversity into a coherent indicator.

FOCAL AREA | Promoting sustainable use of biodiversity

One of the most important ways of trying to maintain ecosystem goods and services for future generations is to ensure that components of biodiversity are used sustainably. The focal area on sustainable use, corresponding to the second objective of the Convention, assesses harvesting and consumption pressure in systems where the primary purpose is production, be it for forest resources, agriculture (including horticulture), grazing, or fisheries (including aquaculture and mariculture). Clearly, there is an overlap between the concepts of conservation and sustainable use, because production and harvesting take place in almost all ecosystems, including in many areas in which conservation is the primary management objective. Accordingly, some indicators of ecosystem integrity, in particular the Marine Trophic Index, are also good indicators of sustainable use.

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 analyses may be carried out reasonably easily in simple systems, such as a few high-latitude fisheries or low-diversity boreal forests, but are much more difficult in more complex systems, such as tropical forests or most tropical and subtropical capture fisheries.

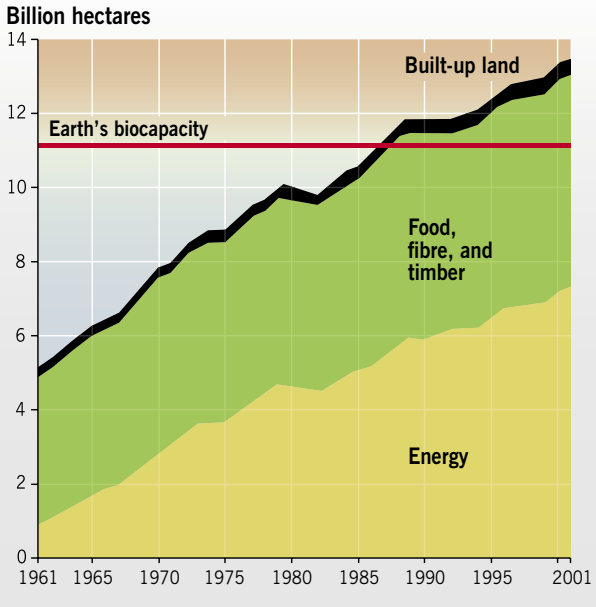
HEADLINE INDICATOR

Area of forest, agricultural and aquaculture ecosystems under sustainable management

One of the headline indicators for assessing the sustainability of human use of biodiversity focuses on the proportion of area of forest, agricultural and aquaculture ecosystems under sustainable management. Global figures for such an indicator are currently not available. In 2000, however, 93 countries provided

Fishermen at conveyor after emptying fish from drag net, New England (United States of America)
Jeffrey L. Rotman/Alpha Presse

FIGURE 2.18 | Global Ecological Footprint



Source: World Wide Fund for Nature, UNEP World Conservation Monitoring Centre, Global Footprint Network 2004[18]

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%.

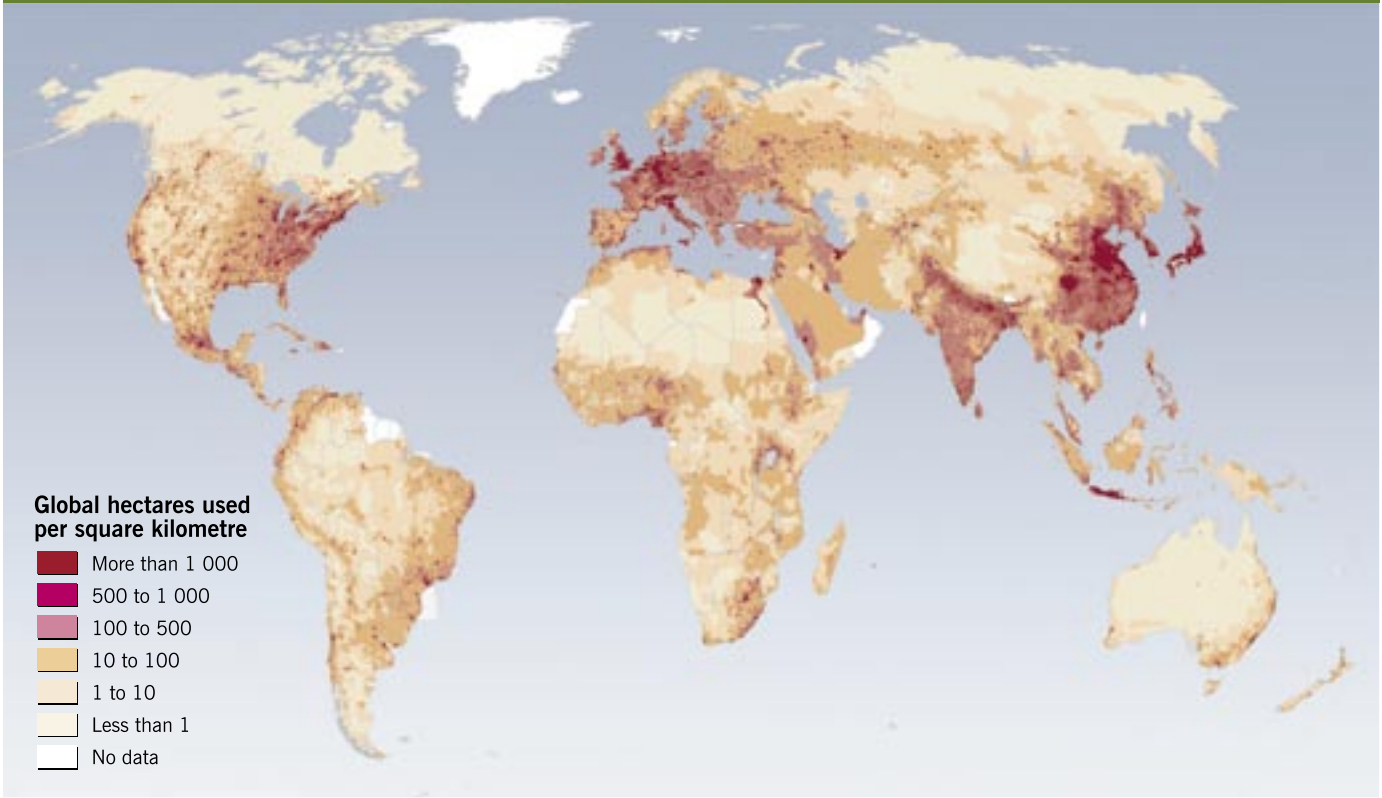
Another possible measure for assessing sustainable use corresponds to the proportion of production lands that have been certified as meeting certain criteria for sustainability. Such measures, however, are far from comprehensive. Forest areas certified for their sustainable management and recognized organic agricultural systems probably represent only a small proportion of the total area under production systems that, intentionally or unintentionally, meet such standards. Under the Forest Stewardship Council, for example, merely 1.5% of global forest cover is currently certified. Certification provides information about market demand and a measure of the degree of awareness about sustainable production but does not allow comprehensive statements about trends in sustainable use. Therefore, although figures on certified area and products show positive trends, these should not be interpreted as progress on sustainable use in general.

HEADLINE INDICATOR
Ecological footprint and related concepts

The ecological footprint is a widely known concept that aims to communicate unsustainable consumption. Using published statistics, it calculates the area of land and water needed to sustain a defined human population at a set material standard, based on the population's use of energy, food, water, building material and other consumables. Although the concept does not provide a comprehensive assessment of demands on nature, it is a useful accounting tool whose purpose is to demonstrate the effect of human consumption on the productive capacity of the Earth.

The Ecological Footprint has been calculated globally on the basis of United Nations statistics and other well-established data. Figure 2.18 shows the ratio between humanity's demand and the Earth's productive capacity, or biocapacity, in each year, and how this ratio has changed over time. Humanity has moved from using, in net terms, about half the planet's biocapacity in 1961 to 1.2 times the biocapacity of the Earth in 2001. The global demand for resources thus exceeds the biological capacity of the Earth to renew these resources by some 20%—in other words, it takes the biosphere one

FIGURE 2.19 | Intensity of ecological footprint



Source: World Wide Fund for Nature, UNEP World Conservation Monitoring Centre, Global Footprint Network 2004[19]

year and nearly three months to renew what humanity uses in one year. This "ecological deficit" or "overshoot" means ecosystem assets are being liquidated and wastes are accumulating in the biosphere, and the potential for future biocapacity is reduced. Overshoot is possible because, for example, forests can be cut faster than they grow, fish can be harvested faster than their natural replacement rate, water can be withdrawn faster than aquifers are replenished, and carbon dioxide (CO_2) emitted faster than it is sequestered.

Currently, two-thirds of the global ecological footprint is caused by the United States, members of the European Union, China, India and Japan. However, the per capita footprint is much greater in developed countries that in developing countries, including China and India. Figure 2.19 shows the global distribution of Ecological Footprint intensity.

To reduce biodiversity loss associated with the overuse of ecological services, humanity would need to reduce its ecological footprint by 2010. In the long run, humanity's footprint needs to be significantly lower than global biocapacity, in order to provide a biodiversity buffer.

FOCAL AREA | Protecting traditional knowledge, innovations and practices

HEADLINE INDICATOR
Status and trends of linguistic diversity and numbers of speakers of indigenous languages

The Convention gives special consideration to the role and needs of indigenous and local communities, and recognizes the value of traditional knowledge and management practices relevant to the conservation and sustainable use of biodiversity. The Convention also recognizes the possible merit of a wider application of such traditional knowledge, innovations and practices, pending approval of the holders. Recognizing the link between traditional knowledge and indigenous languages as a vehicle of transmission of such knowledge, a headline indicator on numbers of languages and of speakers of indigenous languages has been adopted. An analysis carried out by the United Nations Educational, Scientific and Cultural Organization (UNESCO) reveals that, although a number of

Medicinal herbs and plants, Sarawak, Malaysia
Nigel Dickinson / Alpha Presse

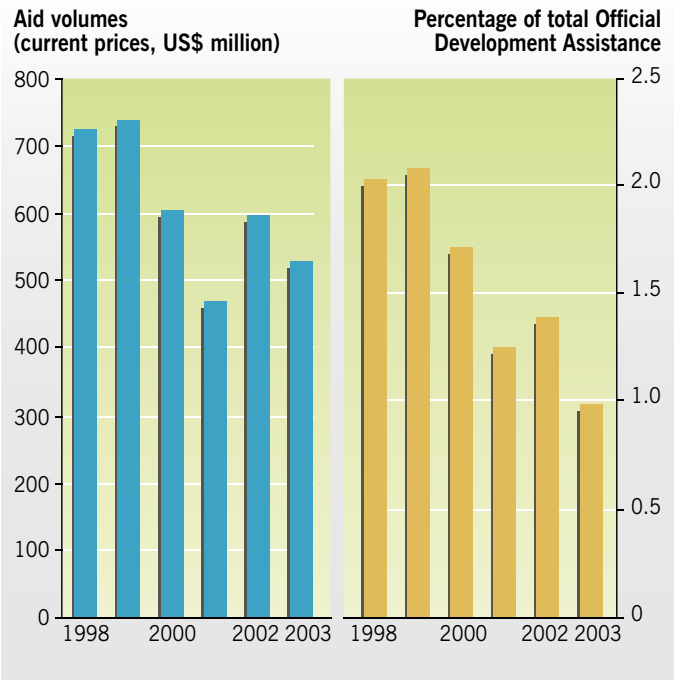
indigenous languages are believed to be threatened with extinction, it is difficult to obtain reliable and globally comparable statistics about trends of speakers of these languages. Moreover, in addition to the number of speakers of a language, a series of other factors should be taken into account to classify the extent to which a language is endangered.

UNESCO carried out a preliminary analysis of comparable assessments of numbers of speakers of indigenous languages, relying primarily on census data of countries in which censuses include information on language use. Information was obtained for just over 250 indigenous languages, for which comparable assessments had been done at two or more points in time. In the period between 1980 and 2003, the number of speakers of 149 indigenous languages had increased while 104 languages had lost speakers. Because the majority of these indigenous languages are only spoken by a small number of people there is great concern over the viability of these languages.

FOCAL AREA | Ensuring the fair and equitable sharing of benefits arising out of the use of genetic resources

The fair and equitable sharing of the benefits arising out of the utilization of genetic resources is one of three objectives of the Convention. These benefits would provide incentives to conserve and sustainably use biodiversity. Some countries have implemented legislation controlling access to genetic resources, and there are a number of cases of benefit-sharing arrangements. However, there is no reliable central depositary of information on national access and benefit-sharing measures. Benefit-sharing arrangements may involve some or all of the following: governments, local and indigenous communities, private companies, non-governmental organizations and scientific research institutes. As the Ad Hoc Open-ended Working Group on Access and Benefit-Sharing develops options for an International Regime on Access and Benefit-Sharing, it is also considering ways to assess the degree to which this objective is achieved.

FIGURE 2.20 | Aid activities targeting CBD objectives from 16 developed countries (1998-2003)



Source: OECD/DAC statistics on aid activities targeting the objectives of the Rio Convention, 31 October 2005, and USAID: USAID's Biodiversity Conservation Programs, Fiscal Year 2003, Washington, D.C., August 2004

FOCAL AREA | Mobilizing financial and technical resources, especially for developing countries, in particular, least developed countries and small island developing states among them, and countries with economies in transition, for implementing the Convention and the Strategic Plan

HEADLINE INDICATOR
Official development assistance provided in support of the Convention

Implementation of the Convention requires financial and technical resources. Parties to the Convention have agreed that developing countries require particular support to enable them to carry out measures required under the Convention. Besides the Financial Mechanism of the Convention, official development assistance—financial flows from developed countries—can be one component of assistance in the implementation of the Convention on Biological Diversity in poorer countries.

Using the three Rio markers developed by the Organisation for Economic Co-operation and Development (OECD) in collaboration with the three Rio convention secretariats, the OECD Creditor Reporting System had collected, as of 31 October 2005, 7943 commitments targeting the objectives of the Convention on Biological Diversity, including data from 15 member countries up to the year 2003. An additional developed country released similar data on the website of its agency up to the year 2003. Taken together, the 16 developed countries account for 77% of total net official development assistance in 2003, and their combined assistance to biodiversity accounted for 69% of total reported biodiversity-related official development assistance in the OECD pilot study for the period 1998-2000. If representative, these figures would suggest that total earmarked aid for biodiversity has declined from about US$ 1 billion per annum, or just over, to some US$ 750 million.

Figure 2.20 shows the total aid volumes from the 16 developed countries that target the objectives of the Convention on Biological Diversity. The absolute volumes, in current prices, of biodiversity assistance from these 16 countries declined from 1998 to 2003, with slight recoveries in 1999 and in 2002. The figure also presents biodiversity funding as a share of total official development assistance from the 16 developed countries between 1998 and 2003. The percentage for biodiversity of the total overseas development assistance declined from just over 2% in 1998 to 1% in 2003. There were slight recoveries in 1999 and 2002.

The available information suggests that between 1998 and 2003, official development assistance earmarked for biodiversity has decreased by an average of 6% per year. The decrease in the proportion of biodiversity-related aid to total aid in the same period was about 13% per year.

Suitability of the indicators for assessing progress towards the 2010 target

The set of headline indicators developed under the Convention has been used to assess and communicate trends in biodiversity for the first time in *Global Biodiversity Outlook 2*. As demonstrated in this chapter, the headline indicators available for testing vary in the length of underlying time-series data, temporal and spatial resolution, and the confidence with which statements about current trends in biodiversity, the drivers of change, and some response options can be made.

Golden-crowned sifaka, (*Propithecus tattersalli*)
David Haring/Alpha Presse

Of the indicators available for immediate testing (decision VII/30, SBSTTA recommendation X/5), the following have been used in *Global Biodiversity Outlook 2* with time-series data: *trends in extent of selected biomes, ecosystems and habitats; trends in abundance and distribution of selected species; change in status of threatened species; coverage of protected areas; Marine Trophic Index; water quality in aquatic ecosystems; nitrogen deposition; trends in invasive alien species* (for selected countries and regions only); *ecological footprint and related concepts;* and *official development assistance provided in support of the Convention.* In addition, the indicator for *connectivity/fragmentation of ecosystems* (for forest biomes, and inland waters), has been used, but with no time-series data.

