2010 International Year of Biodiversity

Biodiversity and Climate Change Action

Recent CBD scientific findings on biodiversity and climate change

Information Note 1 for UNFCCC COP15

November 2009

It is now widely recognized that **climate change and biodiversity are interconnected**, not only through climate change effects on biodiversity, but also through changes in biodiversity and ecosystem functioning that affect climate change. The carbon cycle and the water cycle, arguably the two most important large-scale processes for life on Earth, both depend on biodiversity - at genetic, species, and ecosystem levels and can yield feedbacks to climate change.

The purpose of this note is to highlight the findings from several recent CBD reports (*see Table 1*) which further underline the interdependence of biodiversity and climate change, including in the areas of forest ecosystem resilience; ocean acidification; ocean fertilization; peatlands degradation; and ecosystem-based adaptation and mitigation. The findings of these reports, as well as the draft of the Third Global Biodiversity Outlook, show clear **linkages with the UNFCCC COP-15 agenda,** as well as with the agendas of UNFCCC subsidiary bodies and working groups.

Main Findings of the Ad Hoc Technical Expert Group on Biodiversity and Climate Change

The CBD Ad Hoc Technical Expert Group (AHTEG) on Biodiversity and Climate Change has **identified relevant linkages and developed recommendations** for the successful design and implementation of ecosystem-based adaptation and mitigation measures. Developed between November 2008 and October 2009, the AHTEG report's key messages can be structured around **three key points**:

Biodiversity and associated ecosystem services are impacted by climate change.

Biodiversity can help people adapt to climate change.

Biodiversity can help people mitigate climate change.

Main findings on biodiversity and climate change include:

- **Impacts have already been observed**; an increasing number of ecosystems, including areas of high biodiversity, are likely to be further disrupted by a temperature rise of 2°C or more above pre-industrial levels.
- 10 per cent of species assessed so far will face an increasingly high risk of extinction **for every 1°C rise** in global mean surface temperature (up to an increase of about 5°C).

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- **Wetlands, mangroves, coral reefs, Arctic ecosystems and cloud forests** are identified as being particularly vulnerable to climate change. In the absence of strong mitigation action, it is possible that **some cloud forests and coral reefs would cease to function** in current forms within a few decades.
- Climate change will have **predominantly adverse impacts** on many ecosystems and their services essential for human well-being. Climate change will **exacerbate other pressures acting on natural systems**, including land use change, invasive alien species and disturbance by fire.
- Societies need to be aware of the **adverse impacts of climate change response measures** on biodiversity and the provision of key ecosystem services. For example, some of the **geo-engineering options** currently being discussed by the scientific community may have significant negative impacts on biodiversity – CBD COP 9, for example, called for the precautionary approach to be applied to ocean fertilization activities given uncertainty over its impacts on marine biodiversity and associated ecosystem services.
- Ecosystem-based approaches which integrate biodiversity and provision of ecosystem services into overall climate change adaptation strategies, can be **cost-effective, can generate social, economic and cultural co-benefits and help maintain resilient ecosystems**.
- Ecosystem-based approaches and other sustainable land management activities for mitigation have potential **benefits for indigenous peoples and local communities** but a number of conditions are important for realizing these co-benefits: *land tenure, principle of free and prior informed consent, recognition of identities and cultural practices and participation in the policy-making process.*
- A portfolio of land use management activities, including the **protection of natural forest and peatland carbon stocks**, the sustainable management of forests, the use of native assemblages of forest species in reforestation activities, sustainable wetland management, restoration of degraded wetlands and sustainable agricultural practices can contribute to the objectives of both the UNFCCC and CBD.
- On the role of **forest ecosystem-based mitigation**[1]: Activities to reduce emissions from deforestation and forest degradation (REDD) have the potential to **deliver significant co-benefits for forest biodiversity** if mechanisms are designed appropriately *(further information on REDD and biodiversity is provided in a later section of this note)*. This means:
  a) recognizing the contribution of diverse forests, in particular primary forests, to long-term carbon sequestration/storage;
  b) considering the rights of indigenous and local communities;
  c) addressing important forest governance issues such as illegal logging.

Table 1 – Ad Hoc Technical Expert Group (AHTEG) on Biodiversity and Climate Change
and other CBD reports and newsletters on biodiversity and climate change

Biodiversity and Climate Change	**Reports and Newsletters**
First AHTEG on Biodiversity and Climate Change Established 2001 to consider the possible negative impacts of climate change related activities on biodiversity, identify the role of biodiversity in climate change mitigation and identify opportunities for achieving climate change and biodiversity co-benefits	*Interlinkages Between Biological Diversity and Climate Change.* CBD Technical Series No. 10. 2003. www.cbt.int/ts *Guidance for Promoting Synergy Among Activities Addressing Biological Diversity, Desertification, Land Degradation and Climate Change.* CBD Technical Series No. 25. 2006. www.cbt.int/ts

[1] Also refer to CBD Technical Series No. 43. Forest resilience, biodiversity and climate change. 2009.

Second AHTEG on Biodiversity and Climate Change Reconvened 2008 to provide biodiversity-related information to the UNFCCC process through the provision of scientific and technical advice and assessment on the integration of the conservation and sustainable use of biodiversity into climate change mitigation and adaptation activities	*Connecting Biodiversity and Climate Change Mitigation and Adaptation.* CBD Technical Series No. 41. 2009. www.cbt.int/ts *Review of the Literature on the Links between Biodiversity and Climate Change: Impacts, Adaptation and Mitigation*. Prepared by the UNEP-World Conservation Monitoring Centre for the AHTEG. CBD Technical Series No. 42 www.cbt.int/ts
Secretariat for the Convention on Biological Diversity – other publications *REDD and Biodiversity e-Newsletter*: The CBD Secretariat publishes a bi-monthly e-Newsletter to inform CBD National Focal Points and other interested recipients about biodiversity aspects in relation to "Reducing Emissions from Deforestation and Forest Degradation" (REDD). *Forest Resilience, Biodiversity and Climate Change.* CBD Technical Series No. 43. 2009. www.cbt.int/ts *Scientific Synthesis on the Impacts of Ocean Acidification on Marine Biodiversity* CBD Technical Series No. 46. In prep. *Scientific Synthesis on the Impacts of Ocean Fertilization on Marine Biodiversity* CBD Technical Series No. 45. In prep. *Water, Wetlands, and Forests: A review of ecological, economic, and policy linkages*. CBD Technical Series No. TBA. In prep.	

