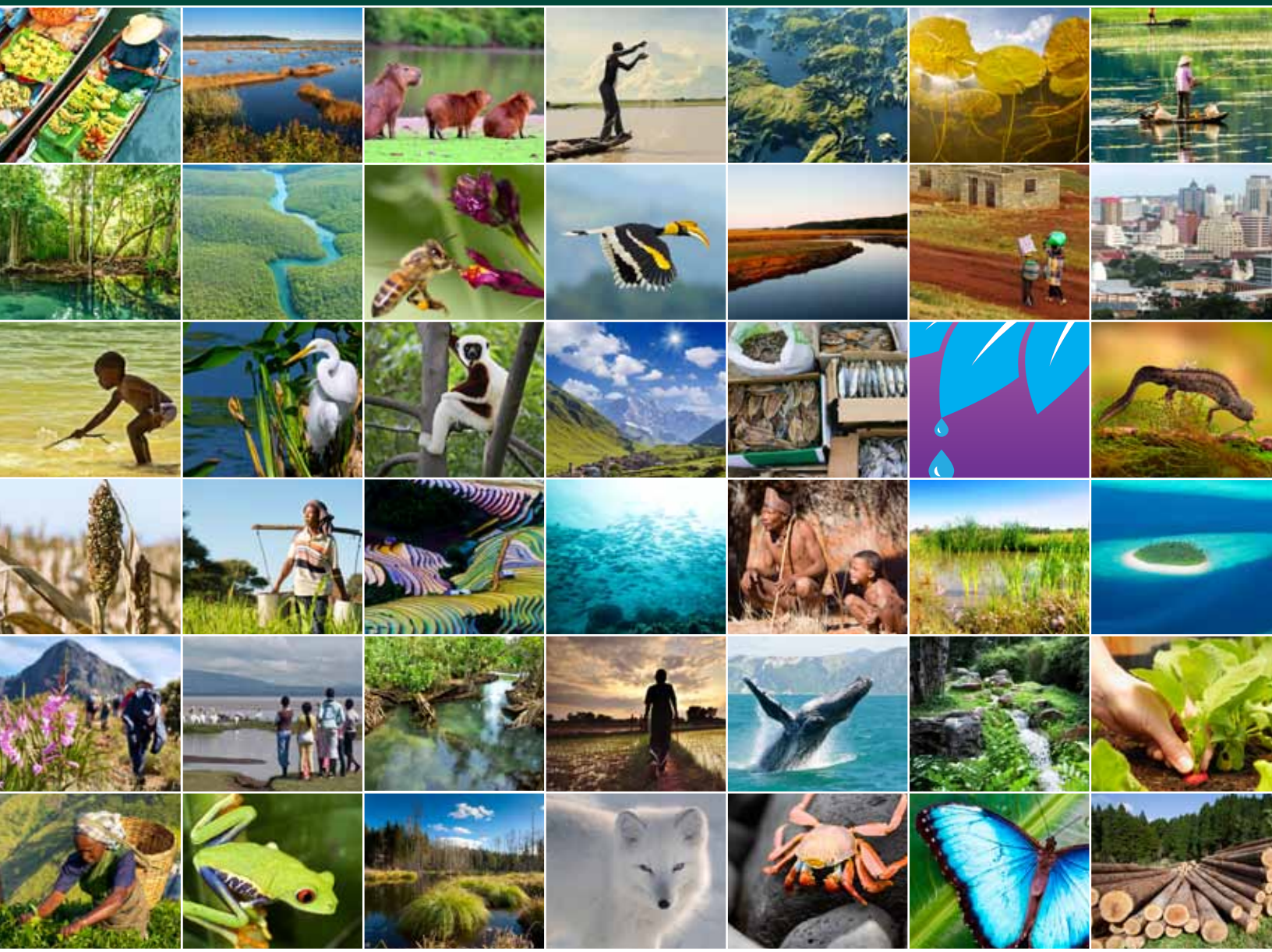
Water and Biodiversity

Summary of the findings of the Fourth Edition of the Global Biodiversity Outlook as they relate to water



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Convention on Biological Diversity

2011-2020 United Nations Decade on Biodiversity

The information in this publication draws heavily from the fourth edition of the Global Biodiversity Outlook (GBO-4) and its underlying reports, including CBD Technical Series 79 (www.cbd.int/gbo4). It is also based on the CBD publication Natural Solutions for Water Security (www.cbd.int/idb/2013/booklet). For acknowledgements and references please see these publications.