In light of the testing of the use of the indicators in *Global Biodiversity Outlook 2*, and taking into account also the use of indicators in the Millennium Ecosystem Assessment, the following conclusions can be drawn concerning the suitability of the indicator framework for assessing progress towards the 2010 target:

- Information is already available to use several of the indicators of the Convention on Biological Diversity to describe current trends in biodiversity, the drivers of change, and some response options;
- Only a sub-set of these indicators, however, are likely to have sufficient resolution to determine a change in the rate of biodiversity loss by 2010. (Such indicators might include: *trends in extent of selected biomes, ecosystems and habitats* in certain types of ecosystems; *trends in abundance and distribution of selected species; change in status of threatened species*; and the *Marine Trophic Index*);
- There are a number of indicators recommended for immediate testing for which available data cover too short a time period to determine current trends at the global level, or for which further indicator development work is required. (These include:

Houseboats, Mekong River, Cambodia
Joerg Boethling/Alpha Presse

trends in genetic diversity of domesticated animals, cultivated plants, and fish species of major socioeconomic importance; area of forest, agricultural and aquaculture ecosystems under sustainable management; connectivity/fragmentation of ecosystems; and *trends in invasive alien species*).

In summary, while we still lack comprehensive global-scale measures to assess progress towards the 2010 target, it is possible to describe trends in the status of biodiversity using this framework.

Taken together, the indicators allow us to establish current trends regarding some important aspects of biodiversity, particularly when they are analysed and interpreted as a suite of complementary and interdependent variables. However, research efforts that focus on improving the coverage and quality of underlying data and related indicator methodologies are required in order to obtain sufficient resolution to determine, with confidence, the general change in the rate of biodiversity loss by 2010. Furthermore, indicators and data are still lacking for certain focal areas under the framework, in particular, for *trends in access and benefit-sharing*. Additional indicators under the focal area related to protecting traditional knowledge, innovations and practices are also needed.

On the basis of the information available to date, a common message emerges: biodiversity is in decline at all levels and geographical scales, but targeted response options—whether through protected areas, or resource management and pollution prevention programmes—can reverse this trend for specific habitats or species (Table 2.1).

It is important to recognize the important linkage between our ability to assess progress towards the 2010 Biodiversity Target and the likelihood of achieving this target. The adoption of the 2010 Biodiversity Target in 2002, and of a flexible framework for assessing progress towards the Convention's Strategic Plan in 2004, has focused the attention of many researchers, segments of civil society, the private sector, representatives of indigenous and local communities, organizations and decision-makers on two related questions: where do we stand in relation to the 2010 target and what needs to be done to achieve it. There is no doubt that the ongoing debate on the need to reduce, and eventually halt the loss of biodiversity, and our ability to assess the effectiveness of actions undertaken in this regard, have already made a significant impact on decision-making and implementation of biodiversity-related activities.

The next chapter discusses the tools and mechanisms established under the Convention to further assist Parties and stakeholders in overcoming key challenges and in expanding efforts necessary to achieve the 2010 target and the longer-term goal of eventually halting biodiversity loss.

TABLE 2.1 | Status and trends of biodiversity-related parameters according to the 2010 indicators

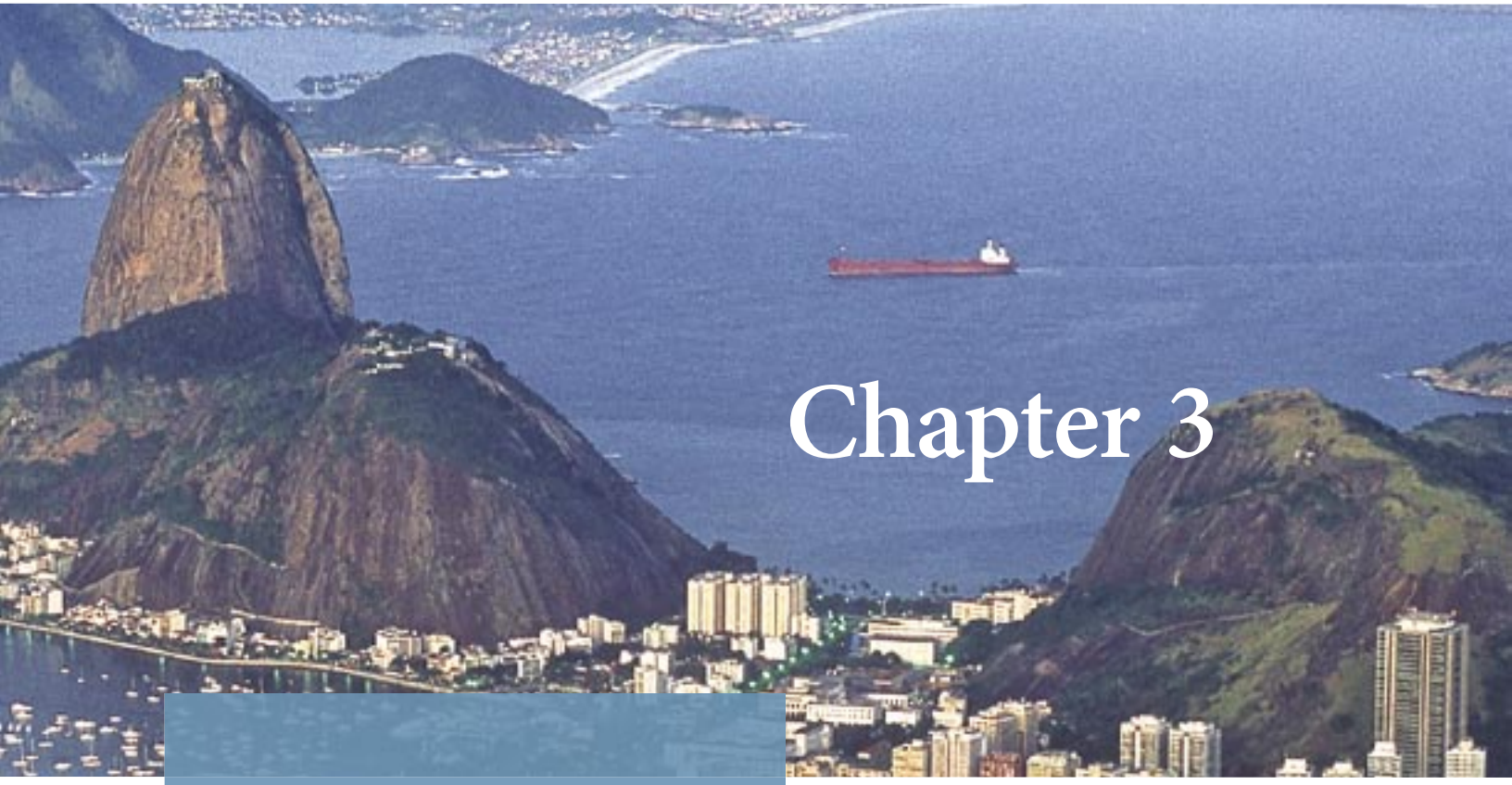
Arrows indicate the direction of trends (broad arrows indicate a high level of confidence about the trend; narrow arrows indicate low confidence; red arrows indicate a trend that is negative for biodiversity; green arrows indicate a trend that is positive for biodiversity). The quality of the data and indicators are shown by the stars at the right hand side.

★★★ good indicator methodology with globally consistent time course data;
★★ good indicator, but no time course data;
★ indicator requires further development and/or limited data.

FOCAL AREA: Status and trends of the components of biological diversity		
↘	Trends in extent of selected biomes, ecosystems, and habitats	★★★ †
↘	Trends in abundance and distribution of selected species	★★★
↘	Change in status of threatened species	★★★
↘	Trends in genetic diversity of domesticated animals, cultivated plants, and fish species of major socio-economic importance	★
↗	Coverage of protected areas	★★★
FOCAL AREA: Ecosystem integrity and ecosystem goods and services		
↘	Marine Trophic Index	★★★
↘	Connectivity – fragmentation of ecosystems	★★
↓ ↑	Water quality of aquatic ecosystems	★★★
FOCAL AREA: Threats to biodiversity		
↗	Nitrogen deposition	★★★
↗	Trends in invasive alien species	★
FOCAL AREA: Sustainable use		
↘	Area of forest, agricultural and aquaculture ecosystems under sustainable management	★
↗	Ecological footprint and related concepts	★★★
FOCAL AREA: Status of traditional knowledge, innovations and practices		
↘	Status and trends of linguistic diversity and numbers of speakers of indigenous languages	★
FOCAL AREA: Status of access and benefit sharing		
?	Indicator of access and benefit-sharing to be developed	
FOCAL AREA: Status of resources transfers		
↘	Official development assistance (ODA) provided in support of the Convention	★

† for forests; data not available globally for all biomes, ecosystems and habitats

Rio de Janeiro, Brazil
Argus / Alpha presse



Chapter 3

IMPLEMENTING THE CONVENTION ON BIOLOGICAL DIVERSITY

The Convention's broad scope makes translating its provisions into policy and practice extremely challenging. In the first ten years following entry into force of the Convention, the Conference of the Parties responded to this challenge by developing a comprehensive body of guidance relating to the conservation and sustainable use of biodiversity and the equitable sharing of the benefits from the use of genetic resources. Through the seven meetings of the Conference of the Parties, 182 decisions have been adopted to guide member states in fulfilling their obligations under the Convention. Among these are key decisions that outline the major areas of work of the Convention, establish principles and guidelines for action, and set out a plan for the more effective and coherent implementation of the Convention as

a whole. In the latter case, recognizing the need to evaluate the effectiveness and state of implementation of the Convention, in 2002, the Conference of the Parties adopted a Strategic Plan, including the 2010 target, and, in 2004, a framework for assessing progress towards the 2010 target. In this chapter, we briefly survey these tools and, using the Strategic Plan as our guide, assess progress made in implementation of the Convention.

3.1 | The Convention's Toolkit: The Ecosystem Approach, Programmes of Work and Guidelines for Action

The processes linking ecosystems and species, including humans, are complex; an action taken in one place may have unforeseen consequences elsewhere, often far away and many years later. It is for this reason that the Conference of the Parties adopted the Ecosystem Approach as the overarching strategy for the integrated management of land, water and living resources (see Box 3.1). Parties can apply the approach at the national level in order to balance the three objectives of the Convention.

The Conference of the Parties has been guided by the Ecosystem Approach in the design of each of the seven thematic programmes of work of the Convention. Corresponding to most of the major biomes on the planet, each programme of work establishes a vision for future work; identifies potential activities and outputs; and suggests a timetable and means for achieving these outputs (see Box 3.2 on page 48). In addition, the Conference of the Parties has adopted cross-cutting programmes of work on technology transfer, taxonomy and protected areas.

The programme of work on protected areas promises to be a key element for achieving the Convention's objectives. The aims of the programme are to establish a comprehensive, effectively managed and ecologically representative network of terrestrial protected areas by 2010, and of marine protected areas by 2012. The programme outlines direct actions for developing and managing these networks, as well as for supporting activities to promote an enabling policy, institutional and socio-economic environment.

The programmes of work of the Convention are complemented by a suite of principles and guidelines developed on cross-cutting issues considered to be of relevance to all thematic areas, including biodiversity monitoring, impact assessment, incentive measures, and invasive alien species (Box 3.3, on page 50). These principles and guidelines are designed to provide practical assistance to Parties in implementing the programmes of work.

The Conference of the Parties has also adopted a Global Strategy for Plant Conservation which encompasses 16 outcome-oriented targets aimed at achieving a series of measurable results by 2010. The Strategy provides a framework for concerted action by all stakeholders towards these targets.

The thematic programmes of work and the other tools referred to above have been developed through the work of the Convention's Subsidiary Body on Scientific, Technological and Technical Advice (SBSTTA), based on the best available scientific advice provided by various expert groups. A number of Working Groups have also been created to assist in implementation. A Working Group has been established to review implementation of the programme of work on protected areas and another to review progress in the implementation of the Convention as a whole. In addition, specific Working Groups have been established on traditional knowledge, innovations and practices, and access and benefit-sharing. Negotiations to elaborate an international regime on access and benefit sharing have been initiated under the latter.

The Cartagena Protocol on Biosafety, developed under the Convention and adopted as a legal instrument in its own right in 2000, aims to ensure that modern biotechnology does not adversely affect biodiversity taking into account also risks to human health. The Protocol entered into force in September 2004. Since then, Parties to the Protocol have met two times to articulate decisions on matters such as risk assessment, liability and redress, capacity-building, information sharing, and labelling.

At the national level, provisions of the Convention and the decisions of the Conference of the Parties are translated into actions through national biodiversity strategies and action plans (NBSAPs). As Parties hold primary responsibility for the implementation of the Convention, NBSAPs are central to achieving the objectives of the Convention. As described below in considering progress made under Goal 3 of the Strategic Plan, many Parties have developed NBSAPs, and a few have updated these to reflect changed conditions since first adopted.

These rice terraces in Banaue, Philippines, are considered to be the Eighth Wonder of the World. Made 2000 years ago they demonstrate the engineering skill and ingenuity of the Ifugao people *Jorgen Schytte/Alpha Presse*

BOX 3.1 | The Ecosystem Approach

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 is based on the application of scientific methodologies focused on levels of biological organization which encompass the essential processes, functions and interactions among organisms and their environment. It recognizes that humans, with their cultural diversity, are an integral component of ecosystems. The Ecosystem Approach can be understood in terms of its 12 Principles and five points of operational guidance.

12 PRINCIPLES

1. The objectives of management of land, water and living resources are a matter of societal choices.
2. Management should be decentralized to the lowest appropriate level.
3. Ecosystem managers should consider the effects (actual or potential) of their activities on adjacent and other ecosystems.
4. Recognizing potential gains from management, there is usually a need to understand and manage the ecosystem in an economic context. Any such ecosystem-management programme should:
   a. Reduce those market distortions that adversely affect biological diversity;
   b. Align incentives to promote biodiversity conservation and sustainable use;
   c. Internalize costs and benefits in the given ecosystem to the extent feasible.
5. Conservation of ecosystem structure and functioning, in order to maintain ecosystem services, should be a priority target of the Ecosystem Approach.
6. Ecosystems must be managed within the limits of their functioning.
7. The Ecosystem Approach should be undertaken at the appropriate spatial and temporal scales.
8. Recognizing the varying temporal scales and lag-effects that characterize ecosystem processes, objectives for ecosystem management should be set for the long term.
9. Management must recognize that change is inevitable.

Organic agriculture, Sitio Tabidiao village, Negros, Philippines—farmers plant rice using this system of rice intensification in flooded paddy fields. *Joerg Boethling /Alpha Presse*

10. The ecosystem approach should seek the appropriate balance between, and integration of, conservation and use of biological diversity.
11. The ecosystem approach should consider all forms of relevant information, including scientific and indigenous and local knowledge, innovations and practices.
12. The Ecosystem Approach should involve all relevant sectors of society and scientific disciplines.

FIVE POINTS OF OPERATIONAL GUIDANCE

I. Focus on the relationships and processes within ecosystem.

II. Enhance benefit-sharing.

III. Use adaptive management practices.

IV. Carry out management actions at the scale appropriate for the issue being addressed, with decentralization to lowest level, as appropriate.