Key Issue: REDD and biodiversity

REDD and biodiversity recommendations from recent CBD scientific reports
The elements of REDD-plus[2] allow for a broad set of activities with different potential biodiversity benefits. Forest-based climate change mitigation and adaptation measures must be planned and implemented based on local conditions, and according to national legislation. To maximize multiple benefits, activities should be planned in a landscape context, based on the ecosystem approach. The CBD AHTEG on biodiversity and climate change has developed the following recommendations for optimizing biodiversity benefits of REDD, while respecting the rights of and generating benefits for indigenous peoples and local communities (for all references/sources, see *Connecting Biodiversity and Climate Change Mitigation and Adaptation. CBD Technical Series No. 41*). Furthermore, the CBD report *Forest Resilience, Biodiversity, and Climate Change*[3] highlights the importance of biodiversity for the permanence of forest carbon stocks (see below).

The exact impact of REDD on biodiversity will depend on its design and implementation, including its scope, carbon accounting methodology, monitoring and verification, and what strategies are implemented to reduce deforestation and forest degradation and promote more sustainable land management practices. There are several REDD design issues which will influence its potential to contribute to biodiversity conservation and sustainable use:

- **REDD methodologies based on assessments of only net deforestation rates could have negative impacts on biodiversity.** The use of net rather than gross deforestation rates[1] could obscure the loss of mature (i.e. primary and modified natural) forests by their replacement *in situ* or elsewhere with areas of new forest growth. This could be accompanied by significant losses of biodiversity as well as unrecorded emissions.
- **Addressing forest degradation is important because forest degradation may lead to the persistent loss of carbon and biodiversity, decreases forest resilience to fire and drought, and can lead to deforestation.[i]**

[2] Actions under paragraph 1 (b) (iii) of the Bali Action Plan of the United Nations Framework Convention on Climate Change (Issues related to policy approaches and positive incentives on issues relating to reducing emissions from deforestation and forest degradation in developing countries; and the role of conservation, sustainable management of forests and enhancement of forest carbon stocks in developing countries) are here referred to collectively as "REDD-plus", in line with AWG-LCA Non-Paper No. 39.
[3] CBD Technical Series No. 43. *Forest Resilience, Biodiversity and Climate Change*. 2009.

Monitoring to detect the severity and extent of forest degradation is therefore a key issue which needs further development.

- **Both intra-national and international leakage under REDD can have important consequences for both carbon and biodiversity and therefore needs to be prevented or minimized**.

Opportunities for implementing forest-related climate change mitigation options will vary across different landscape contexts, depending on the land-use history, current land-use activities and socioeconomic conditions. Three broad types of landscapes can be identified (Table 2) and a mixture of forest-related and agricultural options may be applicable in each of these landscapes:

1) In forest landscapes subject to ongoing clearing and forest degradation, climate change mitigation and biodiversity conservation can be achieved by reducing deforestation and forest degradation, and improving forest management;
2) In forest landscapes that currently have little deforestation or forest degradation occurring, the conservation of existing primary forests is critical both for protecting carbon stocks and preventing future greenhouse emissions, as well as for conserving biodiversity;
3) In forest landscapes that have already been largely cleared and degraded, climate change mitigation and biodiversity conservation can be achieved by enhancing carbon stocks through restoration and improved forest management, creating new carbon stocks (e.g., afforestation and reforestation), and improving agricultural management.

Table 2 provides further details ecosystem-based mitigation options (forest-based and non-forest-based) in the landscape context.

Table 2. Relevance of Different Climate Change Mitigation Options to Different Landscape Contexts

	Landscape context		
Land use management and forestry-based climate change mitigation options	**1. Landscapes where active deforestation and forest degradation are occurring**	**2. Landscapes where there is minimal or no deforestation and forest degradation**	**3. Landscapes which have largely been deforested**
Reducing deforestation and forest degradation	X		
Forest conservation	X	X	
Sustainable management of forest carbon stocks	X		X (potentially applicable to remnant forest patches in landscape)
Afforestation, reforestation and forest restoration	X (on already deforested or degraded land)		X
Implementation of sustainable cropland management	X (on deforested land)		X
Implementation of sustainable livestock management practices	X (on deforested land)		X
Implementation of agroforestry systems	X (on deforested or degraded land)		X
Conservation and restoration of peatlands, mangroves and other forested wetlands	X	X	X

The conservation of existing primary forests where there is currently little deforestation or forest degradation occurring provides important opportunities for both protecting carbon stocks and preventing future greenhouse emissions, as well as for conserving biodiversity. Most of the biomass carbon in a primary forest is stored in older trees or the soil. Land-use activities that involve clearing and logging reduce the standing stock of biomass carbon, cause collateral losses from soil, litter and deadwood and have also been shown to reduce biodiversity and thus ecosystem resilience. This creates a carbon debt which can take decades to centuries to recover, depending on initial conditions and the intensity of land use. Conserving forests threatened by deforestation and forest degradation and thus avoiding potential future emissions from land-use change is therefore an important climate change mitigation opportunity for some countries. Avoiding potential future emissions from existing carbon stocks in forests, especially primary forests, can be achieved through a range of means, including:

- designating and expanding networks of protected areas,
- establishing biological corridors that promote conservation in a coordinated way at large scales and across land tenures,
- establishing payments for ecosystem services including carbon uptake and storage,
- developing conservation agreements, easements and concessions,
- providing incentives to compensate land owners, stewards and indigenous peoples on their traditional lands for opportunity costs associated with forgoing certain kinds of development,
- promoting forms of economic development that are compatible with conservation and sustainable use of biodiversity, and
- adopting sound and effective technological and financial transfer mechanisms for conserving carbon stocks and biodiversity in those countries where forests still represent a significant asset.

Forest management that is closer to natural forest dynamics is likely to increase adaptive capacity. Maintaining or restoring species and genotypic diversity in these forests would increase their adaptive capacity (when some species or genotypes will no longer be suited to the altered environment), and their resistance against spreading pests. In addition, maintaining structural diversity (presence of various successional stages instead of even-aged stands) would increase forest resilience and resistance in the face of extreme events (wind-throw, ice/snow damage). At broader scales, adaptation can include the maintenance of different forest types across environmental gradients, the expansion of national and, where appropriate, regional systems of protected areas, the protection of climatic refuges, the reduction of fragmentation, and the maintenance of natural fire regimes, bearing in mind that as fire becomes a major threat to forests, risk assessment should be reviewed at the regional level and an alert system should be developed.