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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@cbd.int
Website: www.cbd.int

Introduction

The links between the water sector[1] and biodiversity involve both the impacts of the sector on biodiversity and the benefits the sector can receive from the ecosystem services provided by biodiversity. The water sector therefore should have a direct interest in safeguarding biodiversity both for its own use and for that of others. The Fourth Edition of the Global Biodiversity Outlook (GBO-4) undertook a mid-term review of progress towards the implementation of the internationally agreed Strategic Plan for Biodiversity 2011 – 2020 and its 20 Aichi Biodiversity Targets. This document presents a summary of the main findings from this report as relevant to the water sector. It is structured around the following key questions:

- How does biodiversity benefit the water sector?
- What is the current status of biodiversity?
- What do long-term scenarios for biodiversity tell us about water issues in the future?
- What needs to be done?

1 Here the water "sector" is understood in its broadest context and includes not only those stakeholders in the water supply, treatment and sanitation sectors, but also all relevant stakeholders involved in policies, management and actions that influence, or depend on, the availability and the quality of water. This includes issues relevant to industry, agriculture, forestry, tourism, environment, education and investment among others.

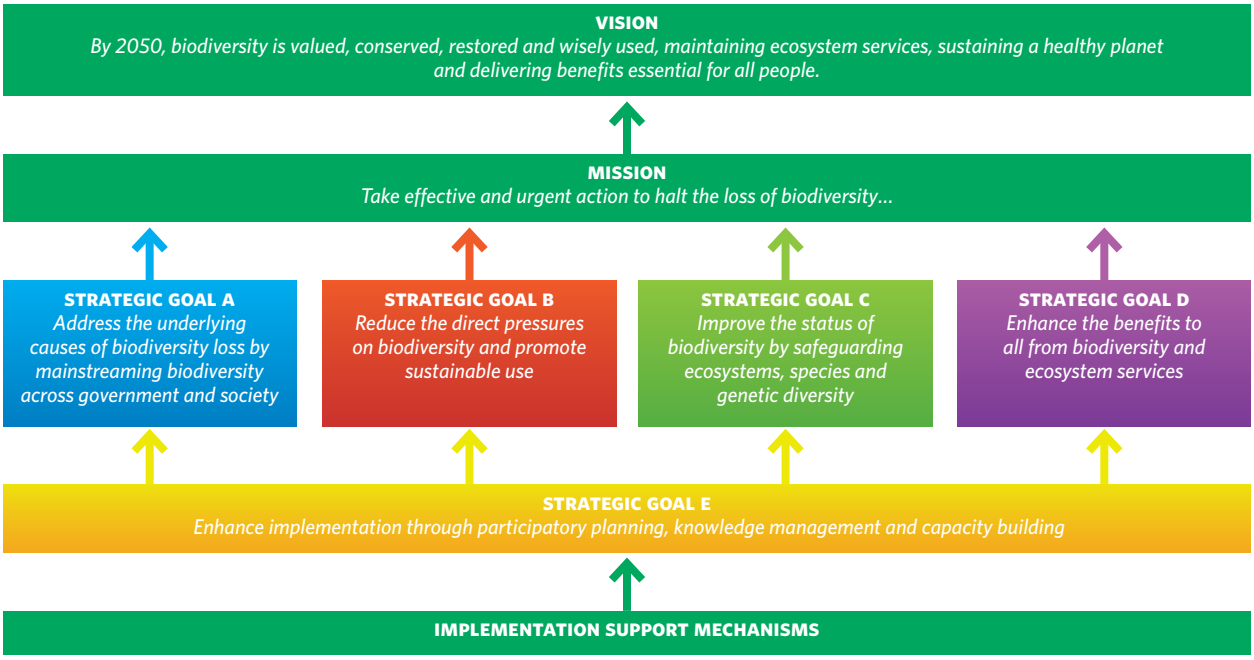
How does biodiversity benefit the water sector?