V. Ensure inter-sectoral cooperation.

BOX 3.2 | Programmes of work of the Convention

Organic Agriculture, France. Organically grown wheat, cornflowers and poppies indicate absence of chemical herbicide
Francois Gilson/Alpha Presse

AGRICULTURAL BIODIVERSITY

Key activities:

- Analyse the status and trends of the world's agricultural biodiversity
- Identify management practices and technologies that promote the positive and mitigate the negative impacts of agriculture on biodiversity
- Strengthen the capacities of farmers and indigenous and local communities to sustainably manage agricultural biodiversity
- Develop national plans or strategies for the conservation and sustainable use of agricultural biodiversity

Tree, vultures and wildebeest on the Mara plains, Masai Mara National Park, Kenya
Martin Harvey/Alpha Presse

BIOLOGICAL DIVERSITY OF DRY AND SUB-HUMID LANDS

Key activities:

- Assess the status and trends of biodiversity in dry and sub-humid lands
- Identify specific areas of value for biodiversity
- Develop indicators of dry and sub-humid land biodiversity
- Build knowledge on ecological, physical and social processes affecting biodiversity
- Identify local and global benefits derived from dry and sub-humid land biodiversity
- Identify best management practices and promote measures for the conservation and sustainable use of biodiversity
- Support sustainable livelihoods

Tropical rainforest, Kinabalu National Park, Malaysia
Jacques Jangoux/Alpha Presse

FOREST BIOLOGICAL DIVERSITY

Key activities:

- Apply the Ecosystem Approach to forest management
- Reduce the threats to forest biodiversity
- Protect, recover and restore forest biodiversity
- Promote the sustainable use of forest biodiversity
- Promote the sharing of benefits resulting from the use of forest genetic resources
- Enhance the institutional enabling environment
- Address socio-economic failures and distortions
- Increase public education, participation and awareness
- Improve the assessment of forest biodiversity and understanding of ecosystem functioning
- Improve information management for assessment and monitoring

Cypress trees and waterlilies, South Carolina, USA
Steve Kaufman/Alpha Presse

INLAND WATER BIODIVERSITY

Key activities:

- Integrate biodiversity into water-resource and river-basin management and relevant sectoral plans and policies
- Establish and maintain systems of protected inland water ecosystems
- Prevent the introduction of invasive alien species
- Encourage the application of low-cost technology and innovative approaches to water-resource management
- Provide incentives for the conservation and sustainable use of inland water biodiversity
- Develop an improved understanding of inland water biodiversity and the threats to inland water ecosystems
- Apply rigorous impact assessments
- Introduce monitoring arrangements for inland water biodiversity

BOX 3.2 | continued

Coral reef life, Red Sea, Egypt,
Rafel Al Ma Ary/Alpha Presse

MARINE AND COASTAL BIODIVERSITY

Key activities:

- Implement integrated marine and coastal area management (IMCAM)
- Promote the conservation and sustainable use of marine and coastal living resources
- Establish and maintain effective marine and coastal protected areas
- Prevent or minimize negative effects of mariculture
- Prevent the introduction of invasive alien species

Crocus on the Campo Imperatore at the Gran Sasso, Abruzzen, Italy
Markus Dlouhy/Alpha Presse

MOUNTAIN BIODIVERSITY

Key activities:

- Prevent and mitigate the impacts of key threats to mountain biodiversity
- Protect, recover and restore mountain biodiversity
- Promote the sustainable use of mountain biological resources
- Promote access to, and sharing of, benefits arising from the use of genetic resources
- Maintain genetic diversity in mountain ecosystems
- Enhance the legal, policy and institutional framework
- Preserve knowledge and practices of indigenous and local communities
- Establish regional and transboundary collaboration
- Improve identification, assessment and monitoring of mountain biodiversity
- Improve research, cooperation, technology transfer and other forms of capacity-building
- Increase public education, participation and awareness

Bora Bora, French Polynesia: Global warming is causing Arctic and Antarctic ice to melt, raising sea levels and flooding low-lying coastlands
Truchet/UNEP/Alpha Presse

ISLAND BIODIVERSITY

Key activities:

- Conserve and restore key terrestrial and marine ecosystems important for island biodiversity, societies and economies
- Establish national and regional systems of protected areas to conserve viable populations of selected island species
- Improve knowledge of and conserve the genetic material of significance to islands
- Prevent the movement of invasive alien species between and within islands and develop long-term management plans for priority species
- Implement climate change adaptation and mitigation measures in land-use and coastal zone planning and strategies

3.2 | Achieving the Goals of the Strategic Plan: Progress to Date

Recognizing the need for enhanced implementation of the Convention, the Conference of the Parties adopted a Strategic Plan in 2002 to guide implementation of the Convention. The purpose of the Plan is to halt the loss of biodiversity so as to secure continued benefits. The Strategic Plan is based on the affirmation that biodiversity remains the living foundation for sustainable development; that the threats to biodiversity must be addressed; that the Convention is an essential instrument for the realization of sustainable development; and that the challenges to implementation can and must be overcome.

Following from this, the mission of the Strategic Plan is for Parties to commit themselves to a more effective and coherent implementation of the three objectives of the Convention, to achieve by 2010 a significant reduction of the current rate of biodiversity loss at the global, regional and national level as a contribution to poverty alleviation and to the benefit of all life on Earth. In the context of this mission, the Plan encompasses four goals, each with four or five objectives.

In the following paragraphs we assess progress towards the four goals and 18 objectives of the

BOX 3.3 | Principles, guidelines and other tools developed under the Convention

Description, Principles and Operational Guidelines for the Ecosystem Approach	See Box 3.1
Bonn Guidelines on Access to Genetic Resources and Fair and Equitable Sharing of the Benefits Arising out of their Utilization	The Guidelines are intended to assist Parties and stakeholders in the development of national legislation and policies and on contracts for benefit-sharing. They provide guidance on the roles of focal points and national authorities; the responsibilities of providers and users; facilitating the participation of stakeholders; and on steps in the overall process, including Prior Informed Consent for access and potential elements of Mutually Agreed Terms for benefit-sharing.
Addis Ababa Principles and Guidelines for the Sustainable Use of Biodiversity	A framework for advising stakeholders on how they can ensure that their use of the components of biodiversity will not lead to long-term biodiversity declines, but will instead promote conservation and contribute to poverty alleviation. Applying to both consumptive and non-consumptive uses of biodiversity, the Principles and Guidelines take into account issues related to policies, laws and regulations; management of biodiversity; socio-economic conditions; and information, research and education.
Guiding Principles on Invasive Alien Species[†]	The Guiding Principles are intended to assist governments to control invasive alien species, as an integral part of conservation and economic development. They comprise 15 principles on prevention, intentional and unintentional introduction, and mitigation of impacts.
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	The guidelines provide advice on how to incorporate cultural, environmental (including biodiversity-related), and social considerations of indigenous and local communities into new or existing impact-assessment procedures, to ensure appropriate development. They support the full and effective participation of indigenous and local communities in screening, scoping and development planning exercises, taking into account their traditional knowledge, innovations and practices.
Guidelines for Incorporating Biodiversity-related Issues into Environmental Impact Assessment Legislation and/or Processes and in Strategic Environmental Assessment	Impact assessment is a comprehensive process and assessment tool that promotes sustainable development and is used to ensure that projects, programmes and policies are economically viable, socially equitable and environmentally sustainable. These guidelines provide advice on the incorporation of biodiversity-related concerns into new or existing environmental impact assessment (EIA) and strategic environmental assessment (SEA) procedures.
Guidelines on Biodiversity and Tourism Development	A comprehensive instrument for managing tourism activities in an ecologically, economically and socially sustainable manner. The guidelines emphasize a consultative approach involving multiple stakeholders, and are structured around ten steps, from development of an overall vision to implementation of adaptive management programmes.
Proposals for the Design and Implementation of Incentive Measures	Incentive measures serve to correct the failure of markets to properly reflect biodiversity's value to society. These Proposals identify and explain key elements that need to be considered when using incentive measures for the conservation and sustainable use of biodiversity. They also provide advice on the application of complementary measures for the provision of capacity-building, and for management, monitoring and enforcement.
Proposals for the Application of Ways and Means to Remove or Mitigate Perverse Incentives	Perverse incentives induce unsustainable behaviours that destroys biodiversity, often as unanticipated side effects of policies designed to attain other objectives. These Proposals offer a general framework for the removal or mitigation of perverse incentives, based on a three-phase approach: identification of policies and practices generating perverse incentives; design and implementation of appropriate reforms; and monitoring, enforcement and evaluation of these reforms.

[†] One Party entered a formal objection to the Decision adopting these Guiding Principles (See UNEP/CBD/COP/6/20, paras. 294-324)
[*] Pronounced "agway-goo". A holistic Mohawk term meaning "everything in creation".

BOX 3.4 | The biodiversity-related conventions

Five international conventions focus on biodiversity issues: the Convention on Biological Diversity, the Convention on International Trade in Endangered Species of Wild Fauna and Flora, the Convention on the Conservation of Migratory Species of Wild Animals, the Ramsar Convention on Wetlands and the World Heritage Convention. The Convention on Biological Diversity is the most recent of these multilateral environmental agreements, arising out of the Rio Earth Summit of 1992, some twenty years after Ramsar (1971), WHC (1972) and CITES (1975) entered into force, and ten years after CMS did (1983).

The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) aims to ensure that international trade in specimens of wild animals and plants does not threaten their survival. Through its three appendices, the Convention accords varying degrees of protection to more than 30,000 plant and animal species.

The Convention on the Conservation of Migratory Species of Wild Animals (CMS, or the Bonn Convention) aims to conserve terrestrial, marine and avian migratory species throughout their range. Parties to the CMS work together to conserve migratory species and their habitats by providing strict protection for the most endangered migratory species, concluding regional multilateral agreements for the conservation and management of specific species or categories of species, and undertaking cooperative research and conservation activities.

The Ramsar Convention on Wetlands (popularly known as the Ramsar Convention) provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources. The Convention covers all aspects of wetland conservation and wise use, recognizing wetlands as ecosystems that are extremely important for biodiversity conservation and for the well-being of human communities.

The primary mission of the **World Heritage Convention** (WHC) is to identify and conserve the world's cultural and natural heritage by drawing up a list of sites whose outstanding values should be preserved for all humanity and ensuring their protection through closer cooperation among nations.

The governing bodies of each convention have set out specific mandates for cooperation among the biodiversity-related conventions, and a number of joint work programmes have been established. To further enhance cooperation, a Biodiversity Liaison Group of biodiversity-related conventions comprising the executive heads of those five conventions was established in 2002.

Strategic Plan, building upon the assessment recently conducted by the Working Group on Review of Implementation of the Convention. This assessment is summarized graphically in Table 3.1 (page 55).

GOAL 1
The Convention is fulfilling its leadership role in international biodiversity issues.

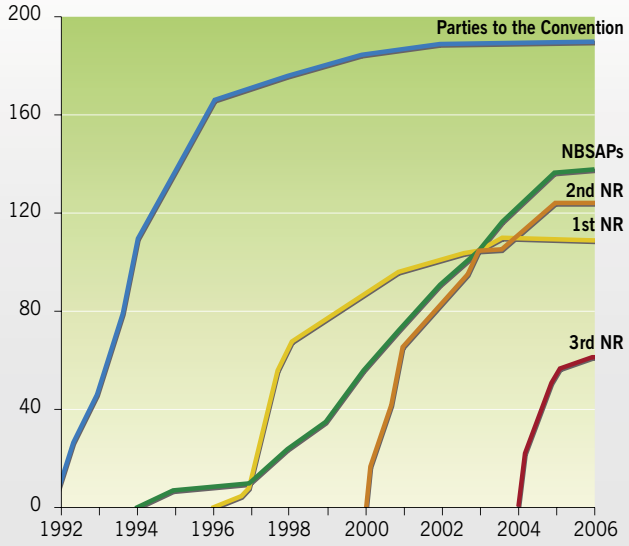
Goal 1 of the Strategic Plan is to promote international cooperation in support of the Convention. Reasonable progress is being made towards this end (Table 3.1). The Convention is playing a major role in setting the agenda among biodiversity-related conventions (Box 3.4) and organizations, in part due to the clear importance and widespread appeal of the 2010 target. The target has been endorsed by the World Summit on Sustainable Development and adopted or acknowledged by the Ramsar Convention on Wetlands, the Convention on the Conservation of Migratory Species of Wild Animals (CMS), the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) and by a number of non-governmental organizations. In addition, the framework for monitoring progress towards the 2010 target has been adapted for use by the European region. Many in the scientific community have taken up the challenge of further developing the framework, and a number of initiatives are underway in support of regional and national application of the framework.

By inviting other international instruments and processes to integrate biodiversity considerations into their work, the Conference of the Parties has made progress in promoting policy coherence at the global level. The International Plant Protection Convention, for example, has developed phytosanitary standards that cover some of the Convention on Biological Diversity's concerns on invasive alien species. Similarly, the International Treaty on Plant Genetic Resources for Food and Agriculture has been developed in harmony with the Convention. Policy coherence is also promoted through joint work programmes, as evidenced by the adoption of common guidance on impact assessment by the Convention and the Ramsar Convention on Wetlands. Closer collaboration among the Convention on Biological Diversity and the four other biodiversity-related

conventions promises further opportunities for increased policy coherence.

Other international processes are increasingly engaged in putting the Convention's policies into practice. The Global Partnership for Plant Conservation, the UNEP Regional Seas Programmes, the River Basin Initiative, the Global Invasive Species Programme and other initiatives have pledged to provide or mobilize support for the implementation of the various programmes of work. However, much more remains to be done, particularly in order to strengthen the support for implementation provided to Parties by international and regional organizations. Without such technical assistance, positive outcomes for biodiversity are unlikely to be achieved. Significant progress is also needed in order to integrate biodiversity concerns outside the environment sector into the work of international organizations and processes concerned with trade, development, agriculture, fisheries, and forestry. Such cross-sectoral cooperation is one aspect of mainstreaming biodiversity, a challenge discussed in more depth in Chapter 4.

FIGURE 3.1 | Participation in Convention processes



Completion of national biodiversity strategies and action plans (NBASPs) and of national reports (NR) by Parties, 1992–2006. The year is based on the date when the Secretariat learned that a final version of the document was available.

Source: Secretariat of the Convention on Biological Diversity reporting database.

GOAL 2

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

Implementation of the Convention at the national level requires that Parties have access to sufficient financial, human, scientific, technical, and technological resources. Without such resources, the Convention's objectives are unlikely to be met. Unfortunately, despite important efforts, progress towards this goal remains limited.

While most financial resources for biodiversity conservation and sustainable use are derived from domestic sources, both in developed countries and most developing countries, external resources are often important in catalysing activities that are directly related to implementing the Convention. For example, most national biodiversity planning and implementation activities have been initiated and associated with certain external financial resources, in particular those from the Global Environment Facility (GEF), the main financial mechanism of the Convention. Further implementation of the Convention and scaling-up of implementation activities will continue to be dependent, to some extent, upon the availability of international financial resources.

However, total aid financing earmarked for the Convention's objectives appears to be on the decline, or at best, stagnant. Since 1997, the GEF has provided an average of US$ 150 million per year to support the implementation of the Convention. While the scope of the Convention's work programmes has expanded, the GEF average annual allocation to biodiversity has changed only marginally. In terms of bilateral aid financing, figures extrapolated from the survey conducted by the Organisation for Economic Cooperation and Development (OECD) (see page 40) indicate financing in support of the Convention's objectives is on the order of US$ 1 billion per year, but show a declining trend.

Securing additional financial resources for biodiversity will likely require adopting new strategies. Development aid to developing countries is increasingly provided through general budgetary support, and less often designated for specific uses. In order for biodiversity conservation and sustainable use activities to receive funding, Governments will need to incorporate biodiversity concerns into relevant national development planning processes, such as Poverty Reduction Strategy Papers (PRSPs) (see Chapter 4 for further discussion). Convincing policy-makers and planners to do so, in turn, requires greater aware-

ness of the role of biodiversity in ensuring sustainable development and supporting poverty reduction. Developing a better appreciation of the value of biodiversity and of the ecosystem services that biodiversity underpins would also encourage the release of domestic resources in support of the Convention's objectives, reducing dependence on foreign aid. In some cases, the creation of markets for biodiversity-related ecosystem services might also generate significant domestic resources to be put towards conservation and sustainable use activities.

Overcoming a lack of human and technological resources is similarly challenging. Many Parties, particularly developing countries and those with economies in transition, lack both the trained staff and technological and institutional infrastructure to fully implement the programmes of work of the Convention. Coordinated action and flexible use of the instruments of the Convention, particularly the programme of work on technology transfer and the Clearing-house Mechanism, could help rectify this.

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.

Progress towards Goal 3, which concerns the national-level planning and implementation necessary for achieving the objectives of the Convention, is critical. Although Parties are involved in the processes of the Convention (for example, by attending meetings, establishing national focal points, and submitting reports), implementation is far from sufficient.

By the end of 2005, almost three-quarters of the Parties (131 of 188) had completed their national biodiversity strategies and action plans or equivalent instruments (see Figure 3.1). Several other Parties had prepared drafts or had national biodiversity strategies and action plans awaiting government approval. As well, one out of three Parties that responded to this issue in their third national report described putting in place comprehensive biodiversity strategies and action plans and integrating the three objectives of the Convention on Biological Diversity into major sectoral plans, programmes and policies. Yet the extent to which these policy instruments are implemented and effectively serve to integrate biodiversity concerns across sectors remains difficult to gauge. To elicit better information from Parties on this topic, and as recommended by the Working Group on the Review of Implementation of the Convention, national report guidelines are being substantially revised.