Successful implementation of plans for REDD requires the reduction of deforestation rates on a national scale. The designation of new **protected areas** and the strengthening of current protected area networks could form one strategy for achieving these goals. In current REDD discussions, protected areas are not considered, mainly because of the impression that carbon in protected areas is safe and that protected areas would not offer additional carbon sequestration. Yet protected areas remain vulnerable to degradation, with a significant number of the world's protected areas being poorly or inadequately managed. REDD depends on effectively designated, managed, and governed protected areas that would continue to protect carbon into the foreseeable future.

The consolidation and expansion of protected areas through regional landscapes offers one of the most cogent responses to large-scale implementation of REDD and particularly climate change adaptation. Implementing REDD activities in areas of high carbon stocks and high biodiversity values can promote co-benefits for climate change mitigation and biodiversity conservation and sustainable use. Several tools and methodologies to support biodiversity benefits are available or under development. The national gap analyses carried out by governments under the CBD programme of work on protected areas can be a valuable tool for identifying areas for the implementation of REDD schemes, in particular regarding the identification of priority forest areas for REDD activities at the national level[4].

Addressing forest degradation is important because forest degradation leads to a loss of carbon and biodiversity, decreases forest resilience to fire and drought, and can lead to deforestation. The definition of forest degradation is open to debate and can include unsustainable timber harvesting for commercial or subsistence use, in addition to other damaging processes such as fire and drought, all of which lead to reductions in carbon stocks and negatively impact biodiversity. Estimates of the extent of forest degradation are still uncertain, due to differences in the way in which forest degradation is defined and limited data availability. However, in some regions of the world, the area of logged and degraded forest is comparable to that deforested. For example, it is estimated that forest damage from logging in the Amazon results in a 15% reduction in carbon stocks and increased susceptibility to fire damage. At the same time, forest degradation generally threatens biodiversity by reducing habitat and the provision of ecosystem services.

Reforestation can make a significant contribution to enhancing forest carbon stocks and biodiversity within landscapes that have been largely deforested and degraded, if the reforestation is designed and managed appropriately. While reforestation with fast-growing monocultures, often exotics, can yield high carbon sequestration rates and economic returns, this type of reforestation often has little value for biodiversity conservation. However, reforestation can provide both biodiversity and climate change mitigation benefits if it uses an appropriate mix of native species, incorporates any natural forest remnants, and results in a permanent, semi-natural forest[5]. If appropriately designed and managed, reforestation activities on degraded lands can also relieve pressure on natural forests by supplying alternatives sources of sustainable wood products to local communities, thereby providing additional biodiversity and climate change mitigation benefits.

Afforestation can have positive or negative effects on biodiversity, depending on the design and management. Afforestation that converts non-forested landscapes with high biodiversity values (e.g., heath lands, native grasslands, savannas) and/or valuable ecosystem services (e.g., flood control) or increases threats to endemic biodiversity through habitat loss, fragmentation and the introduction of invasive alien species will have adverse impacts on biodiversity. However, afforestation activities can support biodiversity if they convert only degraded land or ecosystems largely composed of invasive alien species; include native tree species; consist of diverse, multi-strata canopies; result in minimal disturbance; consider the invasiveness of non-native species; and are strategically located within the landscape to enhance connectivity.

In forest landscapes currently subject to harvesting, clearing and/or degradation, climate change mitigation, biodiversity conservation and sustainable use can be best achieved by addressing the underlying drivers of deforestation and degradation, and improving the sustainable management of forests. Sustainable forest management (SFM) refers to a tool kit of forest management activities that emulate natural processes. These tools include planning for multiple values, planning at appropriate temporal and spatial scales, suitable rotation lengths, often decreasing logging intensities, and reduced impact logging that minimizes collateral damage to ground cover and soils. The application of internationally accepted principles of SFM in forests that are being degraded by current forestry practices can contribute to climate change mitigation, biodiversity conservation and sustainable use by enhancing carbon stocks and reducing greenhouse gas emissions. For example, a recent study demonstrated that improved management of tropical forest through reduced impact logging can reduce carbon emission by approximately 30%. Globally, it is estimated that the sustainable management of forests could reduce emissions by about 6.6 Gt C by 2030, which is approximately 3% of current emissions. However, especially in tropical forests,

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[4] More information is available in *The CBD PoWPA Gap Analysis: a tool to identify potential sites for action under REDD* at http://www.cbd.int/forest/

[5] Chazdon, R.L. 2008. Beyond deforestation: restoring forests and ecosystem services on degraded lands. *Science* 320: 1458-1459.

whilst such practices constitute a significant improvement on a "business as usual approach," they still result in depletion of *in situ* carbon stocks and increased emissions, along with reduced resilience and biodiversity loss, compared to an intact primary forest. If SFM practices are applied to previously intact primary forests, this could lead to increased carbon emissions and biodiversity loss, depending on the specific practices and the forest type.

REDD and benefits for indigenous peoples and local communities

The implementation of rights recognized in the United Nations Declaration on the Rights of Indigenous Peoples could be taken into account as a means of linking indigenous peoples' biodiversity-related practices to the potential benefits from REDD and other land management activities. While it is generally recognized that REDD and other land use management activities could provide potential benefits, including critical ecosystem services, to forest-dwelling indigenous peoples and local communities (ILCs), a number of conditions are important for realizing these co-benefits. Indigenous peoples are likely to benefit from land use management climate change mitigation options in cases where: they own their lands, there is the principle of free, prior and informed consent, their identities and cultural practices are recognized; and they have space to participate in policy-making processes.

There is a need for greater awareness and capacity-building for indigenous peoples and local communities on biodiversity and climate change issues, so that these groups can take an active role in deciding how to engage in climate change mitigation activities. It is also important that indigenous peoples can exchange their knowledge and practices of biodiversity conservation and sustainable management among themselves and have the opportunity to raise general awareness of such practices. At the same time, governments could benefit from indigenous peoples and local communities' traditional knowledge and practices related to biodiversity, and forest conservation and management.

If REDD is to achieve significant and permanent emissions reductions, it will be important to provide alternative sustainable livelihood options (including employment, income and food security) for those people, especially the rural poor who are currently amongst the agents of deforestation and forest degradation. Specific livelihood options are most likely to be successful when they are tailored to specific social, economic and ecological contexts and consider sustainability under both current and projected future climate conditions.