Water is an ecosystem service. Well-functioning ecosystems – forests, grasslands, soils, rivers, lakes, streams, wetlands, aquifers, estuaries and coastal waters – provide services that influence the availability of water and its quality. These services are also vital to meet water management goals such as water storage and flow regulation, filtering and flood and drought protection, among others. These ecosystem services are impacted by water and land management decisions and in turn influence water availability and quality. In addition biodiversity is directly implicated in maintaining most ecosystem functions that deliver these services but it is also a co-beneficiary of improved ecosystem conditions.

Some specific objectives of water management that ecosystems and biodiversity can assist in achieving are:

Urban water management - Protecting biodiversity, natural vegetation and other ecosystem attributes in catchment areas is part of proper land-use management. Intact ecosystems prevent the pollution of water sources, reduce erosion and prevent floods thus helping to deliver cleaner water more reliably. Natural, restored and constructed ecosystems within cities can provide

The Strategic Plan for Biodiversity 2011-2020 was adopted by the Conference of the Parties to the Convention on Biological Diversity in 2010. This plan provides an overarching framework on biodiversity, not only for the biodiversity-related conventions, but for the entire United Nations system and all other partners engaged in biodiversity management and policy development. It is comprised of a shared vision, a mission, strategic goals and 20 ambitious yet achievable targets, collectively known as the Aichi Biodiversity Targets. The Strategic Plan serves as a flexible framework for the establishment of national and regional targets and it promotes the coherent and effective implementation of the three objectives of the Convention on Biological Diversity.



This diagram shows the structure of the Strategic Plan for Biodiversity 2011–2020. Progress towards a 2050 Vision is achieved through a 2020 Mission. In turn, the Mission is addressed through five Strategic Goals under which the 20 Aichi Biodiversity Targets are organized, and supported by implementation mechanisms. The Strategic Plan serves as a flexible framework for the establishment of national and regional targets and it promotes the coherent and effective implementation of the three objectives of the Convention on Biological Diversity.

For more information about the Strategic Plan for Biological Diversity 2011-2020, please visit:

www.cbd.int/sp

natural infrastructure to support sustainable urban water drainage and storage.

Agricultural water management - Intact floodplains contribute to the regulation of seasonal water flows, securing water availability and quality for agriculture and industry. Buffer strips along water bodies are often used to reduce the run-off of nutrients, chemicals and sediments from farming, helping to improve water quality. Vegetation in the landscape supports local climates, including rainfall and groundwater infiltration, and water security for farming and livestock.

Water management for dams and hydropower- The management of vegetation and soils in catchments to prevent erosion and reduce sediment loads in reservoirs has long been good practice. Increasingly, ecosystem restoration is being used to significantly improve dam efficiency and life-expectancy. Healthy watersheds also regulate both surface and groundwater recharge of reservoirs and fisheries in reservoirs are increasingly being used as a source of food, income and recreation.

Disaster risk reduction – Ecosystem degradation has been implicated as a contributing factor in several major water related disasters. Conversely the value of intact ecosystems is being increasingly recognized as a means of disaster risk reduction. Ecosystems are increasingly being used to augment, or replace, built disaster reduction infrastructure, such as dykes, and often with significant economic gains resulting from reduced operational and capital costs. Similarly restoring soils and vegetation in dryland landscapes is becoming a significant and increasingly effective response to reducing risks from drought.