Available information from other processes suggests that integration is in fact limited. Analyses by the World Bank of Poverty Reduction Strategy Papers and by the United Nations Development Programme (UNDP) of the country reports on progress towards the Millennium Development Goals show that biodiversity issues are poorly reflected in these documents, if at all. While some Poverty Reduction Strategy Papers document declining biodiversity, the links between biodiversity and human well-being are not elaborated and very few reports contain policies for integrating biodiversity into poverty reduction policies. Of 100 country reports analysed, UNDP found that only 17 included targets for forest cover or protected areas, under MDG 7 ("To ensure environmental sustainability"). A number of countries in sub-Saharan Africa referred to the implications of the loss of biodiversity for livelihoods, but generally, there was little reference made to biodiversity with respect to Millennium Development Goals other than MDG 7.

To realize significant progress under Goal 3, each Party should establish appropriate national targets within the flexible framework set up by the Conference of the Parties and then focus national efforts on achieving them. Greater efforts must also be made to mainstream biodiversity concerns into national policies, strategies and programmes for sustainable development and poverty reduction. This includes sectoral integration of biodiversity concerns, with a focus on sectors such as land-use planning, agriculture, forestry and fisheries. There are already a number of tools available under the Convention to facilitate cross-sectoral integration and the mainstreaming of biodiversity into decision-making, including the Ecosystem Approach and the application of strategic environmental assessments. These issues are taken up in Chapter 4.

GOAL 4

There is a better understanding of the importance of biodiversity and of the Convention, and this has led to broader engagement across society in implementation.

Progress towards this goal is mixed. Current communication, education and public awareness programmes

BOX 3.5 | The business case for biodiversity

The "business case for biodiversity" is based on a company's need to maintain its competitive advantage and long-term sustainability. While some businesses may choose to integrate biodiversity considerations into their practices because it is "the right thing to do" or simply as a public relations exercise, more and more companies, particularly those that heavily depend, or have major impacts, on biodiversity, are investing in biodiversity in order to sustain and improve their profits.

In industries that have significant impacts on biodiversity, a company's productivity, and often its competitive advantage, will be influenced by its biodiversity record, including: compliance with legal requirements; implementation of industry standards; response to demands from local communities, civil society groups and shareholders; and application of consumer-driven standards, such as certification schemes for timber and seafood.

As societal expectations and legal requirements increasingly favour biodiversity, companies that have good biodiversity records will have a significant advantage over those that do not. A company's biodiversity record will influence its ability to access land, sea and other natural resources essential for its operations, as well as its ability to obtain both the legal and social right to operate in an area. It will also affect a company's access to capital and insurance, particularly given that impact on biodiversity loss is increasingly being recognized as a material risk for business by investors, financial institutions and insurance companies.

For retailers and other companies that interact directly with the public, having a good biodiversity record will also facilitate access to consumer markets, particularly as consumer awareness about the importance of biodiversity increases. In all industries, a good record may also help to attract and retain high quality employees.

In addition, for industries that depend on biodiversity, its components, or the ecosystem services supported by biodiversity, biodiversity loss is a production risk that could lead to insecure supply chains, decreased productivity, unreliable service, and poor product quality. In such industries, companies that minimize their negative impacts on biodiversity and invest in ecosystem health are helping to guarantee the sustainability of their businesses.

by Parties are not sufficient to address the widespread lack of awareness and understanding of biodiversity and the importance of the Convention. Yet political will to address the biodiversity crisis will only result from an increased public understanding of biodiversity and its relation to human well-being. Such knowledge needs to be included in basic educational programmes and promoted through the general media.

Indigenous and local community representatives as well as many civil-society organizations are well engaged with the Convention processes, attending meetings and contributing expertise. The involvement of indigenous and local communities at the national level is often limited, however, and varies greatly from country to country, suggesting the need to develop appropriate participatory mechanisms.

Efforts to engage key actors and stakeholders to integrate biodiversity concerns into other sectors outside the environment are advancing, and more tools and instruments to aid this process are in development, but much more progress is required. Many positive examples of engagement with non-governmental organizations exist, and these could be promoted further through the development of a global partnership on biodiversity and similar initiatives. Until recently, there has been very little engagement of the private sector in the work of the Convention at any level, despite the significant impacts of their activities on biodiversity. Through the "Business and Biodiversity 2010 Challenge" initiative, however, there is a growing recognition of the "business case" for biodiversity (see Box 3.5), leading to increasing and concrete opportunities to promote private sector engagement.

Conclusion

In looking across the four goals of the Strategic Plan, it becomes apparent that, while there is advancement in some areas, more actions are urgently needed at the national level. It is at the national level that implementation of the Convention must be focused, and tangible outcomes for biodiversity can be achieved. Action under one area in particular appears essential: the mainstreaming of biodiversity outside of the environment domain as strictly understood, and into all relevant sectoral policies and plans (Goals 3 and 1 of the Strategic Plan). Mainstreaming not only promises to reduce direct impacts on biodiversity, as economic sectors modify their activities, but will also raise awareness of the importance of biodiversity (Goal 4). A better understanding of biodiversity's value can translate into increased political will to implement change, and to mobilize the additional resources (Goal 2) needed for real progress. The potential for mainstreaming biodiversity into key sectors is explored in the next chapter, as part of an overall assessment of the prospects and challenges for achieving the 2010 target.

TABLE 3.1 | Strategic Plan scorecard

An overview of progress made towards each of the objectievs of the Stategic Plan, as indicated by the number of dark stars. The assessment is indicative only, is based on the analysis prepared for the Working Group on Review of Implementation of the Convention, and is consistent with the conclusions of the Working Group regarding the state of implementation of the four goals of the Strategic Plan.

GOAL 1: The Convention is fulfilling its leadership role in international biodiversity issues.		
1.1	The Convention is setting the global biodiversity agenda.	★★★☆☆
1.2	The Convention is promoting cooperation between all relevant international instruments and processes to enhance policy coherence.	★★★★☆
1.3	Other international processes are actively supporting implementation of the Convention, in a manner consistent with their respective frameworks.	★★★☆☆
1.4	The Cartagena Protocol on Biosafety is widely implemented.	★★★☆☆
1.5	Biodiversity concerns are being integrated into relevant sectoral or cross-sectoral plans, programmes and policies at the regional and global levels.	★★☆☆☆
1.6	Parties are collaborating at the regional and subregional levels to implement the Convention.	★☆☆☆☆
GOAL 2: Parties have improved financial, human, scientific, technical, and technological capacity to implement the Convention.		
2.1	All Parties have adequate capacity for implementation of priority actions in national biodiversity strategy and action plans.	★★☆☆☆
2.2	Developing country Parties, in particular least developed countries (LDCs) and small island developing States (SIDS) amongst them, and other Parties with economies in transition, have sufficient resources available to implement the three objectives of the Convention.	★☆☆☆☆
2.3	Developing country Parties, in particular LDCs and SIDS amongst them, and other Parties with economies in transition, have increased resources and technology transfer available to implement the Cartagena Protocol.	★☆☆☆☆
2.4	All Parties have adequate capacity to implement the Cartagena Protocol on Biosafety.	★☆☆☆☆
2.5	Technical and scientific cooperation is making a significant contribution to building capacity.	★★☆☆☆
GOAL 3: NBSAPs and the integration of biodiversity concerns into relevant sectors serve as an effective framework for the implementation of the objectives of the Convention.		
3.1	Every Party has effective NBSAPs in place to provide a national framework for implementing the three objectives of the Convention and to set clear national priorities.	★★★☆☆
3.2	Every Party to the Cartagena Protocol on Biosafety has a regulatory framework in place and this is functioning to implement the Protocol.	★★☆☆☆
3.3	Biodiversity concerns are being integrated into relevant national sectoral and cross-sectoral plans, programmes and policies.	★☆☆☆☆
3.4	The priorities in NBSAPs are being actively implemented as a means to achieve national implementation of the Convention, and as a significant contribution towards the global biodiversity agenda.	★☆☆☆☆
GOAL 4: There is a better understanding of the importance of biodiversity and of the Convention, and this has led to broader engagement across society in implementation.		
4.1	All Parties are implementing a communication, education, and public awareness strategy and promoting public participation in support of the Convention.	★★☆☆☆
4.2	Every Party to the Cartagena Protocol on Biosafety is promoting and facilitating public awareness, education and participation in support of the Protocol.	★☆☆☆☆
4.3	Indigenous and local communities are effectively involved in implementation and in the processes of the Convention, at national, regional and international levels.	★★☆☆☆
4.4	Key actors and stakeholders, including the private sector, are engaged in partnerships to implement the Convention and are integrating biodiversity concerns into relevant sectoral and cross-sectoral plans, programmes and policies.	★★☆☆☆

Homes built on reclaimed wetlands, California, USA
NRSC/Alpha Presse

Chapter 4

PROSPECTS AND CHALLENGES FOR ACHIEVING THE 2010 BIODIVERSITY TARGET

In Chapter 2, the survey of current trends in biodiversity found that, according to the set of headline indicators, biodiversity loss is continuing. The analysis of the state of implementation of the Convention presented in Chapter 3 revealed that, while advances are apparent in some areas, more action at the national level is urgently needed. Against this background, the present chapter addresses the prospect for achieving the 2010 Biodiversity Target and sets out some of the key challenges to progress.

In surveying prospects and challenges for meeting the 2010 target, this chapter draws not only on the analysis of the headline indicators from Chapter 2, but also on the findings of the Millennium Ecosystem Assessment. The Assessment was the largest-ever global evaluation of the relationship between human

BOX 4.1 | Summary of the main findings on biodiversity of the Millennium Ecosystem Assessment

1. Biodiversity is being lost at rates unprecedented in human history;
2. Losses of biodiversity and decline of ecosystem services constitute a concern for human well-being, especially for the well-being of the poorest;
3. The costs of biodiversity loss borne by society are rarely assessed, but evidence suggests that they are often greater than the benefits gained through ecosystem changes;
4. Drivers of loss of biodiversity and the drivers of change in ecosystem services are either steady, show no evidence of declining over time, or are increasing in intensity;
5. Many successful response options have been used, but further progress in addressing biodiversity loss will require additional actions to address the main drivers of biodiversity loss; and
6. Unprecedented additional efforts will be required to achieve, by 2010, a significant reduction in the rate of biodiversity loss at all levels.

well-being and ecosystems, with the participation of over 1,300 experts from 95 countries. The Millennium Ecosystem Assessment is also significant in that it directly responded to requests for information from international environmental conventions, such as the Convention on Biological Diversity, and was designed to meet the needs of other stakeholders as well, including business, civil society, and indigenous peoples. The main findings of the Assessment relating to biodiversity are summarized in Box 4.1.

The headline indicators and the Millennium Ecosystem Assessment together paint a picture of ongoing biodiversity loss at all levels. Tropical forests, many wetlands and other natural habitats are decreasing in extent and are becoming increasingly fragmented; the range and number of populations of many species groups are declining; and more species are becoming threatened with extinction. In fact, the Millennium Ecosystem Assessment finds that biodiversity is being lost at rates unprecedented in human history. This underlines the magnitude of the challenge we face to achieve the 2010 Biodiversity Target.

As demonstrated by the Assessment, biodiversity loss and decline of ecosystem services constitute a concern for human well-being, especially for that of the poorest. As discussed in Chapter 1, the poor will suffer disproportionately as a result of their direct dependence on ecosystems for their livelihoods and their inability to afford substitutes when ecosystem goods and services are degraded. This harsh reality highlights the need to spare no effort to meet the 2010 target.

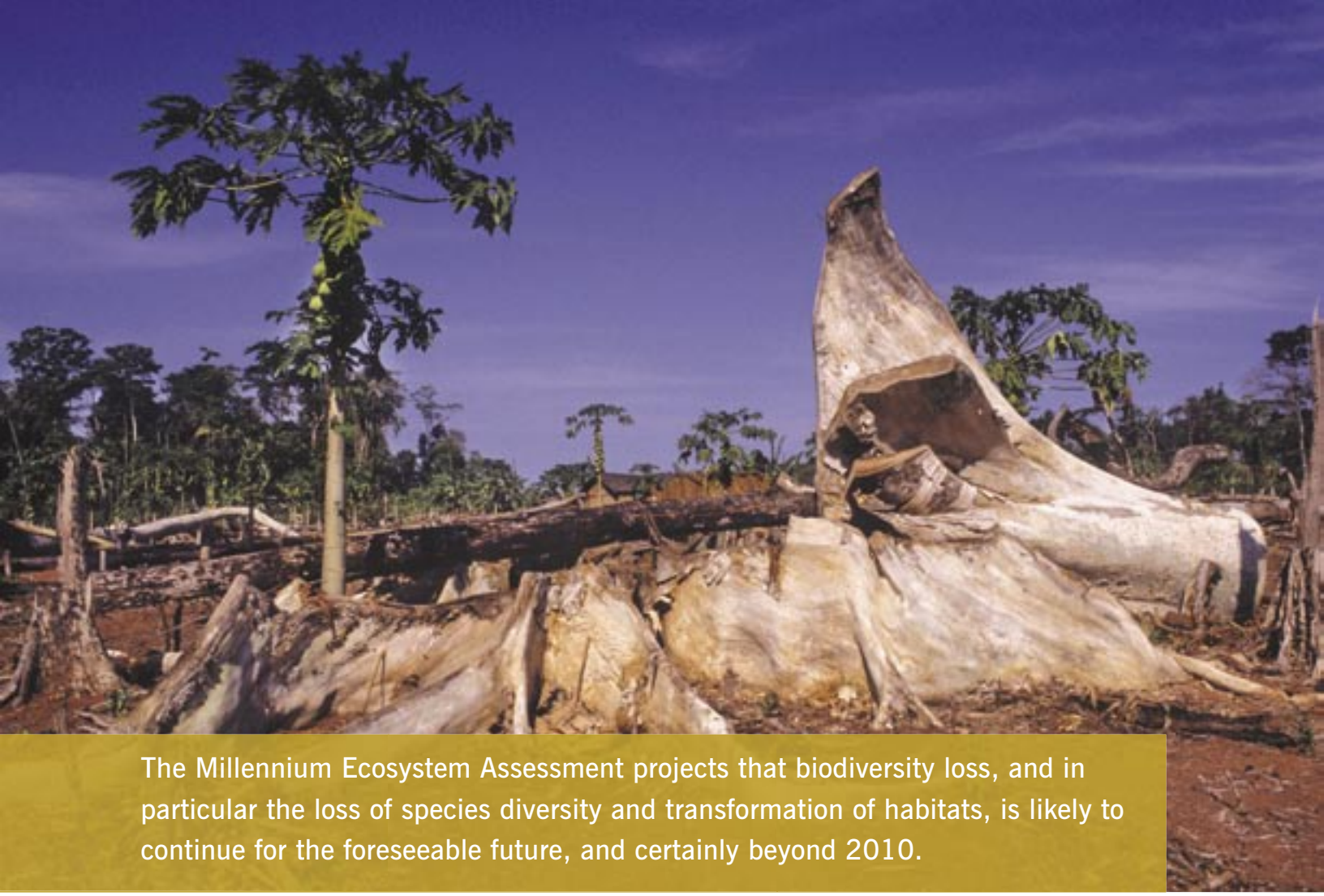
While the trends elucidated by the indicators in Chapter 2 and the findings of the Millennium Ecosystem Assessment leave no room for complacency, neither do they suggest that progress towards the 2010 Biodiversity Target is impossible. Three conclusions of the Millennium Ecosystem Assessment are particularly pertinent in this regard:

- First, while "unprecedented additional efforts" will be needed to achieve the 2010 Biodiversity Target at national, regional and global levels, with appropriate responses at the global, regional, and, especially, the national level, it is possible to achieve, by 2010, a reduction in the rate of biodiversity loss for certain components of biodiversity or for certain indicators, and in certain regions.
- Second, the majority of the targets that the Convention has established as part of its framework for assessing progress towards the 2010 target are achievable, provided that the necessary actions are taken, as will be discussed in Section 4.1
- Third, for the most part, the tools needed to achieve the 2010 target, including programmes of work, principles and guidelines, have already been developed, as described in Chapter 3.

These conclusions should be seized upon, and should motivate Parties and civil society to act. Real progress can be made by applying the tools already available under the Convention.

At the same time, the Millennium Ecosystem Assessment's conclusions raise new challenges for the Convention that will need to be addressed as implementation proceeds. These concern the need to address the drivers of change more directly in the Convention's programmes of work (as discussed in Section 4.2) and to fully integrate biodiversity concerns into the activities and policies of economic sectors that impact upon biodiversity (as discussed in Section 4.3).