Global Assessment on Peatlands, Biodiversity and Climate Change[6]

Peatlands, which are wetland ecosystems, store about twice the carbon of the entire Earth's forest systems. They have high biodiversity values, particularly in tropical areas, and play significant roles in sustaining ecosystem services, including livelihoods. **Peatlands degradation is a major source of GHG emissions worldwide and a major source of biodiversity loss** and poverty impacts in tropical regions. Some estimates suggest that investments in avoided peatland degradation, or restoration, can be 100 times more cost effective than some other mitigation measures. Because the peat is stored below ground there have been some difficulties in undertaking appropriate carbon accounting in relation to the Kyoto Protocol. Many tropical peatlands are forested, and there are significant opportunities for multiple benefits from REDD initiatives in tropical forested peatland areas.

Key Issue: Climate-resilient ecosystems, climate-resilient people

It is increasingly clear that climate change, pollution, fragmentation and loss of habitat, invasive species infestations and over-use individually or together are resulting in severe impacts on the world's ecosystems and the services they provide (Box 1). Therefore, the combined effects of these may steadily and, in some cases, possibly sharply increase the vulnerability of the world's ecosystems and the services they provide, with important ecological, economic and

[6] The report is available at http://www.imcg.net/docum/pcb.htm. The CBD Secretariat contributed to the preparation of this report.

social implications. Further information about the importance of climate-resilient ecosystems[7] to underpin climate-resilient communities, refer to the UNEP issues paper on the role of ecosystems in climate change adaptation8 which:

- analyses the vicious spiral between climate change impacts, ecosystem degradation and increased risk of climate-related disasters;
- defines the central role of ecosystem management in climate change adaptation and disaster risk reduction and their multifaceted linkages; and
- assesses the challenges for enhanced ecosystem management for climate change adaptation and disaster risk reduction.

Also, the recent report for national and international policymakers of the Economics of Ecosystems and Biodiversity (TEEB) initiative discusses the links between poverty and the loss of ecosystems and biodiversity and the risks these pose to the achievement of several Millennium Development Goals[9]. The prospect of future, irreversible climate change adds to the urgency of achieving the objectives of the Convention on Biological Diversity (CBD): 1) The conservation of biological diversity; 2) The sustainable use of its components; 3) The fair and equitable sharing of benefits arising out of the utilization of genetic resources.

Maintaining and restoring biodiversity in ecosystems promotes their resilience to human-induced pressures and is therefore an essential "insurance policy" to safeguard against climate-change impacts. Acting now to mitigate greenhouse gas emissions and identify ecosystem-based adaptation and mitigation priorities can help reduce the risk of species extinctions and limit damage to the resilience of ecosystems. It can also help reduce risks to the provision of ecosystems services and the communities dependent on them. We can preserve intact habitats, especially those sensitive to climate change; improve our understanding of the relationship between climate change and biodiversity; and think of biodiversity as part of the solution to climate change.

Box 1: *Biodiversity and associated ecosystem services are highly vulnerable to climate change*

The Millennium Ecosystem Assessment (MA) identified climate change as a dominant driver of future biodiversity loss. The MA also found that climate change is projected to further adversely affect key development challenges, including the provision of clean water, energy services, and food; maintaining a healthy environment; and conserving ecological systems, their biodiversity, and associated ecological goods and services[10]. The IPCC 2007 Fourth Assessment Report provided further, stronger evidence that accelerated climate change is a result of human activity. It also identified significant implications of a warming planet for many regions and sectors, including the vulnerability of freshwater supply, ecosystems, food and coastal communities.

There is growing scientific consensus that more than 2°C of average global warming above the pre-industrial level (which relates to around 450 ppm atmospheric carbon dioxide equivalent[11]) would constitute a dangerous level of climate change with serious implications for the achievement of Millennium Development Goals, and the objectives of the CBD and other Rio Conventions. For example, scientists are concerned that if atmospheric carbon dioxide-equivalent concentrations are allowed to reach 450 ppm (due to occur by 2030-2040 at current rates), coral reefs will be in rapid and terminal decline worldwide from multiple

[7] *Resilience* – the capacity of an ecosystem to return to the pre-condition state following a perturbation, including maintaining its essential characteristics, taxonomic composition, structures, ecosystem functions and process rates (CBD Technical Series No. 43. *Forest Resilience, Biodiversity and Climate Change*. 2009. p. 5.

[8] The Role of Ecosystem Management in Climate Change Adaptation and Disaster Risk Reduction. UNEP Copenhagen Discussion Series. http://www.unep.org/climatechange/LinkClick.aspx?fileticket=rPyahT90aL4%3d&tabid=836&language=en-US

[9] *TEEB for national and international policymakers* available at http://www.teebweb.org/InformationMaterial/TEEBReports/tabid/1278/language/en-US/Default.aspx

[10] Ecosystems and Human Well-being – Policy Responses. Ch 13. p. 378. Available at http://www.millenniumassessment.org/documents/document.318.aspx.pdf

[11] See IPCC Fourth Assessment Working Group I Report, for example TS-5, p. 66.

synergies arising from mass bleaching, ocean acidification and other environmental impacts[12]. Also, on the global scale, ecosystems are currently acting as a carbon sink, sequestering 30% of anthropogenic emissions, but if no action is taken on mitigation, this sink will slowly convert to a carbon source. The reason for this conversion from sink to source is linked to temperature rises, increasing soil respiration, regional decreases in precipitation or increases in seasonality, thawing of peatlands, increasing wildfires, etc. Some studies suggest that this feedback could increase CO_2 concentrations by 20 to 200 ppm and hence increase temperatures by 0.1 to 1.5ºC in 2100. The level of global warming which would be required to trigger such a feedback is uncertain, but could lie in the range of an increase in global mean surface temperature of between 2 and 4ºC above pre-industrial levels, according to some models[13].

Global Biodiversity Outlook 3: Climate Change and Biodiversity

The third edition of Global Biodiversity Outlook (to be released in May 2010) will present several messages regarding climate change based the third and fourth national reports submitted by Parties to the CBD, information provided by the Biodiversity Indicators Partnership and a review of scientific literature. The messages are both positive and negative. On one hand climate change is already impacting biodiversity and is projected to become a progressively more significant threat to biodiversity in the coming decades. It is expected that many species will be unable to keep up with the changes caused by climate change and as a result will be at an increased risk of extinction as the resilience of ecosystems will be threatened broadly. On the other hand, while biodiversity can be negatively effected by climate change, **determined and appropriate action to protect biodiversity can reap rich rewards by helping us to slow climate change by enabling ecosystems to store and absorb more carbon** and will help people adapt to climate change by adding resilience to ecosystems and making them less vulnerable. The protection and restoration of resilient ecosystems provide some of the most cost-effective means of limiting both the scale and negative consequences of climate change. From the information available, it is clear that addressing the multiple drivers of biodiversity loss is a vital form of climate change mitigation and adaptation.