Drinking water supply - There is ever increasing experience in the conservation and restoration of ecosystems as an effective means to address needs for clean drinking water supply. Delivering clean water is already one of the primary motivations for establishing nature protection areas. Where poor water quality exists it is increasingly evident that improving catchment management can be much more cost-effective than treating water through artificial means.

What is the current status of biodiversity as it relates to water?

Multiple lines of evidence, including information provided by countries, scientific literature, indicator-based statistical extrapolations as well as longer term model based scenarios, show that significant additional efforts will be required if internationally agreed biodiversity commitments are to be met. On our current trajectory the status and trends of biodiversity will continue to decline with negative consequences for human wellbeing.

Current biodiversity trends are being driven by a set of indirect pressures. While public awareness of biodiversity and its importance appears to be increasing in both the developed and developing world, it remains at a low level in some countries. Important progress has been achieved in incorporating biodiversity values into planning processes and strategies to reduce poverty. There has also been progress when it comes to integrating natural capital into national accounts. Wide variations among countries remain, but international initiatives are helping to reduce these differences. Governments continue to provide subsidies harmful to biodiversity, and while agricultural and water subsidies are increasingly shifting towards positive incentives for conserving biodiversity, the evidence on whether these incentives will achieve their aims is inconclusive. While natural resources are being used much more efficiently to produce goods and services, this progress is overwhelmed by our greatly increased total levels of consumption. It is unlikely that ecosystems can be kept within safe ecological limits given current patterns of consumption.

Natural habitats play a major role in water regulation. Loss of habitats in some regions, for example the Brazilian Amazon, has been significantly slowed. However, deforestation in many other tropical areas of the world is still increasing, and habitats of all types, including grasslands, wetlands and river systems, which also support the water cycle, continue to be fragmented and degraded. Increased certified forestry, especially in boreal and temperate zones, and increased adoption of good agricultural practices signify more sustainable production. Nevertheless, unsustainable practices in agriculture, aquaculture and forestry, including as they relate to water, still cause substantial environmental degradation and biodiversity loss. Nutrient pollution has stabilized in parts of Europe and North America but is projected to increase in other regions, and remains a significant threat to aquatic and terrestrial biodiversity. Other forms of pollution such as from chemicals, pesticides and plastics are increasing. Governments are increasingly taking steps to control and eradicate invasive alien species, many of which are aquatic or have significant impacts on water. However the

overall rate of invasions, with great economic and ecological costs, shows no sign of slowing. Preventive measures have been taken in a limited number of countries.

Habitats important for ecosystem services, including in particular water-related ecosystem services, continue to be lost and degraded. However, restoration is under way for some depleted or degraded ecosystems, especially wetlands and forests, sometimes on a very ambitious scale, as in China. Many countries, organizations and companies have pledged to restore large areas. Abandonment of farmland in some regions including Europe, North America and East Asia is enabling 'passive restoration' on a significant scale. The need for water-related ecosystem services is a major driver of efforts in ecosystem restoration. Further, the benefit that protected areas provide in terms of water management remains a significant motivation for their establishment and management. Taking current commitments into account, good progress is being made in expanding the world's terrestrial protected areas network although protection of some ecosystem types remains underrepresented and many critical sites for biodiversity are poorly conserved.

What are the long-term scenarios for biodiversity under business as usual and do alternative development pathways?

The combined impact of escalating water abstraction rates, flow modification, wetland habitat conversion, flood protection measures, increased nutrient loads and pollution have altered aquatic ecology worldwide. Freshwater ecosystems have, relatively, the highest amount of species under threat of extinction and exhibit some of the fastest rates of biodiversity loss among all biomes. Wetlands in particular are threatened. Substantial changes from business-as-usual trends are needed in order to address these challenges and to meet three key global objectives: slow and then stop the loss of biodiversity; keep average global temperature increases below 2°C; and attain other human development goals. The GBO-4 and its supporting reports present plausible pathways for accomplishing this.