Furthermore, on the basis of both an analysis of current trends and by exploring scenarios of plausible futures, the Millennium Ecosystem Assessment projects that biodiversity loss, and in particular the loss of species diversity and transformation of habitats, is likely to continue for the foreseeable future, and certainly beyond 2010. This is largely due to inertia



The Millennium Ecosystem Assessment projects that biodiversity loss, and in particular the loss of species diversity and transformation of habitats, is likely to continue for the foreseeable future, and certainly beyond 2010.

Migrant slash and burn farmers clear land to plant crops, vicinity Maraba, Amazon, Brazil
Mark Edwards / Alpha Presse

in ecological and human systems and to the fact that the drivers of biodiversity loss are themselves broadly constant or increasing. This has implications for the long-term vision of the Convention, as expressed in the Strategic Plan, which is to halt the loss of biodiversity. Given the characteristic response times for human political and socio-economic systems, and for ecological systems, short-term goals and targets alone are not sufficient as a policy framework— longer-term goals and targets are also needed to guide policy and actions. The development of these goals and targets, undertaken as part of the review of the Strategic Plan, is envisaged to be completed by 2010.

4.1 | Prospects for achieving the goals and targets of the Convention's framework for assessing progress towards the 2010 target

The framework adopted by the Conference of the Parties for assessing progress towards the 2010 Biodiversity Target includes not only indicators to assess biodiversity status and trends, but also a set of goals and targets for advancing towards the 2010 Biodiversity Target, as described earlier. It is too soon to assess progress towards these goals and targets. However, the prospects for achievement can already be analysed on the basis of current trends and through consideration of plausible future scenarios, as was done as part of the Millennium Ecosystem Assessment.

Prospects for achievement are better for some targets than others. The Assessment confirms that it is possible to achieve many of the targets aimed at protecting the components of biodiversity if the response options that are already incorporated into the programmes of work of the Convention on Biological Diversity are implemented. However, it appears highly unlikely that all the targets aimed at addressing threats to biodiversity could be achieved globally by 2010, although some may be achieved at smaller scales. It will also be a major challenge to meet the targets to maintain, until 2010 and also throughout the 21st century, goods and services from biodiversity to support human well-being. Table 4.1 provides an analysis of current prospects for meeting each of the framework's targets.

TABLE 4.1 | Prospects for achieving the targets of the framework for assessing progress towards the 2010 Biodiversity Target

The Conference of the Parties has adopted a framework of goals and targets for assessing progress towards the 2010 Biodiversity Target. In this table, the prospects of achieving these targets—which may be considered as sub-targets of the overall 2010 Biodiversity Target—are assessed, taking into account the current status and trends revealed by the Convention's indicators and the Millennium Ecosystem Assessment, and the scenarios of plausible futures examined in the Assessment. For many targets, measurable progress can be envisaged, even though full achievement is unlikely. This partial progress underlines the importance of developing quantitative targets. Where a target is identified as "achievable", this means only that it is achievable, *if appropriate actions are taken*; it does not imply that progress is likely in the absence of such actions. "GSPC Targets" are those of the Global Strategy for Plant Conservation.

	Target	*Prospects for Progress by 2010*
PROTECT THE COMPONENTS OF BIODIVERSITY		
GOAL 1: Promote the conservation of the biological diversity of ecosystems, habitats and biomes.		
1.1	At least 10% of each of the world's ecological regions effectively conserved.	Whereas some 12% of terrestrial areas are protected overall, the proportion varies among biomes, and even more so among ecoregions. Moreover, not all of these areas are "effectively conserved". Only about 0.6% of marine areas are protected. Reaching the target is thus challenging but achievable.
1.2	Areas of particular importance to biodiversity protected.	Sites of importance to birds are well documented, and those for plants becoming so. Progress is being made towards protecting these two sets of sites. Progress in other key biodiversity areas is variable. GSPC Target 5: "Protection of 50% of the most important areas for plant diversity assured" is challenging but achievable.
GOAL 2: Promote the conservation of species diversity.		
2.1	Restore, maintain, or reduce the decline of populations of species of selected taxonomic groups.	Many species will continue to decline in abundance and distribution, but restoration and maintenance of selected species is possible.
2.2	Status of threatened species improved.	More species will become threatened, but species-based conservation measures will improve the status of some.
GOAL 3: Promote the conservation of genetic diversity.		
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 are 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 are likely to decline overall.
PROMOTE SUSTAINABLE USE		
GOAL 4: Promote sustainable use and consumption.		
4.1	Biodiversity-based products derived from sources that are sustainably managed, and production areas managed consistent with the conservation of biodiversity.	Progress expected for some components of biodiversity, and increased take-up of various certification schemes likely to continue. If more general 'good practices' for sustainable management of agriculture and forestry are applied, the GSPC Targets 6 and 12 are achievable ("30% of production lands managed for conservation" and "30% of products derived from sustainable sources"). More stringent and urgent action is needed for marine fish stocks. Overall, although substantial progress is possible, it is unlikely that the majority of products and production areas will be sustainable by 2010.
4.2	Unsustainable consumption of biological resources, or consumption that has an impact on biodiversity, reduced.	Total consumption is projected to increase due to demographic change and economic growth. However, these increases could be moderated by reduced waste and luxury consumption.
4.3	No species of wild flora or fauna endangered by international trade.	Progress is possible, for example through enhanced implementation of the Convention on International Trade in Endangered Species of Wild Fauna and Flora.
ADDRESS THREATS TO BIODIVERSITY		
GOAL 5: Pressures from habitat loss, land-use change and degradation, and unsustainable water use reduced.		
5.1	Rate of loss and degradation of natural habitats decreased.	Land-use change is projected to continue to be the largest driver of ecosystem change and biodiversity loss. However, rates of change could be decreased and, through landscape-level planning, pressures on regions of high conservation value could be further reduced.
GOAL 6: Control threats from invasive alien species.		
6.1	Pathways for major potential alien invasive species controlled.	While pressures are likely to increase from greater transport, trade, and tourism, measures to address these major pathways could be enhanced, including through the implementation of existing international agreements (e.g., the International Plant Protection Convention, the International Ballast Water Convention).

TABLE 4.1 | continued

	Target	*Prospects for Progress by 2010*
6.2	Management plans in place for major alien species that threaten ecosystems, habitats, or species.	Management plans could be developed for key invasive species. For example, GSPC target 10 ("Management plans for at least 100 major alien species") is achievable.
GOAL 7: Address challenges to biodiversity from climate change and pollution.		
7.1	Maintain and enhance resilience of the components of biodiversity to adapt to climate change.	The aggregate level of natural habitats, species and genetic diversity is projected to decrease. Thus progress in this target is challenging and depends on protecting those critical habitats, populations of species and genetic diversity that contribute to resilience and/or facilitate adaptation in the face of climate change.
7.2	Reduce pollution and its impacts on biodiversity.	Nutrient loading (of nitrogen and phosphorus) is projected to increase. These increases can be mitigated through increases in fertilizer use efficiency, and the enhanced use of wetlands to sequester or denitrify reactive nitrogen, and to remove other nutrients. A combination of approaches could reduce impacts from eutrophication on biodiversity. However, it is unlikely that the effects of aerial deposition can be reduced or mitigated. Levels of other pollutants (e.g. persistent organic pollutants) may increase or decrease.
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.		
8.1	Capacity of ecosystems to deliver goods and services maintained.	Most ecosystem services, other than production of food and fibre from agriculture and aquaculture, are currently declining, but this could be reversed through effective actions. However, this can probably be achieved only on a selective basis by 2010. In any case, the provision of freshwater is likely to decline.
8.2	Biological resources that support sustainable livelihoods, local food security, and health care, especially of poor people, maintained.	While the current trend is negative, the most important resources for the poor could be protected given effective action and could 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.		
9.1	Protect traditional knowledge, innovations, and practices.	The long-term decline in traditional knowledge is likely to continue given demographic, cultural and socio-economic trends. However, measures could be taken to reduce the rate of decline.
9.2	Protect the rights of indigenous and local communities over their traditional knowledge, innovations, and practices, including their rights to benefit sharing.	The target is achievable but depends on political will, nationally and internationally, and on building capacity among indigenous and local communities and stakeholders.
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.		
10.1	All access to genetic resources are in line with the Convention on Biological Diversity and its relevant provisions.	The target is achievable but depends on political will, nationally and internationally, and on building capacity among stakeholders.
10.2	Benefits arising from the commercial and other utilization of genetic resources shared in a fair and equitable way with countries providing such resources in line with the Convention on Biological Diversity and its relevant provisions.	The target is achievable but depends on political will, nationally and internationally, and on building capacity among stakeholders.
ENSURE PROVISION OF ADEQUATE RESOURCES		
GOAL 11: Parties have improved financial, human, scientific, technical, and technological capacity to implement the Convention.		
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.	The target is achievable but depends on political will internationally and, increasingly, on integration of biodiversity concerns into development assistance frameworks and related policies and strategies.
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.	The target is achievable but depends on political will, nationally and internationally, and on building capacity among stakeholders.

4.2 | Addressing the drivers of biodiversity loss in the Convention's programmes of work

The magnitude of the challenge to achieve the 2010 Biodiversity Target lies in the fact that most of the direct drivers of biodiversity loss—habitat change, climate change, the introduction of invasive alien species, overexploitation and nutrient loading—are projected to either remain constant or to increase in the near future. Figure 4.1 illustrates the relative importance of these drivers for the various ecosystem types.

The Millennium Ecosystem Assessment finds that further progress in addressing biodiversity loss will require additional actions to address the main direct drivers of biodiversity loss. Accordingly, a few elements of the programmes of work of the Convention on Biological Diversity could be better prioritized and refocused to more squarely address drivers of biodiversity loss, as discussed in this section.

For terrestrial ecosystems, the most important direct driver of change in the past 50 years has been habitat change. Land-use change is projected to continue to be a major driver of biodiversity loss, especially due to agricultural expansion into tropical and sub-tropical forests, grasslands and savannas, particularly in sub-Saharan Africa. Issues of land-use change arising from agriculture may need to be addressed more directly, as discussed in Section 4.3, including in the context of the programme of work on agricultural biodiversity. There are additional pressures, especially in coastal areas, from urbanization, development of transport infrastructure and tourism, and from development of aquaculture.

Degradation in drylands is another major concern for terrestrial ecosystems and is squarely addressed by the Convention's programme of work on the biodiversity of dry and sub-humid lands. Some 10 to 20% of drylands already suffer from a persistent reduction in their capacity to supply ecosystem services, often with significant impacts on livelihood security.

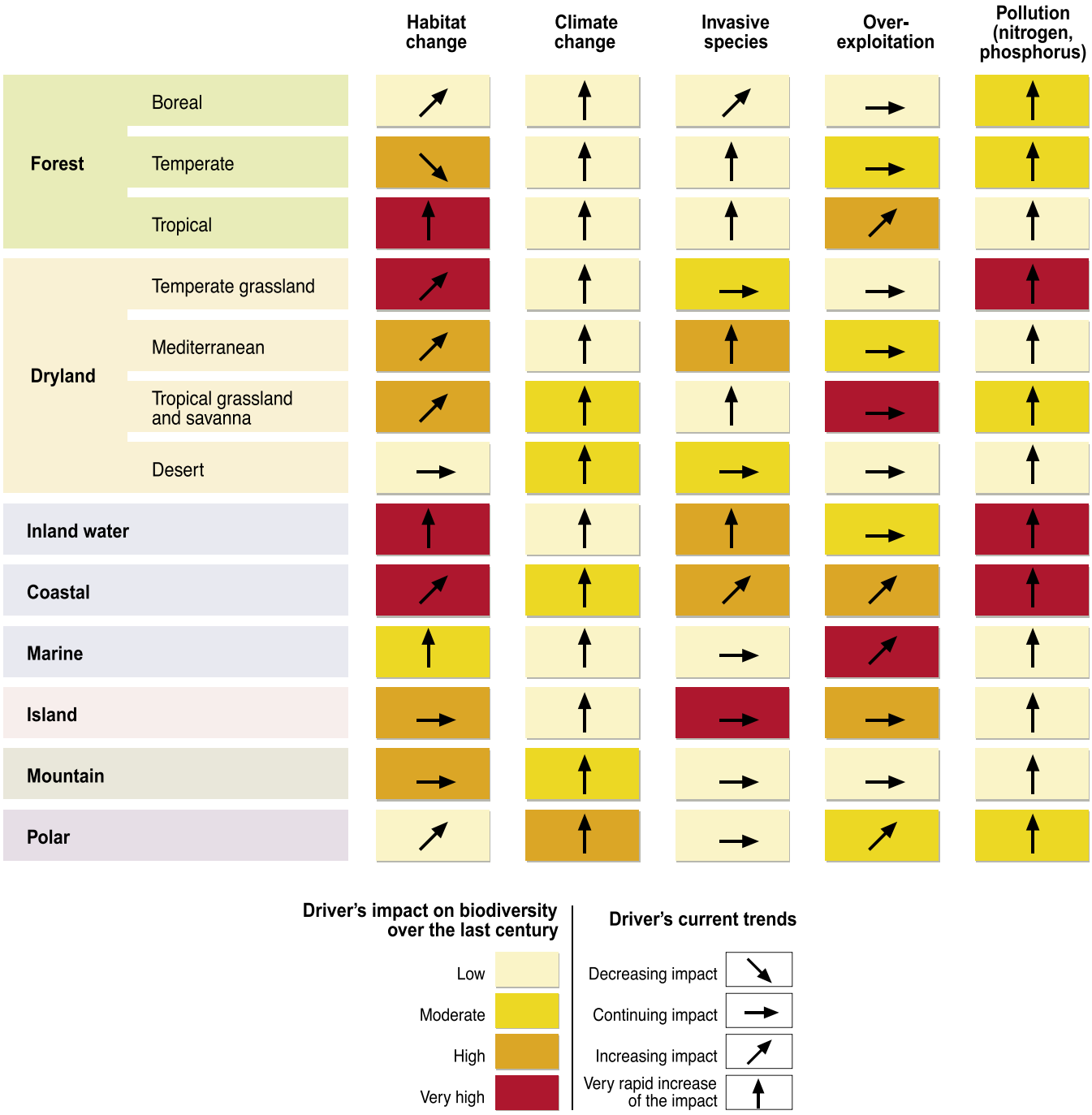
For marine ecosystems, the most important direct driver of change in the past 50 years, on the whole, has been overexploitation. Global fisheries landings peaked in the late 1980s and are now declining, despite increasing fishing effort. This fishing pressure is seriously harming marine biodiversity in many parts of the world, often with potentially significant impacts on food security. Some response measures identified by the Millennium Ecosystem Assessment, such as the establishment of marine protected areas, are already included in the programme of work on marine and coastal biodiversity, but must be put into practice as a matter of urgency. The programme of work also calls for activities to eliminate destructive fishing practices, and restore and maintain fisheries stocks to sustainable levels by the year 2015, but this is not a primary focus.

For freshwater ecosystems, depending on the region of the world, the most important direct drivers of change in the past 50 years are physical alteration of habitats, modification of water regimes, and reduced water quality (pollution, sedimentation and eutrophication). Such pressures are likely to intensify as demand for water continues to increase from agriculture, industry and for human consumption. The drivers of change are thus found to be largely external to inland water ecosystems, and this means that the programme of work on the biodiversity of inland waters—which addresses these drivers—must be better known, understood and implemented across many economic sectors.

Over the past four decades, nutrient loading, particularly of nitrogen and phosphorus, has emerged as one of the most important drivers of ecosystem change in terrestrial, freshwater, and coastal ecosystems. Humans now produce more reactive nitrogen than is produced by all natural pathways combined. Furthermore, nitrogen use is projected to increase by 20 to 50% globally over the next 50 years, with most of the increase occurring in Asia. Although the framework of goals, targets and indicators adopted to assess progress towards the 2010 Biodiversity Target includes targets and indicators related to the nutrient-loading issue, the problem is not fully integrated into all of the relevant programmes of work (including, notably, the programme of work on agricultural biodiversity). Addressing nutrient loading will require both the promotion of increased efficiency of nitrogen use and the conservation of wetlands to maintain or increase their capacity to filter and remove excess nutrients. Again, addressing this issue effectively will require outreach to other economic sectors.