Ecosystem-based mitigation and adaptation[14]: two sides of the same coin

Climate change is a serious threat to ecosystems. At the same time, healthy ecosystems can provide natural buffers to the impacts of climate change, especially extreme weather events. Improving the health of ecosystems is one way of adapting to climate change and yields multiple environmental, economic and social benefits.

At its fifth Conference of the Parties in 2000 the CBD adopted the ecosystem approach as the primary framework for implementation of the convention. The ecosystem approach[15] 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 appropriate 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. Key elements of ecosystem-based approaches to managing risks to biodiversity from human activity include:

- Focussing on the relationships and processes within ecosystems;
- Enhancing benefit-sharing;
- Using adaptive management practices;

[12] Veron et al. 2009. The coral reef crisis: the critical importance of <350 ppm CO2. *Marine Pollution Bulletin*.58: 1428-1436.
[13] *CBD (2009). Connecting Biodiversity and Climate Change Mitigation and Adaptation. Report of the Second Ad Hoc Technical Expert Group on Biodiversity and Climate Change. CBD Technical Series No. 41*
[14] Ecosystem-based adaptation is discussed in the AHTEG report *Connecting Biodiversity and Climate Change Mitigation and Adaptation.* CBD Technical Series No. 41. 2009.
[15] For more information see the SCBD website at http://www.cbd.int/ecosystem/

- Carrying out management actions at the scale appropriate for the issue being addressed, with decentralization to the lowest level, as appropriate; and
- Ensuring intersectoral cooperation.

Ecosystem-based approaches to biodiversity conservation and management are applicable to climate change adaptation and mitigation because they:

- Can be applied at regional, national and local levels, at both project and programmatic levels, and benefits can be realized over short and long time scales;
- May be more cost-effective and more accessible to rural or poor communities than measures based on hard infrastructure and engineering; and
- Can integrate and maintain traditional and local knowledge and cultural values.

Ecosystem-based adaptation can help to achieve a number of multiple benefits, including for adaptation, biodiversity, mitigation and livelihoods; see also Table 3 for examples. Examples of ecosystem-based adaptation include (see also Box 2):

- Sustainable water management where river basins, aquifers, flood plains and their associated vegetation provide water storage and flood regulation;
- Disaster risk reduction where restoration of coastal habitats such as mangroves, or the flood mitigation services provided by wetlands, can be a particularly effective measure against storm-surges, coastal erosion and flood risk;
- Sustainable management of grasslands and rangelands, to enhance pastoral livelihoods;
- Establishment of diverse agricultural systems, where using indigenous knowledge of specific crop and livestock varieties, maintaining genetic diversity of crops and livestock, and conserving diverse agricultural landscapes secure food provision in changing local climatic conditions; and
- Establishing and effectively managing protected-area systems to ensure the continued delivery of ecosystem services that increase resilience to climate change.

Many of these and other ecosystem-based activities can be designed and implemented in such a way to enhance the conservation and management of biodiversity and the longer-term provision of key ecosystem services. With regard to the carbon storage service of ecosystems, ecosystem-based mitigation can integrate carbon and biodiversity conservation and management activities to enhance resilience of terrestrial and coastal/marine ecosystems[16].

[16] See UNEP *The Natural Fix?: The Role of Ecosystems in Climate Mitigation* at http://www.unep.org/publications/search/pub_details_s.asp?ID=4027 and *Blue Carbon: The Role of Healthy Oceans in Binding Carbon* at http://www.unep.org/climatechange/Publications/Publication/tabid/429/language/en-US/Default.aspx?BookID=4066

Table 3: Co-benefits of ecosystem-based climate change responses
(from pp. 43-44, CBD Technical Series 41 – Connecting Biodiversity and climate change)

Activity	Adaptive Function	Social and cultural	Economic	Biodiversity (linked to carbon, water, climate services)	Mitigation
Mangrove conservation	Protection against storm surges, coastal erosion associated with sea- level rise etc.	Fisheries and prawn cultivation – local employment and food security	Income generated through mangrove products	Conservation of mangrove-dependent species	Conservation of carbon stocks (above and below ground)
Forest conservation and sustainable forest management	Maintenance of nutrient and water flow, prevention of landslides	Recreation, culture, shelter	Ecotourism, recreation, sustainable logging	Conservation of habitat for forest-dependent species	Carbon storage
Restoration of degraded wetlands	Maintenance of nutrient and water flow, quality, storage and capacity; Protection from flood or storm inundation	Sustained provision of livelihood, recreation, employment opportunities	Increased livelihood generation, revenue from recreational activities, sustainable use, sustainable logging of trees	Conservation of wetland flora, fauna breeding and feeding habitat, including stopver sites for migratory species	Reduced emissions from carbon mineralisation
Diverse agroforestry in agricultural land	Diversification of agricultural production to cope with changed climate	Contribution to food and fuel wood security	Generation of income from sale of timber, firewood, etc.	Conservation of biodiversity in agricultural landscape	Carbon storage (above and below ground biomass)
Conservation of agrobiodiversity	Provision of specific gene pools for crops and livestock adaptation to climate variability	Enhance food security, diversification of food products, conservation of local, traditional knowledge and practices	Income generation in difficult environments; Pollination of cultivated crops by bees	Conservation of genetic diversity of crops and livestock	
Conservation of medicinal plants	Availability of local medicines to deal with health problems resulting from climate change or habitat degradation	Reliable local supply of medicines, conservation of local, traditional knowledge	Source of income for local people	Enhanced medicinal plant conservation (genetic diversity)	Bee and insect pollination for cultivated crops
Sustainable management of grassland	Protection against flood, storage of nutrients, maintains soil structure	Recreation and tourism	Income for local communities, e.g., grass products	Forage for grazing animals, diverse habitat for animals	Carbon storage

Box 2: Examples of Ecosystem-based Adaptation Approaches
(For further information see annex 1 of CBD Technical Series No. 41, *Connecting Biodiversity and Climate Change*)

Coral Triangle Initiative on Coral Reefs, Fisheries and Food Security (CTI-CFF): Indonesia, Malaysia, Papua New Guinea, the Philippines, Solomon Islands and Timor Leste. To conserve/sustainably manage coastal and marine resources within the Coral Triangle region, thus contributing to strengthened food security, increased resilience and adaptation to climate change.