As many examples of recent environmental successes illustrate, solutions for a sustainable future will require a wide range of deep societal transformations – there is no individual, simple policy tool available to address all of these challenges. The pathways explored in GBO-4 do not represent a single set of actions but rather a suite of different approaches that could be used in developing a package of actions to address these challenges in a coherent way. The different approaches identified include increasing agricultural productivity and efficiency, the conservation and restoration of degraded and fragmented habitats as well as making effective use of abandoned land, giving more attention to consumption patterns and waste reduction, and promoting approaches to bioenergy and wood production which account for their effects on biodiversity. Three broad pathways, which make use of these approaches in different ways, were explored in GBO-4:

Global Technology - This pathway places an emphasis on elaborating large-scale technologically-optimal solutions, such as intensified production on relatively small areas, to increase agricultural yields, a reliance on market-based approaches and a high level of international coordination. The result is higher productivity on less land, therefore providing opportunities for

the effective conservation of remaining nature areas. Under this pathway the average loss of aquatic biodiversity is lowest, mainly because agricultural intensification condenses land use, thus reducing the need for further cropland area and wetland conversion. This scenario also assumes the greatest improvements in urban wastewater treatment.

Decentralized Solutions - This pathway focuses on regional solutions such as an increased sustainable and biodiversity-friendly use of land resources and agriculture that is interwoven with natural corridors. Specifically it calls for innovative ecological solutions (ecological intensification) that combine technological advances and a reliance on ecosystem services. This pathway results in mosaic landscapes, consisting of a mixture of agricultural land interspersed with natural elements. The increased focus on harnessing ecosystem services moderates overexploitation and, therefore, land degradation. This pathway shows the smallest benefits for freshwater as benefits from lower nutrient losses from less intensively used cropland are apparently counteracted by the larger cropland area. However, the scenarios have different impacts across regions.

Consumption Change - This pathway prioritizes changes in human consumption patterns, most notably by having per capita meat, dairy and egg consumption in line with dietary recommendations. It also calls for ambitious efforts to reduce waste in food consumption and production chains and to increase recycling and re-use of wood and paper. The overall effect of this pathway is a reduction in the global demand for crop production leading to a reduction in the need to convert natural areas for production purposes and a reduction in the need for other inputs such as water and fertilizers. This pathway has similar land-use impacts compared to the global technology pathway, mainly because of the changes in land use away from animal production and the reduction in food waste.

All three pathways (see figure on page 8) represent a significant improvement over the current business as usual scenario under which freshwater biodiversity suffers significant further loss. They also limit climate change to two degrees Celsius warming while halting biodiversity loss, combating desertification and land degradation and meeting human development goals. All three pathways require changes in society including much more efficient use of land, water, energy and materials, rethinking consumption habits and in particular major transformations of food systems. Ultimately, the combination of approaches would need to be tailored to national circumstances and conditions in order to be effective and the optimal or most effective combination would almost certainly require a mix of the different approaches.

What needs to be done?