Climate change in the past century has already had a measurable effect on biodiversity and is projected to have greater impacts in the future. The Millennium Ecosystem Assessment expects that an increase in average global temperature beyond two degrees above pre-industrial temperatures will give rise to globally significant impacts on ecosystems. There is an urgent

FIGURE 4.1 | Main direct drivers of change in biodiversity and ecosystems



The cell colour indicates the impact of each driver on biodiversity in each type of ecosystem over the past 50 to 100 years. High impact means that over the last century the particular driver has significantly altered biodiversity in that biome; low impact indicates that it has had little influence on biodiversity. The arrows indicate the trend in the driver. Horizontal arrows indicate a continuation of the current level of impact; diagonal upward and vertical arrows indicate progressively increasing trends in impact; and diagonal downward arrows indicate decreasing trends in impact. For example, if an ecosystem had experienced a very high impact of a particular driver in the past century (such as the impact of invasive species on islands), a horizontal arrow indicates that this very high impact is likely to continue. This figure is based on expert opinion consistent with and based on the analysis of drivers of change in the various chapters of the assessment report of the Condition and Trends Working Group of the Millennium Ecosystem Assessment. The figure presents global impacts and trends that may vary among regions.

Source: Millennium Ecosystem Assessment.

A significant and sustained reduction in the rate of biodiversity loss can only be achieved if the main drivers of change are addressed.

Primary and secondary industry, Ratcliffe-on-Sour near Nottingham, UK
Paul Springett / Alpha Presse

need for Parties and other Governments to address this threat, including through their commitments under the United Nations Framework Convention on Climate Change and its Kyoto Protocol, in order to lessen dangerous impacts on ecosystems. At the same time, activities aimed at the conservation and sustainable use of biodiversity (including the development and management of protected areas) also need to fully take into account climate change. Some species and ecosystems, in some regions, may be more vulnerable to climate change and with this in mind, there is a need to develop and implement adaptation measures in all the thematic programmes of work.

Increased levels of transport, tourism and trade are associated with more frequent introductions of invasive alien species which pose a significant threat to ecosystems. Whereas the various programmes of work already consider the impacts of invasive alien species once introduced, further work is needed to strengthen preventative measures.

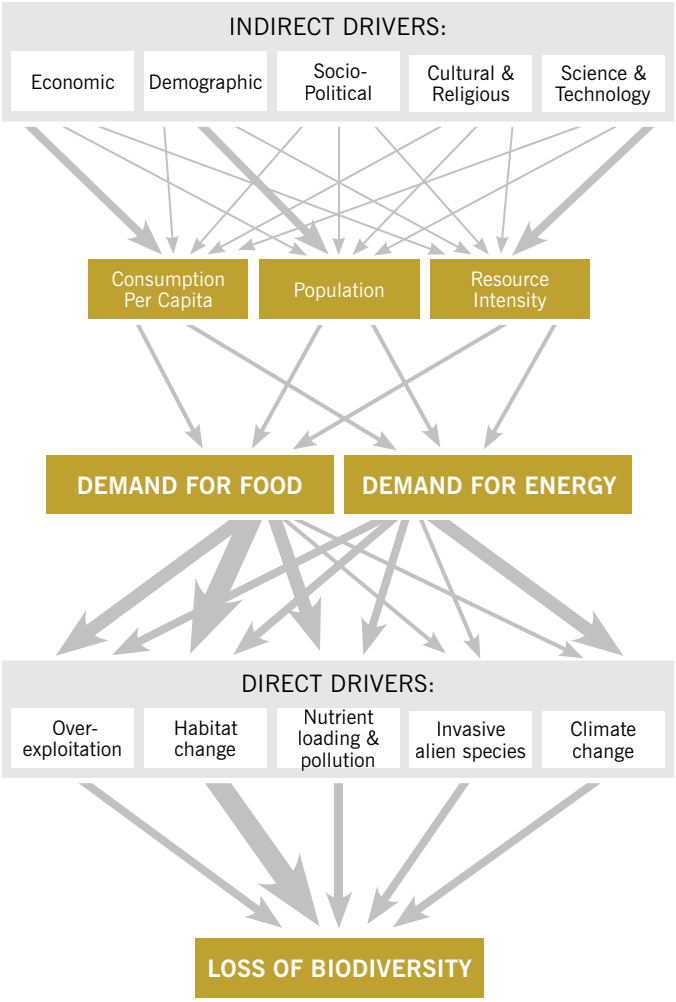
4.3 | Mainstreaming biodiversity into economic sectors and development planning

The Convention calls for the conservation and sustainable use of biodiversity to be integrated, as far as is possible and appropriate, into relevant sectoral or cross-sectoral plans, programmes and policies. This imperative, also highlighted in the Strategic Plan, is reinforced by the findings of the Millennium Ecosystem Assessment. As discussed above, a significant and sustained reduction in the rate of biodiversity loss can only be achieved if the main drivers of change are addressed. To do so, it is necessary to engage with key actors in the main economic sectors that give rise to the drivers of change so that negative impacts can be reduced or mitigated. Engaging the principal actors in these sectors and recruiting allies as advocates for the conservation and sustainable use of biodiversity is also needed to ensure wider awareness of biodiversity issues. With wider awareness will come the increased political will and additional resources necessary for change. This transformation represents the essence of mainstreaming biodiversity across economic sectors.

In this section, we outline priority issues for engaging with the key economic sector of food and agriculture, as well as with the trade, and poverty and development sectors. Integrating biodiversity concerns into the food and agriculture sector is particularly important to conservation and sustainable use efforts, as is integration into the energy sector (Figure 4.2). Energy use contributes to biodiversity loss through climate change that, as noted in Section 4.2, is becoming an increasingly significant driver of biodiversity loss. The main efforts at reducing this threat are carried out under the United Nations Framework Convention on Climate Change, however, and are discussed only briefly here. In terms of the food and agriculture sector, agriculture is the main driver of land-use change, as well as the main source of excessive reactive nitrogen, phosphorus and other nutrients in ecosystems. The overexploitation of wild foods, particularly marine fishes but also bushmeat, is another major driver of biodiversity loss.

Since economic development—including growth in the energy and food and agriculture sectors—is

FIGURE 4.2 | Links between food, energy and biodiversity loss



Schematic representation of the links between biodiversity loss, the direct and indirect drivers of change, and the demand for food and energy. The width of the arrows gives a broad and approximate illustration of the importance of the economic sectors in driving biodiversity loss.

strongly affected by policies on trade, there is a need to integrate biodiversity concerns into trade discussions. In addition, there are important linkages between biodiversity and poverty reduction. Just as the loss of biodiversity and the degradation of ecosystem services could undermine achievement of the Millennium Development Goals, many of the actions that could be implemented most quickly to promote economic development and reduce hunger and poverty could harm biodiversity, at least in the short-run. Given these complex interrelations, there is a need to integrate biodiversity consideration in polices, plans and programmes for sustainable development.

The analysis in this section is based on the findings of the Millennium Ecosystem Assessment concerning the present and future drivers of biodiversity loss and is informed by the scenarios of plausible futures examined under the Assessment (see Figure 4.4). The analysis also draws upon an additional set of scenarios developed for the Convention by the GLOBIO Consortium (Box 4.2).

Energy

As noted above, biodiversity issues related to energy use and attendant climate change will only be briefly outlined here. The conservation and sustainable use of biodiversity can contribute to measures both to mitigate climate change (i.e., reducing greenhouse gas concentrations) and to adapt to climate change (i.e., reducing the impacts of climate change on ecosystems and human well-being). Conversely, climate change mitigation and adaptation activities can have positive or negative impacts on biodiversity, depending on the response options chosen. For instance, maintaining natural forests for carbon storage has a greater benefit for biodiversity than planting single-species tree stands. Integration of biodiversity concerns into climate change policy is therefore very important. An assessment of these interlinkages has been carried out under the auspices of the Convention and provides guidance to policy-makers on these matters.

Food and Agriculture

According to the various scenarios of plausible futures explored in the Millennium Ecosystem Assessment, land-use change is expected to remain the largest driver of biodiversity loss to 2010 and indeed at least until the middle of this century (see Figure 4.3). While other factors are important, especially in coastal areas, the biggest driver of land-use change is agriculture. Expansion of agriculture is driven by increasing demand for food, which in turn is driven by increasing population and increases in per capita consumption associated with rising income, urbanization and changing food preferences. Whereas the size of the increase is susceptible to policy change, technological advances and personal preferences (as discussed below), a substantial rise in the demand for food is nonetheless inevitable and an essential element of most strategies to achieve the Millennium Development Goals. Efforts under the Convention must therefore be focused on minimizing the impact of these

BOX 4.2 | Policy options for the 2010 Biodiversity Target and beyond

Scenario building—based on models that allow a quantitative analysis of the effects of different policy interventions on biodiversity—can be used both to inform policy responses and to communicate the challenges for achieving the 2010 Biodiversity Target and the longer term goal of halting biodiversity loss.

Scenarios were developed to evaluate six global policy interventions that were considered realistic, yet challenging, and for which long-term benefits for biodiversity were anticipated. The six policy options were:

1. The effective implementation of **full trade liberalization in agriculture** beginning in 2015, in line with the Doha Development Round of the World Trade Organization;
2. Direct investments in Sub-Saharan Africa, as well as trade liberalization in agriculture (option 1), to **alleviate extreme poverty,** in line with the proposals of the Millennium Project;
3. Implementation of a **climate change mitigation policy** option focusing on bio-energy, aimed at limiting climate change to within a global average temperature rise of 2 degrees Celsius;
4. **Sustainable wood production** based on plantation forestry, aimed at limiting the exploitation of timber from natural and semi-natural forests;
5. Implementation of **sustainable meat production** practices, taking into account human health, animal welfare, and limiting nutrient loading, involving higher costs and reduced demand for meat;
6. **Doubling the area of all terrestrial biomes under protected areas**.

The above policy options complement the more general storylines of the four scenarios examined in the Millennium Ecosystem Assessment (see Figure 4.4). Each of the six options was analysed individually for its impact on species abundance and ecosystem extent in terrestrial ecosystems, against a baseline of a moderate business-as-usual scenario in which biodiversity continues to decline driven by the combination of increasing global population and economic activity.

Full trade liberalization in agriculture (option 1) leads to losses of biodiversity additional to those occurring in the baseline scenario, because of expansion of land used for agriculture, particularly in Southern Africa and Latin America. These negative effects on biodiversity are accentuated in the poverty alleviation option (option 2), though longer-term benefits for biodiversity may result from the expected reductions in demographic pressure and economic improvements. Options 3 and 4 lead to medium-term additional reductions in biodiversity, but later improvements are expected due to reduced climate change and pressure on natural forests, respectively. Sustainable meat production (option 5) leads to marginal improvements in biodiversity compared to the baseline scenario. Doubling of protected areas (option 6) leads to a significant, but still small, improvement.

These findings suggest the need to identify smart, nationally and locally tailored combinations of measures for reducing biodiversity loss, using a range of approaches. The study concludes that:

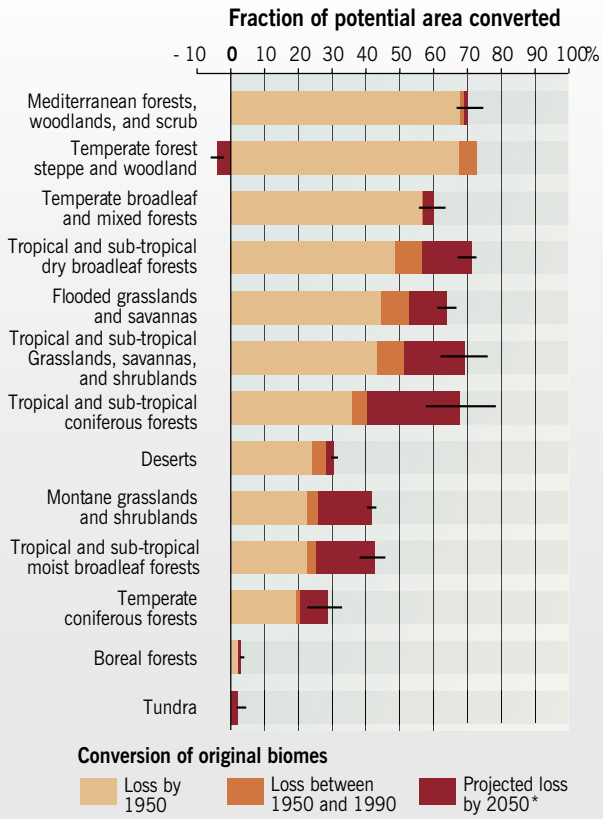
- It is of paramount importance to minimize the rate of land conversion. The further enhancement of agricultural productivity is a key factor in reducing the need for land. Payment for environmental services that compensate for the opportunity cost of the non-conversion of biodiversity-rich natural ecosystems could also contribute to the 2010 target.
- Trade liberalization measures need to be combined with policy interventions to avoid unnecessary loss of biodiversity through land conversion in areas of low land and labour costs.
- A comprehensive and effectively managed network of protected areas is another important mechanism to limit the loss of biodiversity.

The study was carried out by the GLOBIO (Global Methodology for Mapping Human Impacts on the Biosphere) Consortium comprising the Global Resource Information Database of UNEP (UNEP/GRID-Arendal), the World Conservation Monitoring Centre (UNEP-WCMC), the Netherlands Environmental Assessment Agency (MNP) and the Agricultural Economics Research Institute at the Wageningen University and Research Centre (WUR-LEI).

changes on biodiversity. There are three broad elements to such an approach:

First, there is a need to limit the expansion of land under cultivation by improving the efficiency of food production. Increased efficiency can be achieved by increasing agricultural productivity and by reducing post-harvest losses. To avoid other negative impacts, however, such measures must be coupled with soil conservation efforts and improved efficiency of water and nutrient use. These improvements can be achieved by promoting technological change, by building upon farmers' knowledge and extending existing best practice. Examples include promoting integrated pest management, low-till cultivation, targeted use of nutrients, and improvements in irrigation. Together, these approaches can contribute to what is often termed "sustainable intensification" of agriculture. The conservation and sustainable use of biodiversity in agro-ecosystems has itself a role to play in this regard, in line with the Convention's programme of work on agricultural biodiversity. A number of international and non-governmental organizations and private sector companies have already developed good agricultural practice guidelines that are useful tools for promoting best practice. Additionally, some existing certification and labeling schemes require particular standards of practice.

FIGURE 4.3 | Conversion of terrestrial biomes



*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.

Based on soil and climatic conditions, it is possible to determine the "potential" extent of biomes prior to significant human impact, although obtaining exact estimates is not feasible. 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. Most of the conversion of these biomes is to cultivated systems.

Source: Millennium Ecosytem Assessment

Second, effective landscape-level planning is required to ensure that any necessary expansion of agriculture, including for cash crops, plantations and aquaculture, occurs primarily on land that is already converted (including degraded lands) rather than in areas of high biodiversity value, or land otherwise important for the delivery of vital ecosystem goods and services. Protected areas can be used to ensure conservation of the sites most important to biodiversity, but a wider landscape-level approach is also needed. The Convention's Ecosystem Approach provides important principles and operational guidance for implementation of such a landscape-level planning process. Environmental impact assessment and strategic environmental assessment are also important tools to this end, and the Convention has developed guidelines for incorporating biodiversity-related issues into these approaches. In addition, purchasers and processors of agricultural commodities increasingly require assurances that production is not promoting deforestation or other conversion of natural habitats and are forming partnerships with producers and civil society organizations to develop criteria for this purpose. The Round Table on Sustainable Palm Oil is an example of such a partnership: the criteria for sustainability under this scheme include no conversion of primary forest to oil palm plantations after November 2005.

Third, efforts could be made to moderate increases in overall demand for food by reducing excessive consumption, especially of meat, by more affluent sectors of society. While increases in consumption are desirable for poorer, less well-nourished sectors of society (and are, in fact, necessary to reach the health and nutrition targets of the Millennium Development Goals), reduction in consumption among the better-off could have both health benefits and environmental benefits. Scenarios developed for the Convention by the GLOBIO Consortium (see Box 4.2) demonstrate that more sustainable meat production methods, coupled with a moderate reduction in meat consumption by the more affluent sectors of society, could contribute to a reduction in biodiversity loss. Increased public awareness of, and education on, the importance of biodiversity, the impacts of unsustainable consumption and production patterns, and the health benefits of a moderate and diverse diet, are probably the main tools to achieve progress in this area.