Costa Rica Biological Corridor Program (part of the Mesoamerican Conservation Corridor): a proposal for improving structural connectivity for the National System of Protected Areas, includes an ecological conservation network to improve the connectivity between protected areas and habitat remnants.

Nariva Wetland Restoration Project-Trinidad and Tobago (World Bank Project): Reforestation and restoration of the Nariva wetlands ecosystem (7,000 ha), a biodiversity-rich environment with a mosaic of vegetation communities (tropical rain forest, palm forests, mangroves, and grass savannah/marshes).

Marine Protected Areas in Kimbe Bay, PNG: Establish a network of marine protected areas that will conserve globally significant coral reefs and associated biodiversity, and sustain fisheries that local communities depend on for food and income.

Mangrove restoration in Viet Nam: Restore coastal mangrove forests along the coasts of Vietnam to provide improved protection of communities and coasts.

Restoring floodplains along the Danube River, in Eastern Europe: Restore 2,236 km^2 of floodplain to form a 9,000 km^2 "Lower Danube Green Corridor". Once restored, they are estimated to provide flood control and other ecosystem services valued at 500 Euros per hectare per year.

***Gondwana Link*, Australia:** to achieve "Reconnected country across south-western Australia…in which ecosystem function and biodiversity are restored and maintained". The region is experiencing ongoing ecological degradation and threats from fragmentation, salinity and climate change.

Wetlands, freshwater resources and climate change

Many of the major impacts of climate change on ecosystems and people are occurring through changes in the water cycle. The Intergovernmental Panel on Climate Change (IPCC) Technical Paper on Climate Change and Water[17] concludes, *inter alia*, that: the relationship between climate change and freshwater resources is of primary concern and interest; so far, water resource issues have not been adequately addressed in climate change analyses and climate policy formulations; and, according to many experts, water and its availability and quality will be the main pressures and issues, on societies and the environment under climate change. As the availability of water resources for ecosystems and people changes (e.g., increasing droughts and floods) the key adaptation response is to sustain or restore the water-related services that both aquatic (wetland) and terrestrial ecosystems provide. For example, wetland restoration is already being implemented as a means to improve water security, one of the most valuable services provided by forests is sustaining water supplies. An estimated 44% of cities worldwide obtain their drinking water from protected forested areas managed primarily for that purpose.[18] Water-related services provided by ecosystems (both wetlands and terrestrial components) is a major driver of the establishment and management of protected areas worldwide, including for forests[19]. Linkages between biodiversity, water and climate change present some of the best examples whereby nature can help us cope with climate change. There are many examples of how

[17] Bates et al. 2008 *Technical Paper on Climate Change and Water* IPCC Secretariat, Geneva
[18] *Water, Wetlands and Forests*. CBD Technical Series. In press
[19] Ibid.

such ecosystem-based adaptation approaches can not only improve sustainability but also greatly reduce adaptation costs.

Forest Resilience, Biodiversity, and Climate Change
The synthesis report, *Forest Resilience, Biodiversity, and Climate Change* [20], analyzed over 400 peer-reviewed articles on the resilience/biodiversity relationship in forest ecosystems, with a particular view to climate change. Its findings strongly support the conclusion that **forest ecosystem resilience depends on biodiversity, at multiple scales**. This has important implications for climate change adaptation and mitigation measures, including REDD (e.g. for permanence of carbon stocks). The carbon pool was found to be largest and most stable in old primary forests, especially in the wet tropics, which are stable forest systems with high resilience. Primary forests are generally more resilient than modified natural forests or plantations, and it is crucial that policies and measures that promote their protection yield both biodiversity conservation and climate change mitigation benefits, in addition to a full array of ecosystem services. It further stresses that the resilience inherent to intact forest ecosystems – fully functional units of plants, animals, micro-organisms, and fungi – provide the best adaptation of forest ecosystems to climate change, and helps ensure that forests meet the needs of present and future generations. However, if pushed past an ecological "tipping point," forest ecosystems could transform into a different forest type. In extreme cases, a new non-forest ecosystem state could emerge, for example, to savannah. The new ecosystem state would invariably be poorer in terms of both biological diversity and delivering ecosystem goods and services.

Protected areas, ecosystem resilience and climate change
The UNFCCC already recognizes the value of ecosystem resilience in article 2 of its Convention. Furthermore, UNFCCC COP 14 introduced the term "ecosystem-based adaptation". However, the contribution of protected areas to ecosystem resilience and ecosystem-based adaptation is not yet explicitly recognized by UNFCC. Climate adaptation "on the ground" cannot and should not be addressed exclusively by human-made infrastructure. Climate-resilient development should also include, where appropriate, ecosystem-based adaptation. Given the important role of protected areas in biodiversity conservation and thereby increasing ecosystem resilience, protected areas should be an explicitly recognized component of an ecosystem-based adaptation strategy.

Protected areas can serve as important elements of climate change adaptation in several ways: 1) provide unbroken blocks of intact habitat; 2) provide places for species and ecosystems to shift their ranges; 3) increase ecosystem resilience and recovery by providing intact structures and natural processes; 4) provide protection against the physical impacts of climate change such as rising sea levels, rising temperatures, and extreme weather events[21]; and (5) sustain water supplies and increase water security under changing hydrological conditions. In addition, corridors between protected areas will become increasingly important to climate change adaptation. **Better managed, better connected, better governed and better financed protected areas are recognized as key to both mitigation and adaptation responses to climate change.** Protected areas are also subject to the impacts of climate change, and these risks need to be better understood and anticipated.

Ecosystems and carbon storage: About 2,500 Gt C is stored in terrestrial ecosystems; an additional ~ 38,000 Gt C is stored in the oceans (37,000 Gt in deep oceans, i.e., layers that will only feed back to atmospheric processes over very long time scales, and ~ 1,000 Gt in the upper layer of oceans) compared to approximately 750 Gt C in the atmosphere. On average ~160 Gt C cycle naturally between the biosphere (in both ocean and terrestrial ecosystems) and atmosphere. Thus, small changes in ocean and terrestrial sources and sinks can have large implications for atmospheric CO_2 levels. Human-induced climate change caused by the accumulation of anthropogenic emissions in

[20] *Forest resilience, biodiversity and climate change*. 2009. CBD Technical Series No. 43
[21] Mulongoy, K.J. and S.B. Gidda (2008). *The Value of Nature: Ecological, Economic, Cultural and Social Benefits of Protected Areas*. Available at www.cbd.int/doc/publications/cbd-value-nature-en.pdf

the atmosphere (primarily from fossil fuels and land use changes) could shift the net natural carbon cycle towards annual net emissions from terrestrial sinks, and weaken ocean sinks, thus further accelerating climate change.