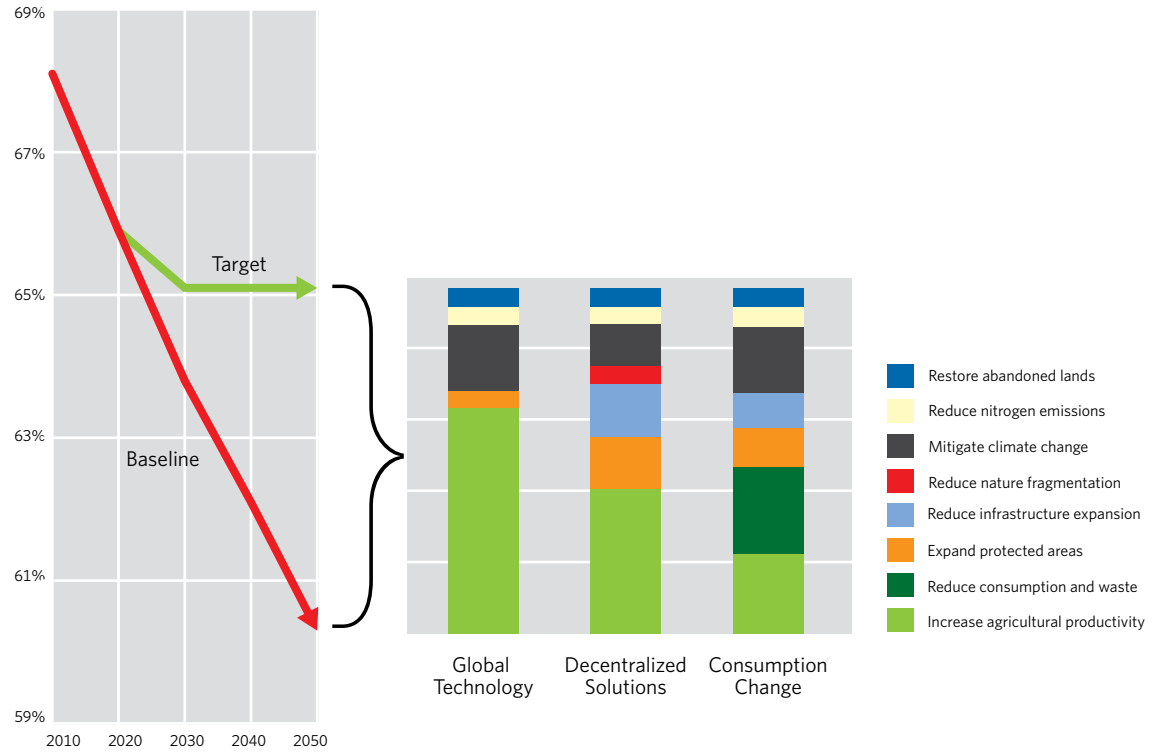
Ecosystem services based approaches offer the water sector the opportunity to improve its own water performance whilst simultaneously improving the status of biodiversity and contributing to a broader development agenda. In addition, any progress by the water sector with regards to water use efficiency, and sustainable consumption of water-dependent products is a contribution to biodiversity conservation, since all use the same water. Many actions to support these types of approaches are already underway but are in need of further support or mainstreaming to reach their full potential.

Economic and political frameworks need to be strengthened to help decision-makers change their way of thinking and acting. There is some progress in the incorporation of biodiversity and ecosystems into accounting, financial planning and reporting in the business sector, including regarding water. This is driven partly by increasing recognition of the economic gains on offer, including risk reduction and resilience, as well as an improving climate of corporate responsibility. The incorporation of water into natural capital accounts is already well advanced in many countries.

In general the adoption of ecologically sound water management is still in its infancy. Further mainstreaming biodiversity into the water sector is essential if biodiversity goals are to be achieved, but equally so if sustainability in the water sector is to be realized. The main condition for the wider implementation and success of relevant ecological practices is the systematic integration of biodiversity in all water-related investment pathways, supported by policy and funding.

Innovative organizational arrangements will be needed to implement ecological approaches across sectors and investment pathways, which are sometimes unable to be communicated effectively because of cultural differences. An example of this is sewage treatment (focused on effluent standards) versus aquatic ecology (focused on quality of the receiving waters). The identification and promotion of synergies, for instance the joint recognition of the need for water quality management, could help overcome such differences. This would also contribute to finding creative solutions to overcome cost partitioning. Integrated solutions usually combine multiple goals, but the costs and benefits are not necessarily attributed accordingly.

Mainstreaming biodiversity in water management can be done by strengthening and expanding the potential for ecological approaches in integrated water resource management. A combination of joint inter-sector



Contrasting pathways to sustainability using the Rio+20 socioeconomic scenarios. The scenarios illustrated here would each reach by 2050 the goals of slowing and eventually halting biodiversity loss, while also keeping global average temperature increases within two degrees Celsius and achieving a range of socio-economic development goals, including ending hunger, and providing universal access to safe drinking water, basic sanitation and modern energy sources. The goals can be reached by three different pathways.

analysis coupled with sector-wide application of integrated water resource management that takes into account the actual investment pathways (and its managing institutions) might be more effective.