Beyond land-use change, overfishing is an important additional cause of biodiversity loss associated with food production, especially in marine areas. Urgent measures are needed to stop overfishing, especially by industrial-scale operations, to prohibit destructive fishing practices, and to end illegal, unregulated and unreported fishing. These measures should be complemented by the establishment of a network of marine protected areas using the Ecosystem Approach, in line with the Convention's programme of work on marine and coastal biodiversity and commitments of the Johannesburg Plan of Implementation of the World Summit on Sustainable Development. Conserving the

BOX 4.3 | Elements of a strategy to reduce biodiversity loss

1. **Sustainable and efficient agriculture:** improve the efficiency of use of land, water and nutrients in agriculture, including aquaculture and plantations.
2. **Landscape-level planning:** protect areas of high biodiversity value and those that produce essential ecosystem services while using already converted lands, including degraded lands, for expansion of agriculture, including aquaculture and plantations.
3. **Sustainable consumption:** limit over-consumption of energy, timber and food, especially meat, by affluent sectors of society.
4. **End over-exploitation of wild resources, in particular overfishing and destructive fishing practices.** Expand marine protected areas. End use of endangered species and populations.
5. **Protect and restore critical ecosystems** that provide resources for the poor, allow adaptation to climate change, and/or provide critical ecosystem goods and services.

marine environment and important fish stocks would also protect vital resources for the poor.

Maintenance of critical biodiversity and ecosystems at the local level can yield benefits beyond the boundaries of the ecosystem in question and thereby contribute more generally to reducing the loss of biodiversity arising from food harvesting and agricultural production activities. Wetlands, including swamps, marshes, river beds and coastal areas, for example, are all important in contributing to the removal of excess reactive nitrogen and other nutrients derived from agricultural activities, thereby protecting downstream ecosystems from eutrophication. Coral reefs and mangroves provide spawning grounds for food fisheries, while also protecting coastlines from extreme weather events. These are all examples of healthy ecosystems providing resilience, a property of ecosystems that will become increasingly important in the future due to rising pressures from climate change, the increased release of nutrients from agriculture and increased human population densities.

Protection of critical ecosystems is one key component of an overall strategy to reduce biodiversity loss (Box 4.3). As discussed above, such a strategy must also include improving agricultural efficiency, developing landscape management plans, and reducing overfishing. To implement these approaches, a mix of planning, regulations and incentive measures will be required. Improved public understanding and better valuation of biodiversity and ecosystem services will also be an important part of the necessary actions.

Trade

The relationship between biodiversity and trade is complex. On the one hand, increased trade associated with globalization may increase pressures on biodiversity through, among other things, an increased risk of the introduction of invasive alien species, and through increasing demand for timber, food and commodities, the production of which are linked to biodiversity loss. On the other hand, economic efficiency gains associated with free trade will enhance resource use efficiency, and may thereby reduce the impact on biodiversity associated with the production of a given quantity of produce. Moreover, a number of disciplines associated with trade liberalization aim to reduce subsidies that are thought to lead to overproduction. Hence, a number of commitments under the Doha Development Agenda of the World Trade Organization have the potential to benefit biodiversity. These include the removal of subsidies that contribute to overfishing and overproduction in agriculture. Economic efficiency gains notwithstanding, however, scenarios developed for the Convention by members of the GLOBIO Consortium indicate that trade liberalization according to the Doha Commitments will likely lead, in the short-term, to an acceleration in the rate of biodiversity loss in some regions and countries, unless accompanied by proactive measures to conserve biodiversity. This is because liberalization is generally expected to shift agricultural production from the United States, Japan and Europe, where yields are relatively high, to Latin America and Southern Africa, potentially resulting in greater total land requirements at the expense of forest and grassland areas.

At the national level, a proactive approach to incorporating biodiversity considerations in cross-sectoral and landscape-level policy planning is clearly necessary to accompany trade liberalization. Incentive measures will also have a role to play. Sustainability assessments of trade liberalization measures are a useful tool to inform policy development in this regard.

At the international level, a supportive trade regime is necessary to allow for, and indeed to encourage, the development and use of appropriate incentive measures. Further, it is important that the global trade regime more generally recognize the value of the Convention on Biological Diversity and other multilateral environmental agreements for achieving sustainable development. The princi-

ples of these agreements need to be duly taken into account when further developing the trade regime. In particular, when reducing trade-distorting (production-related) subsidies—which tend to be bad for biodiversity as well—it is important to keep a window for the application of well-designed and targeted measures to safeguard the provision of important ecosystem services.

Completion of the Doha Development Round under the World Trade Organization, in particular the removal of harmful subsidies in fisheries and agriculture, accompanied by appropriate planning and incentive measures at the national level, could thus generate synergy with the conservation and sustainable use of biodiversity while also contributing to the broader development agenda, including the achievement of the Millennium Development Goals.

Development and poverty eradication

The two great challenges of the 21st century—to eradicate poverty and to protect biodiversity—are reflected in the Millennium Development Goals and the 2010 Biodiversity Target. Between the two, however, poverty eradication, and associated economic and social development, is the first and overriding priority of developing countries, as recognized in the preamble to the Convention. Generally, biodiversity conservation and sustainable use are given less political weight than policies and actions to promote development and combat poverty. As discussed in Chapter 3, the result is that biodiversity is usually not reflected in national development plans. As a consequence, biodiversity concerns are not effectively mainstreamed across relevant sectors, opportunities for biodiversity to contribute to poverty eradication are often missed, and there are little funds or human resources devoted to biodiversity conservation and sustainable use.

There is increasing evidence that the above approach is short-sighted. The Millennium Ecosystem Assessment finds that, of 24 ecosystem services examined, 15 are in decline, and that it is usually the poor who suffer most from this loss. As the Assessment concludes, the widespread decline in biodiversity and ecosystem services may undermine progress towards the Millennium Development Goals.

At the same time, the Millennium Ecosystem Assessment notes potential tradeoffs between development and biodiversity goals: some measures that promote short-term development may undermine the resource base on which sustained development progress rests. There is no simple relationship between progress towards the Millennium Development Goals and biodiversity conservation. In the range of plausible future scenarios examined in the Assessment, the scenario that showed the most progress towards reducing hunger and poverty entailed relatively high losses of biodiversity, and those scenarios that were more favourable from a biodiversity perspective made smaller advances towards the development goal (see Figure 4.4).

Moreover, future scenarios developed for the Convention by members of the GLOBIO Consortium (Box 4.2) show that actions taken to achieve the Millennium Development Goal of eradicating poverty are likely to accelerate biodiversity loss in the short-run, unless proactive mitigating measures are put in place. This is largely because expansion of agriculture contributes to both economic development and an improved food supply but tends to have negative implications for biodiversity, further underlining the importance of integrating biodiversity concerns in landscape planning processes. Indeed, as the Millennium Ecosystem Assessment concludes, coordinated implementation of the goals of the Convention on Biological Diversity and the Millennium Development Goals would facilitate the consideration of the trade-offs and synergies between the two sets of goals, so that informed decisions can be made. Such an approach is consistent with the decision of the Conference of the Parties at its seventh meeting in Kuala Lumpur, in which Parties, Governments, international financial institutions, donors, and relevant intergovernmental organizations are urged to implement development activities in ways that are consistent with, and do not compromise, the achievement of the objectives of the Convention on Biological Diversity and the 2010 target.

The existence of trade-offs and synergies implies that environmental considerations, including those related to biodiversity, should be integrated into the implementation not only of the environmental sustainability goal of the Millennium Development Goals (MDG 7), but of all the relevant goals, including those to eliminate poverty and hunger (MDG 1), and to improve human health (MDGs 4 through 6). In turn, this highlights the urgent need for countries to integrate biodiversity concerns into strategies for poverty reduction and sustainable development, including the

Meeting the 2010 target is a considerable, but by no means impossible, challenge.

Women growing *Prunus africana* seedlings in tree nursery, Cameroon. The bark is sold to pharmaceutical companies
Mark Edwards / Alpha Presse

Millennium Development Goal strategies and Poverty Reduction Strategies.

Elements of an approach that involves integration of biodiversity into strategies for poverty reduction and sustainable development should include:

- Recognition of the value of biodiversity in providing ecosystem goods and services, in particular goods and services of value to the poor, including those not traded in markets;
- Protection, in particular, of biodiversity of value to the poor, including common pool resources. Protection might involve the use of environmental assessment approaches that are sensitive to the perspectives and needs of the poor, in order to prevent the types of ecosystem changes highlighted in Chapter 1 (Figure 1.2);
- Respect for the traditional rights and practices of indigenous and local communities that contribute to the conservation and sustainable use of biodiversity; extending property and resource rights to local communities and promoting community-based natural resource management as appropriate;
- Creation of pro-poor markets for ecosystem services at all appropriate levels.

Examples of pro-poor biodiversity conservation measures include: protecting coral reefs and mangroves that support important fisheries and protect shorelines; preventing the depletion of artisanal fisheries by large-scale commercial fishing operations; and protection of wild food of high nutritional value in forests and agricultural landscapes.

As noted by the Millennium Ecosystem Assessment, there is substantial scope for greater protection of biodiversity through actions justified on their economic merits, where the concept of economic value goes beyond coventional, narrow definitions to include material or other benefits to human well-being. Realizing this potential requires making

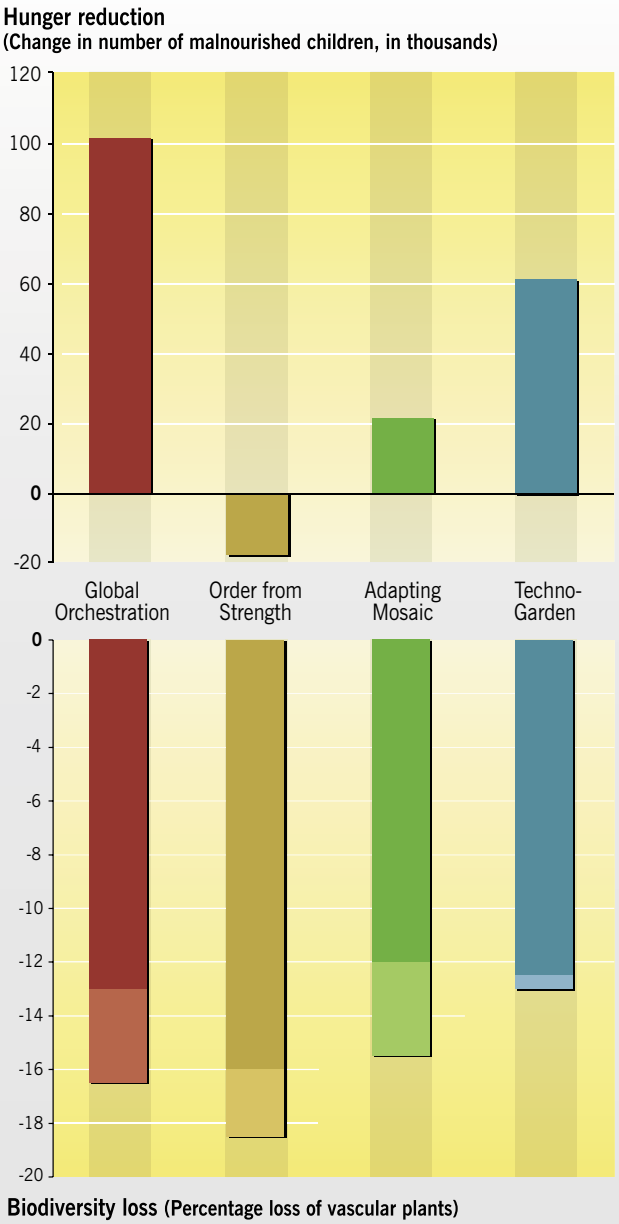
FIG. 4.4 | Outcomes for hunger reduction and biodiversity loss under the Millennium Ecosystem Assessment scenarios

Hunger reduction is shown as reduction in the number of malnourished children (0-5 years) in developing countries, by 2050 as compared to 2000.

Biodiversity loss is shown as the eventual loss of vascular plant species on land, due to land-use change (dark part of bars) and to the combined effects of land-use change, climate change and nitrogen deposition (total bars) by 2050, as compared to 1970.

Projections are for each of the four Millennium Ecosystem Assessment scenarios, namely "Global Orchestration", "Order from Strength", "Adapting Mosaic" and "Techno-Garden" . The first two have a reactive approach to environmental issues, but differ in that the world represented by the "Order from strength" scenario is regionalized and fragmented, emphasizing security and protection, whereas the world under the "Global orchestration" scenario has moved towards increased global cooperation. The remaining two scenarios feature proactive approaches, and also differ from one another in taking a regional versus a global approach. The world represented by the "Techno-Garden" scenario is globally connected and the environment is highly managed, whereas under the "Adapting Mosaic" scenario, society emphasizes ecosystem management strategies and institutions on a local scale.

Note that there is no simple relationship between hunger reduction and biodiversity loss. The scenario "Order from strength" features poor outcomes for both hunger reduction and biodiversity conservation. However, the other three scenarios show an inverse relationship between the two goals. In all scenar-



greater efforts towards understanding and computing the total value of biodiversity, its components, and its role in providing ecosystem services, together with the enhanced use of the resulting information and understanding in decision-making. This observation underscores the more general requirement to pay increased attention in the work of the Convention to socio-economic issues and analysis, including biodiversity valuation and the promotion of markets for ecosystem services. Care should be taken so that responses to address biodiversity conservation and sustainable use do not further marginalize the world's poor and instead, wherever feasible, generate synergy with the Millennium Development Goals.

As discussed in this chapter, meeting the 2010 target is a considerable, but by no means impossible, challenge. Unprecedented additional efforts are needed, and these must be focused on addressing the main drivers of biodiversity loss. The Convention already provides a toolkit that, with minimal adjustments, can guide action at the global, regional and national level. For the best possible outcomes to be achieved, however, these tools must be put to immediate and widespread use in those sectors that give rise to the drivers of biodiversity loss. Many opportunities exist for mainstreaming biodiversity, as outlined above, but seizing these will depend on taking effective action at the national level.

Green Belt Movement, Kenya—children planting indigenous trees
William Campbell / Alpha Presse

Conclusions

ACTIONS TO ACHIEVE THE 2010 TARGET

Global Biodiversity Outlook 2 draws on the Convention's set of global indicators and the findings of the Millennium Ecosystem Assessment to show that biodiversity is continuing to be lost, and that these losses may undermine achievement of the Millennium Development Goals. *Global Biodiversity Outlook 2* also reveals that, while much progress has been made developing policy and tools for implementing the Convention, national-level implementation to date has been limited. The magnitude of the challenge is confirmed by the Millennium Ecosystem Assessment's finding that unprecedented action will be required to achieve the 2010 Biodiversity Target at the global, regional and national levels.

With 2010 fast approaching, Parties and all stakeholders need to take urgent action to reduce the rate

of biodiversity loss. What is required is not only a firm commitment by Parties to act according to the priorities identified by the Convention and its Strategic Plan, but concrete activities for following through on these commitments. The conservation and sustainable use of biodiversity need to become integral elements of planning, policy and practice for all economic and social sectors of society. There are many good reasons, as well as multiple opportunities, for mainstreaming biodiversity more widely.

Primary responsibility for action lies with Parties to the Convention themselves, but the international community can play an important supporting role, including through the Convention's Conference of the Parties and its Secretariat. In addition, individuals singly and collectively can make a difference through their choices and activities as citizens, consumers and actors in their own right. Box 5.1 provides a checklist of key actions to be undertaken by these players for achieving the 2010 target, with further discussion provided in this concluding section.

Action by Parties

Action by Parties should be guided by the priorities identified in the Strategic Plan for implementation of the Convention, and in particular, by the need to integrate biodiversity concerns across all relevant sectors. Five key actions can be identified:

First, all Parties should develop comprehensive national biodiversity strategies and action plans (NBSAPs) that include national targets for 2010, in line with their commitments under Article 6 of the Convention and with decisions of the Conference of the Parties. The integration of targets into NBSAPs should be part of an ongoing review process, by which these instruments are regularly updated to reflect the latest guidance from the Conference of the Parties and changing national circumstances. National targets should be clear, preferably quantifiable, and consistent with the framework adopted by the Conference of the Parties. Such targets will give focus and impetus to countries' conservation and sustainable use efforts, and allow for an objective assessment of progress made under NBSAPs. Clear targets are also essential for engaging with citizens, providing not only a convincing means to communicate complicated messages, but also serving as a commitment to which governments can be held accountable, and around which stakeholders can develop concerted action.