Of the terrestrial global carbon stock, more than 15% is contained within the current terrestrial protected area network, with more likely in the future as governments continue to designate new protected areas in the last remnants of intact, high-carbon areas (e.g., in the Arctic, tropical rainforests, and Taiga forests). In some tropical regions, such as Central and South America, this proportion is even higher than 25%. Protected areas are critical in preventing further carbon emissions from degradation and development, and provide an important contribution to an overall strategy for climate change mitigation. For example, a total of 312 Gt of terrestrial carbon is currently stored in the protected area network, which would be equivalent to 1,142 Gt CO_2 if lost to the atmosphere—or more than 43 times the total annual global emissions from fossil fuel (26.4 Gt).[22] Furthermore, protected areas often act as important barriers for land conversion and help in containing greenhouse gas emissions from altered land use of forest and other ecosystems. Strengthening the protected area network, particularly in areas of high deforestation pressure and high carbon, such as the Neotropics and Tropical Asia, could be one strategy to reduce emissions from deforestation and degradation.

An estimated 50% of the carbon in the atmosphere that becomes bound in natural systems is cycled into the seas and oceans. The most crucial climate change-combating coastal ecosystems are disappearing at an alarming rate. This includes mangroves, salt marshes and seagrasses, responsible for capturing and storing up to 70% of the carbon stored permanently in the marine realm[23].

Ocean acidification, and its impacts on marine biodiversity and habitats, has been identified as a potentially serious threat to cold-water corals and other marine biodiversity. In the absence of strong mitigation action, the risk to marine ecosystem resilience is high (this is discussed later). Key adaptation options to enhance the resilience of marine and coastal biodiversity include:

- The further development of integrated approaches to coastal and marine zone management;
- Implementing ecosystem-based approaches to the conservation and long-term sustainable use of marine and coastal living resources in a manner that respects both societal interests and the integrity of ecosystems;
- Enhancing efforts to expand networks of marine protected areas to conserve biological diversity and associated ecosystems through, for example, protecting critical spawning and nursery habitats to help them recover from stresses with spillover benefits to adjacent areas, (for example, for supporting fish stocks in areas beyond marine protected area boundaries); and
- Reducing the spread of invasive alien species.

Key Issue: Marine biodiversity, ecosystem services and climate change

The IPCC 4th Assessment Report (AR4) report highlighted that the most vulnerable marine ecosystems include warm water coral reefs, cold water corals, the Southern Ocean and sea-ice ecosystems. It also noted that climate change will have major impacts on coastal ecosystems, including coastal marshes and mangroves. Coastal and near-shore ecosystems are already under multiple stresses which will be exacerbated by climate change and ocean acidification. The predicted consequences from ocean acidification for marine plants and animals, food security and human health

[22] IPCC 2007 as quoted by Campbell et al. 2008. *Carbon Storage in Protected Areas – Technical Report*. UNEP-WCMC. http://www.unep-wcmc.org/climate/pdf/Carbon%20storage%20in%20protected%20areas%20technical%20report.pdf
[23] UNEP/GRID-Arendal. *Blue Carbon – the role of healthy oceans in binding carbon*.

are profound, including disruption to fundamental biogeochemical processes, regulatory ocean cycles, marine food chains and production, and ecosystem structure and function.

Ocean Acidification

In its decision IX/20 (marine and coastal biodiversity), the Conference of the Parties to the Convention on Biological Diversity requested the Executive Secretary, in collaboration with Parties, other Governments, and relevant organizations, to compile and synthesize available scientific information on **ocean acidification and its impacts on marine biodiversity and habitats**, which is identified as a potentially serious threat to cold-water corals and other marine biodiversity, and to make such information available for consideration at a future meeting of the Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA) prior to the tenth meeting of the Conference of Parties.

Pursuant to the above request, the CBD Secretariat prepared, in collaboration with UNEP-WCMC, a report on the scientific synthesis on the impacts of ocean acidification on marine biodiversity. Key findings of the report[24] include:

- The surface ocean plays a critical role in the global carbon cycle, **absorbing approximately one quarter of the carbon dioxide** emitted to the atmosphere from the burning of fossil fuels, deforestation, and other human activities. As more and more anthropogenic CO_2 has been emitted into the atmosphere, the ocean has absorbed greater amounts at increasingly rapid rates. In the absence of this service by the oceans, atmospheric CO_2 levels would be significantly higher than at present and the effects of global climate change more marked.
- The absorption of atmospheric CO_2 has, however, resulted in **changes to the chemical balance of the oceans** (which are naturally slightly alkaline), causing them to become more acidic. Ocean acidity has increased significantly (by 30%) since the beginning of the Industrial Revolution 250 years ago.
- Atmospheric CO_2 concentrations are predicted to increase by 0.5%-1.0% per year throughout the 21st century. Ocean acidification directly follows the accelerating trend in world CO_2 emissions, and the magnitude of ocean acidification can be ascertained with a high level of certainty based on the predictable marine carbonate chemistry reactions and cycles within the ocean. Future predictions indicate that by 2050 ocean acidity could increase by 150%. This significant increase is **100 times faster than any change in acidity experienced in the marine environment over the last 20 million years**, giving little time for evolutionary adaptation within biological systems.
- Increasing ocean acidification reduces the availability of carbonate minerals in seawater, important building blocks for marine plants and animals. Carbonate ion concentrations are now lower than at any other time during the last 800,000 years. Furthermore, given current emission rates, it is predicted that the **surface waters of the highly productive Arctic Ocean will become under-saturated** with respect to essential carbonate minerals by the year 2032, and the Southern Ocean by 2050 with disruptions to large components of the marine food web. Seasonal fluctuations in carbonate mineral saturation in the Southern Ocean could mean that detrimental conditions for the continuing function of marine ecosystems, especially calcifying organisms, develop on much shorter timeframes.
- By 2100 it has been predicted that **70% of cold-water corals, key refuges and feeding grounds for commercial fish species, will be exposed to corrosive waters**. Tropical waters, such as those around the Great Barrier Reef will also experience rapid declines in carbonate ions, reducing rates of net warm water coral reef accretion and leaving biologically diverse reefs outpaced by bioerosion and sea-level rise.
- An emerging body of research suggest that many of the **effects of ocean acidification on marine organisms and ecosystems will be variable and complex**, impacting developmental and adult phases differently across species depending on genetics, pre-adaptive mechanisms, and synergistic environmental factors. Evidence

[24] *Scientific Synthesis on the Impacts of Ocean Acidification on Marine Biodiversity* CBD Technical Series No. 46. In prep.

from naturally acidified locations confirms, however, that although some species may benefit, biological communities under acidified seawater conditions are less diverse and calcifying species absent.