Where possible, the restoration of natural systems and the use of green infrastructure should be prioritized, to reverse current degradation of aquatic ecosystems, restore biodiversity and safeguard the ecosystem services that water management ultimately depends on.

The agriculture sector as a whole urgently needs to deal with increasing degradation and natural resource scarcity. Targeted management of biodiversity would be part of broad strategies towards sustainable food security. Managing multi-purpose agriculture at the landscape level includes the mobilization of multiple sources of water, using a wide range of water storage options, including natural infrastructure, as well as the integration of agricultural production systems. This leads to high water-use efficiency within agro-ecosystems as well as at the landscape level, reconnecting previously

fragmented nature areas. A focus on ecosystem services thus enhances sustainable land use and reduces pollution. However, this requires dedicated institutions at the landscape and basin level, supported by strong legislation and reinforcement, all depending on the political will to preserve biodiversity and stimulate green growth.

For cities, the major actors are municipal councils or comparable institutions. Municipalities are driven by the need to supply a growing urban population with safe water and are often organized and funded so they can manage, or at least influence, their own watersheds. Strong coordination with agriculture is required to prevent eutrophication and pollution by agrochemicals. In low income countries, municipal policies need to move from restricting urban and peri-urban agriculture to the stimulation of the safe use of nutrient-rich wastewater for producing food and supporting livelihoods.

For the hydropower sector, a thorough analysis of costs and benefits of different ecosystem services should be carried out, and dam locations with the least impact should be preferred. Furthermore, sustainable dam management offers the possibility to release environmental flows to downstream ecosystems, enhancing biodiversity and other services, while allowing for fish migration. Hi-tech infrastructure and regulatory installations at large dams facilitate fine-tuning for multiple purposes including hydropower, irrigation and the urban water supply, as well as environmental flows and fisheries. Various alternatives to large dams that are both more sustainable and cost-effective are available.

As ecologically-based water management is generally more knowledge-intensive than traditional approaches, this offers numerous business opportunities for operating outside traditional disciplinary boundaries. A number of groups have enthusiastically started addressing the knowledge gap in the development of win-win solutions such as the combination of green and grey infrastructure for flood control and other benefits.

The water sector has both a responsibility to mitigate its negative effects on biodiversity and ecosystems and motivation to utilize the benefits of biodiversity on offer. Often, these work together to deliver solutions that meet both water development and biodiversity conservation goals under a broader sustainable development agenda.

Learn More

- Global Biodiversity Outlook 4 and its related reports - www.cbd.int/gbo4
- Strategic Plan for Biodiversity 2011-2020 - www.cbd.int/sp
- The Convention on Biological Diversity's Inland Water Programme - www.cbd.int/waters

The Convention on Biological Diversity is one of the three 'Rio Conventions', emerging from the UN Conference on Environment and Development, also known as the Earth Summit, held in Rio de Janeiro in 1992. It came into force at the end of 1993, with the following objectives: "The conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources, including by appropriate access to genetic resources and by appropriate transfer of relevant technologies, taking into account all rights over those resources and to technologies, and by appropriate funding." There are currently 194 Parties to the Convention (193 countries).

The *Global Biodiversity Outlook (GBO-4)* is the flagship publication of the Convention on Biological Diversity. The fourth edition of the report, along with its underlying reports, provides an assessment of progress towards meeting the 20 Aichi Biodiversity Targets and potential actions to accelerate that progress, on prospects for achieving the 2050 Vision for "Living in Harmony with Nature", and on the importance of biodiversity in meeting broader goals for sustainable human development during this century.

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@cbd.int
Website: www.cbd.int