Second, all Parties should ensure that their NBSAPs are implemented and do not merely remain as good ideas on paper. Putting NBSAPs into practice requires that appropriate policy be developed, legislative measures enacted, and practical activities implemented on the ground.

Third, all Parties should translate biodiversity-related concerns outside the environment sector, mainstreaming biodiversity into national policies, programmes and strategies on trade, agriculture, forestry and fisheries and other relevant sectors. Biodiversity issues must also be mainstreamed into countries' development planning, including through integration into Millennium Development Goal strategies and Poverty Reduction Strategy Papers. Increased interministerial dialogue, among other approaches, will be particularly crucial for integrating biodiversity across economic sectors, to enable governments to develop integrated plans, regulations and incentive measures. Concrete tools already exist under the Convention to assist Parties in factoring biodiversity concerns into national planning. The Ecosystem Approach, if applied systematically, should lead to integrated management of natural resources. Following available guidelines for incorporating biodiversity into environmental impact assessment and strategic environmental assessment approaches can ensure that national development proceeds in an economically viable, socially just and environmentally sustainable manner. Establishing positive incentives for the conservation and sustainable use of biodiversity and removing negative incentives that encourage overexploitation and ecosystem degradation will further promote the consideration of biodiversity issues in relevant economic sectors. Also, creating markets for ecosystem services, where appropriate, will encourage producers and consumers to value biodiversity and plan for its sustainable use.

Fourth, Parties need to ensure that sufficient human, financial, technical and technological resources are available for implementation of their national biodiversity strategies and action plans. As discussed in Chapter 3, mobilizing financial resources will increasingly require Parties to integrate biodiversity concerns into development planning processes, with funds released as part of national strategies for poverty reduction and sustainable development. Securing financial and other resources, however, will in turn depend on increased public awareness of the importance of biodiversity conservation and sustain-

Inspection of illegal logging site using satellite map. German development agency (GTZ) supporting the Mekong River Commission, Cambodia
Joerg Boethling/Alpha Presse

able use, and a consequent increase in the political attention given to these matters.

Finally, Parties should promote greater awareness of the importance of biodiversity, and of national actions taken under the Convention for its conservation and sustainable and equitable use. To this end, Parties should make all efforts to report comprehensively on progress towards the 2010 target in their fourth national reports. Not only will the report assist the Conference of the Parties to assess the state of implementation of the Convention and to refine guidance provided to Parties, but the report can also be adapted to serve as a public communication tool. Written reports, websites and other materials derived from the reporting process can alert the public to status and trends in biodiversity in their country, and encourage civic engagement in addressing identified threats.

Action by the International Community

The Conference of the Parties of the Convention on Biological Diversity provides the primary forum for the international community to agree upon an agenda and necessary actions for addressing threats to biodiversity. This common understanding is arrived at through negotiations by States party to the Convention, but can also reflect the views of intergovernmental organizations (e.g., United Nations agencies) and

of civil society (e.g., non-governmental organizations, local and indigenous community groups) involved in Convention processes. As such, decisions made at the Convention level can be informed by the best available knowledge and experience surrounding biodiversity issues, and contribute to setting standards for action at the national level.

The Conference of the Parties must continue its important work of reviewing progress in implementation of the Convention and of considering actions necessary for achieving the Convention's objectives. Decisions of the Conference of the Parties arising from this monitoring process can inform national action and contribute to the review of progress towards the 2010 target. Accordingly, it is crucial that the Conference of the Parties has available to it accurate and up-to-date information on the state of implementation of the Convention in member countries. To this end, the Secretariat of the Convention will support an in-depth review of progress in implementation of national biodiversity strategies and action plans and of the provision of financial resources to Parties. As well, the Secretariat will systematically and comprehensively examine the third and subsequent national reports submitted by Parties, and improve the resulting synthesis of information and analysis provided to the Conference of Parties and directly to Parties.

Beyond improving guidance to member States, the Conference of the Parties needs to explore and establish concrete means to enhance implementation. Work to develop and promote tools for the valuation of biodiversity and the design of appropriate incentive measures would significantly enhance efforts to mainstream biodiversity and should be a priority. Enhanced implementation also rests on providing adequate resources and technical assistance to Parties in need, an issue that the Conference of the Parties urgently needs to address if the 2010 target is to be met. Implementation of the already established programme of work on technology transfer and cooperation will be one important step in this direction. Increased information exchange would significantly benefit implementation, and could be achieved through further developing the Convention's Clearing-house Mechanism and facilitating the development of clearing-house mechanisms at the national level. Additionally, the Secretariat could play an enhanced role in providing and facilitating technical support for national-level implementation, including through stronger partnerships with international agencies that already work on the ground.

Even as the Conference of the Parties shifts its focus to issues of implementation, a few key policy issues remain to be resolved, which will require agreement and concerted action by the international community. Chief among these is completing the elaboration of an international regime on access and benefit-sharing. Effectively addressing issues of sustainable and equitable use will further require that policy developed under the Convention is integrated with international policy instruments in the economic and trade sectors. Policy coherence is needed within the environmental sector as well, where multiple environmental agreements exist, each with overlapping objectives. While the Secretariat can contribute to facilitating policy coherence with other international agreements by developing a more systematic approach to cooperation with other conventions, organizations and sectors, the main onus is on Parties to highlight biodiversity-related concerns in other relevant international fora, including at meetings of the other agreements to which they are party.

Finally, meeting the objectives of the Convention requires concerted action from all nations of the world. To this end, the international community should endeavour to achieve universal membership to the Convention. No country can afford to adopt an observer status on matters as critical as sustaining life on Earth.

Action by individuals and all stakeholders

Much of the political motivation to address biodiversity concerns arises from the priorities expressed by individuals through their electoral choices and in all aspects of their daily lives.

On the political level, individuals can promote biodiversity conservation and sustainable use by demanding action from government at all levels. Where politicians have made promises to the citizenry—through signing on to international agreements or through other national plans and legislation—individuals must strive to hold governments accountable to these commitments. This is especially important where no formal compliance measures exist to ensure that countries are meeting their international obligations. Also critical are actions at the municipal level, as these can

BOX 5.1 | Checklist of key actions for 2010

PARTIES

- Define national targets for 2010 and integrate them into National Biodiversity Strategies and Action Plans (NBSAPs)
- Implement NBSAPs, with a focus on meeting the 2010 targets
- Integrate biodiversity into national policies, programmes and strategies on trade, agriculture, forestry, fisheries, and development
- Provide resources and build capacity for implementation of NBSAPs
- Report on progress and raise public awareness

INTERNATIONAL COMMUNITY, THROUGH THE CONFERENCE OF THE PARTIES

- Provide the framework for monitoring progress and ensuring feedback from reports of implementation
- Promote and develop tools for implementation including valuation and incentives
- Ensure provision of necessary resources and technical assistance
- Complete the elaboration of an international regime on access and benefit-sharing
- Ensure policy coherence among multilateral environmental agreements and with the trade and economic regimes

INDIVIDUALS AND STAKEHOLDERS

- Demand action from governments and hold governments accountable
- Contribute to the 2010 target through partnerships
- Promote sustainable consumption directly and through supply chains

produce direct and obvious results that convince others in the community of the need to become involved in environmental issues, while also sending a message to higher levels of government.

Individuals can combine their efforts to greater effect by becoming involved in community groups, non-governmental organizations, or other civil society organizations, through donations of their time, expertise and/or money. Non-governmental organizations and other civil society organizations already make major contributions to the implementation of the Convention. To harness further this energy, the Conference of the Parties is exploring options for a global partnership on biodiversity, which will rally together organizations that pledge to contribute to meeting the 2010 target.

Indigenous and local communities must continue to play an important role in the Convention. Through their traditional and often close dependence on biological resources, these communities have developed unique perspectives and valuable traditional knowledge that can help the global community to achieve conservation and sustainable development objectives. The establishment of a voluntary fund to enable greater participation of indigenous and local community representatives will serve to increase their presence at the Convention's meetings. These voices must also be heard more often at the national level, a demand that citizens can make of policy-makers as part of efforts to increase participation in conservation and sustainable use planning processes.

Finally, in our everyday choices, we all have direct impacts on biodiversity and the state of our Planet's ecosystems. What we eat, wear and buy, where we live, work and travel, are not neutral choices. Options for sustainable consumption are available and increasing (e.g., organic foods, cleaner technology), and many of us have the additional possibility of reducing waste in our daily consumption of resources. Corporations should also assume responsibility for the environmental impacts of their activities, including by choosing to buy from suppliers that adopt sustainable practices. The Convention is increasing efforts to engage the private sector in biodiversity issues through the "Business and the 2010 Biodiversity Challenge" initiative.

The challenges before us are great, but the cost of doing nothing is far greater. We all derive benefits from biodiversity, and we will all suffer from its loss. We do need to acknowledge, however, that this loss will not be borne equally. Failure to deal with the biodiversity crisis will most severely affect the poor of the developing world. Proof of the compassion and care of the global community for those less fortunate lies in ensuring that the basis for their livelihoods is conserved and used sustainably and that the benefits of this use are shared equitably. These are heavy commitments, requiring a basic rethinking of our economic and social practices and priorities, but they are by no means unreachable. Through cooperation and the contribution of all, the task will be lessened and our hopes for the future made real.

List of Boxes, Tables and Figures

Lotus flower, Thailand
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Chapter 3

Chapter 4

Conclusions

Endnotes

Introduction

1 For the purposes of assessing progress towards the 2010 target, biodiversity loss is defined as the long-term or permanent qualitative or quantitative reduction in components of biodiversity and their potential to provide goods and services, to be measured at global, regional and national levels (decision VII/30, paragraph 2). The "current" rate is taken to be the rate in 2002, when the Strategic Plan was adopted.

Chapter 1

1 Selected provisioning, cultural and regulating services were considered. Supporting services were not assessed because, by definition, they are not directly used by people.

Chapter 2

1 *Global Forest Resources Assessment (2005). Progress towards sustainable forest management. FAO Forestry Paper 147, Food and Agriculture Organization of the United Nations Rome, 2005.*

2 *Millennium Ecosystem Assessment (2005). Ecosystems and Human Well-being: Synthesis. Island Press, Washington DC.* Note: The designation of areas undergoing land-cover change resulting from degradation in drylands has been omitted.

3 *T. A. Gardner, I. M. Côté, J. A. Gill, A. Grant, A.R.. Watkinson (2003). Long-Term Region-Wide Declines in Caribbean Corals. Science 301: 958-960.* Figure 2.3 shows the weighted means with 95% bootstrap confidence intervals shown as a band.

4 *World Wide Fund for Nature, UNEP World Conservation Monitoring Centre, Global Footprint Network (2004). Living Planet Report. Edited by J. Loh and M. Wackernagel, Gland, Switzerland.*

5 *R.D. Gregory; A. van Strien; P. Vorisek ; A.W.G. Meyling ; D.G. Noble; R.P.B. Foppen; D.W. Gibbons. (2005). Developing indicators for European birds. Philosophical Transactions of the Royal Society (Biological sciences) 360(1454): 269-288.*

6 *S.H.M Butchart, A.J. Stattersfield, J. Baillie, L.A. Bennun, S.N. Stuart, H.R. Akçakaya, C. Hilton-Taylor, G.M. Mace. (2005). Using Red List Indices to measure progress towards the 2010 target and beyond. Phil. Trans. R. Soc. B 360: 255–268.* Note: The y-axis represents the percentage change in the rate at which the relative projected extinction risk of birds is changing, as classified using the categories of the IUCN Red List (1988, the year of the first assessment, is set to 100).

7 Based on the World Database on Protected Areas (WDPA), maintained by UNEP-WCMC.

8 Marine Protected Areas: A considerable amount of the Marine Protected Areas data used in this publication / database / map was derived from MPA Global, a global database of MPAs developed by Louisa Wood, Sea Around Us Project, University of British Columbia Fisheries Centre, in collaboration with WWF and UNEP-WCMC. MPA Global was originally developed from the World Database on Protected Areas (WDPA), maintained by UNEP-WCMC, and much of the data in MPA Global has been used to update the WPDA. Please refer to www.mpaglobal.org and www.unep-wcmc.org for additional information on these MPAs. Any further use or publication of this data must include this acknowledgment. Terrestrial Protected Areas: Based on the World Database on Protected Areas (WDPA), maintained by UNEP-WCMC. Note: The analysis is based on the surface area of the designated protected areas whose centre point falls within a WWF terrestrial ecoregion in relation to the surface area of that ecoregion.

9 Based on the World Database on Protected Areas (WDPA), maintained by UNEP-WCMC. Note: The analysis is based on the surface area of the designated protected areas whose centre point falls within a WWF terrestrial ecoregion in relation to the surface area of that ecoregion.

10 *D. Pauly and R. Watson. (2005). Background and interpretation of the 'Marine Trophic Index' as a measure of biodiversity. Philosophical Transactions of the Royal Society (Biological Sciences) 360(1454): 415-423.* Note: The analysis in figure 2.10 includes small pelagic organisms, which reduce the Marine Trophic Index and make the decline in the Index appear less significant than stated in the text.

11 *R. Watson; G. Kitchingman; D. Pauly. (2004). Mapping global fisheries: sharpening our focus. Fish and Fisheries 5: 168-167.* Note: Grand mean trophic level of fisheries catches based on FAO statistics are disaggregated using the method described in this article.

12 *C. Nilsson, C.A. Reidy, M. Dynesius and C. Revenga. (2005). Fragmentation and Flow Regulation of the World's Large River Systems. Science 308: 405-408.* Note: River systems are treated as units and are represented on the map by their catchments. Systems excluded from the study for lack of data are shown in grey.

13 *T.G. Wade, K.H. Riitters, J.D. Wickham and K.B. Jones.(2003). Conservation Ecology 7(2) [online]. www.consecol.org/vol7/iss2/art7 http://www.biodiv.org/doc/publications/cbd-ts-11.pdf.* Note: The map was reprojected.

14 This figure has been modified from the one prepared by UNEP-GEMS/Water Programme for the second World Water Development Report.

15 *Millennium Ecosystem Assessment (2005). Ecosystems and Human Well-being: Synthesis. Island Press, Washington DC.* Note: The projection of future human input to 2050 has been omitted.

16 *J.N. Galloway, F. Dentener, D. Capone, E.W. Boyer, R.W. Howarth, S.P. Seitzinger, G. Asner, C. Cleveland, P. Green, E. Holland, D. Karl, A.F. Michaels, J.H. Porter, A. Townsend, and C. Vörösmarty. (2004). Nitrogen Cycles: Past, Present and Future. Biogeochemistry 70: 153-226.* Note: Models for 1860 and 2050 have been omitted.

17 *Based on data in Weidema, I. (ed.). 2000. Introduced Species in the Nordic Countries. Nord Environment 2000:13. Nordic Council of Ministers. Produced by the 'Nordic/Baltic Network on Invasive Alien Species (NOBANIS)' as a contribution to European biodiversity indicators in the context of 'Streamlining European 2010 Biodiversity Indicators (SEBI2010).*

18 *World Wide Fund for Nature, UNEP World Conservation Monitoring Centre, Global Footprint Network (2004). Living Planet Report. Edited by J. Loh and M. Wackernagel, Gland, Switzerland.*

19 *World Wide Fund for Nature, UNEP World Conservation Monitoring Centre, Global Footprint Network (2004). Living Planet Report. Edited by J. Loh and M. Wackernagel, Gland, Switzerland.*

Global Biodiversity Outlook 2 assesses the current status and trends of biodiversity and the key drivers of biodiversity loss. It provides a powerful case for the importance of biodiversity to human well-being. The report contains a succinct overview of the status of the implementation of the Convention on Biological Diversity, progress towards the 2010 Biodiversity Target and its contribution to the achievement of the Millennium Development Goals. As 2010 approaches, the document identifies key actions required at the individual, institutional and systemic levels to achieve the 2010 target.

"Activities that devastate the environment and societies continue unabated. Today we are faced with a challenge that calls for a shift in our thinking, so that humanity stops threatening its life-support system. We are called to assist the Earth to heal her wounds and in the process heal our own—indeed, to embrace the whole creation in all its diversity, beauty and wonder. This will happen if we see the need to revive our sense of belonging to a larger family of life, with which we have shared our evolutionary process."

—Wangari Maathai
2005 Nobel Peace Prize acceptance speech