- Many questions remain regarding the biological and biogeochemical consequences of ocean acidification for marine biodiversity and ecosystems, and the impacts of these changes on oceanic ecosystems and the services they provide, for example, in fisheries, coastal protection, tourism, carbon sequestration and climate regulation. In order to accurately predict the consequences the **ecological effects must be considered alongside other environmental changes associated with global climate change**.
- **Ocean acidification is irreversible on timescales of at least tens of thousands of years**, and substantial damage to ocean ecosystems can only be avoided by urgent and rapid reductions in global emissions of CO_2, and the recognition and integration of this critical issue in the global climate change debate.

Ocean Fertilization

In its decision IX/20 (marine and coastal biodiversity), the Conference of the Parties to the Convention on Biological Diversity, taking into account the role of the International Maritime Organization, also requested the Executive Secretary to seek the views of Parties and other Governments, and, in consultation with the International Maritime Organization, other relevant organizations, and indigenous and local communities, to compile and synthesize available scientific information on **potential impacts of direct human-induced ocean fertilization on marine biodiversity**, and to make such information available for consideration at a future meeting of the Subsidiary Body on Scientific, Technical and Technological Advice prior to the tenth meeting of the Conference of the Parties.

Pursuant to the above request, the CBD Secretariat prepared, in collaboration with UNEP-WCMC, a report on the scientific synthesis on the impacts of ocean fertilization on marine biodiversity. Key findings of the report[25] include:

- The ocean is one of the **largest natural reservoirs of carbon**, storing about 20 times more carbon than the terrestrial biosphere and soils, and playing a significant role in the regulation of atmospheric CO_2 and climate due to its large heat capacity and global scale circulation mechanisms. Globally, the oceans have accumulated up to one third of the total CO_2 emissions arising from burning fossil fuels, land use change and cement production, among others, within the last 250 years. Anthropogenic emissions of CO_2 continue to significantly increase atmospheric CO_2 concentration, which in turn is expected to bring about significant global temperature increases with both predicted and unforeseen implications for humans and the environment.
- There is a **clear need for a reduction in greenhouse gas emissions** in line with internationally agreed targets to reduce the rate of climate change, necessitating the implementation of clean energy technologies, supported by a range of mitigation and adaptation measures. According to the IPCC, iron fertilization of the oceans may offer a potential strategy for removing CO_2 from the atmosphere by stimulating the growth of phytoplankton and thereby sequestering CO_2 in the form of particulate organic carbon. However, the IPCC states that commercial ocean iron fertilization remains largely speculative, and many of the environmental side effects have yet to be assessed.
- Scientific studies into the potential mechanisms for global climate modulation, involving **ocean fertilization activities**, have consistently demonstrated the stimulation of phytoplankton biomass through the addition of macro or micro nutrients in certain nutrient-deficient areas of the oceans. However the consistent and significant downward transport of the captured carbon (biologically fixed carbon) into the deep waters of the ocean, as would be required by an effective commercial CO_2 sequestration tool, is not well substantiated.
- The natural variability and fluctuations in biogeochemical processes within the oceans, coupled with an incomplete understanding of the linkages and drivers within this complex system, introduces **uncertainty in the extrapolation of experimental observations to the temporal and spatial scales** proposed for carbon sequestration by commercial ocean fertilization. A dearth of baseline information in the areas suitable for fertilization, and significant costs and logistical constraints of large-scale commercial ocean fertilization

[25] *Scientific Synthesis on the Impacts of Ocean Fertilization on Marine Biodiversity* CBD Technical Series No. 45. In prep.

experiments also limits the accurate observation and monitoring of impacts to marine biodiversity resulting from the intentional alteration of chemical and biological processes. This means that unconfirmed modeled simulations are often the only tool available for estimating the longer term impacts.

- Given the present state of knowledge, **significant concern surrounds the intended and unintended impacts of large-scale ocean fertilization** on marine ecosystem structure and function, including the sensitivity of species and habitats and the physiological changes induced by micro nutrient and macro nutrient additions to surface waters. Accurate assessment of the costs and benefits of commercial ocean fertilization must account for the observed shortcomings in sequestration efficiency, and the total economic value of ecosystem function which might be affected due to ocean fertilization activities.
- The uncertainties surrounding the viability of large-scale ocean fertilization as a carbon sequestration tool and the potential consequences of such large-scale fertilization for marine species, habitats and ecosystem function add significant weight to the case for the wide adoption of an assessment framework for the careful validation of side effects from ocean fertilization activities, and the identification of legitimate scientific research involving ocean fertilization to advance our collective understanding of biogeochemical processes within the vast global oceans. An integrated and **coordinated response from the relevant international organizations/bodies** is required to ensure that ocean fertilization activities do not jeopardize human health or breach the protection, conservation and sustainable management of the marine environment or living resources.

The Convention on Biological Diversity

The objectives of the Convention on Biological Diversity (CBD) include 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. The Convention recognizes that biological diversity is about more than plants, animals and micro organisms and their ecosystems – it is about people and our need for food security, medicines, fresh air and water, shelter, and a clean and healthy environment in which to live.

Parties to the CBD have acknowledged both the need to facilitate biodiversity adaptation and the contribution of biodiversity to broader adaptation activities, particularly for the most vulnerable regions and ecosystems. They have identified ocean acidification as a potentially serious threat to cold-water corals and other marine biodiversity. On actions for reducing emissions from deforestation and forest degradation, Parties are interested in ensuring they do not run counter to the objectives of the CBD, support the implementation of the programme of work, provide benefits for forest biodiversity and to indigenous and local communities, involve biodiversity experts including holders of traditional forest-related knowledge, and respect the rights of indigenous and local communities.

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