UNEP

CBD

CONVENTION ON BIOLOGICAL DIVERSITY

Distr.
GENERAL

UNEP/CBD/SBSTTA/12/7
27 March 2007

ORIGINAL: ENGLISH

SUBSIDIARY BODY ON SCIENTIFIC,
TECHNICAL AND TECHNOLOGICAL ADVICE
Twelfth meeting
UNESCO, Paris, 2–6 July 2007
Item 5.1 of the provisional agenda*

BIODIVERSITY AND CLIMATE CHANGE

Proposals for the integration of climate change activities within the programmes of work of the Convention, options for mutually supportive actions addressing climate change within the Rio Conventions and a summary of the findings of the global Assessment on Peatlands, Biodiversity and Climate Change

Note by the Executive Secretary

EXECUTIVE SUMMARY

1. The Millennium Ecosystem Assessment, 1/ the reports of the Intergovernmental Panel on Climate Change, 2/ national communications under the United Nations Framework Convention on Climate Change, 3/ and other relevant reports identify numerous links between biodiversity and climate change. Overall, these reports reveal that climate change is a serious threat to biodiversity in all the thematic areas addressed by the Convention on Biological Diversity, with potentially significant consequences for people and livelihoods.

2. At the same time, the Millennium Ecosystem Assessment recognizes climate regulation as an important ecosystem service and acknowledges that biodiversity can therefore play a significant role in climate change mitigation and adaptation. Correspondingly, climate-change-related activities are integrated within all programmes of work of the Convention on Biological Diversity, with the exception of the programme of work on technology transfer and technological and scientific cooperation.

3. The Conference of the Parties to the Convention on Biological Diversity therefore requested through its decision VIII/30 that the Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA) present guidance on the further integration of climate change impact and response activities into the programmes of work of the Convention.

* UNEP/CBD/SBSTTA/12/1.

1/ Millennium Ecosystem Assessment. Ecosystems and Human Well-Being - Biodiversity Synthesis. World Resources Institute. 2005.

2/ www.ipcc.ch.

3/ http://unfccc.int/national_reports/items/1408.php.

/…

4. Proposed general guidance on the integration of climate-change impacts and response activities entails:

(a) Identification of vulnerable regions, sub-regions and ecosystem types, including vulnerable components of biodiversity within these areas;

(b) Assessment of the threats and likely impacts of climate change on biodiversity in the identified vulnerable areas;

(c) Identification of climate change adaptation and mitigation options and evaluation of their impacts on biodiversity; and

(d) Implementation and monitoring of the selected adaptation and mitigation plans.

5. Vulnerable regions, subregions and ecosystem types include islands, mountains, tropical and boreal forests, coastal zones (especially mangroves, coral reefs and coastal wetlands), prairie wetlands, peatlands, polar regions, rangelands/savannahs (especially remnant native grasslands), polar seas, and ecosystems overlying permafrost.

6. A review of the current climate-change impacts and response activities within the programme of work of the Convention revealed that the thematic programmes of work on the biodiversity of forests, inland waters, islands and marine and coastal ecosystems contain many relevant elements. The thematic programmes of work on agricultural, mountain and dry and sub-humid land biodiversity, however, contain some gaps.

7. The programmes of work on protected areas; traditional knowledge, innovations and practices; the Global Taxonomy Initiative; and incentive measures contain climate-change-related activities that are relevant across all thematic programmes of work. The programme of work on technology transfer and technological and scientific cooperation contains no activities on climate change impacts and responses.

8. A review of case-studies revealed four key lessons on the design and implementation of climate-change impact and response activities:

(a) Ensure stakeholder participation;

(b) Develop adequate technical and informational capacity;

(c) Consider the long-term sustainability of activities; and

(d) Develop an appropriate policy framework.

9. The global Assessment on Peatlands, Biodiversity and Climate Change 4/ concluded that peatlands are the most efficient terrestrial ecosystem in storing carbon. While covering only 3 per cent of the world's land area, they contain twice as much carbon as all forests. Climate change impacts on peatlands are, however, already visible through melting of permafrost peatlands and desertification of steppe peatlands.

SUGGESTED RECOMMENDATIONS

The Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA) may wish to recommend that the Conference of the Parties:

(a) *Encourage* Parties to enhance the integration of climate-change impacts and response activities within national implementation of the Convention;

(b) More specifically, *encourage* Parties to

(i) Identify vulnerable regions, subregions and ecosystem types, including vulnerable components of biodiversity within these areas, and assess the threats and likely impacts of climate change on biodiversity;

4/ http://www.imcg.net/imcgnl/nl0404/kap13.htm.

(ii) Identify climate change adaptation and mitigation options, evaluate their impacts on biodiversity, and implement and monitor the selected adaptation and mitigation plans following the guidance proposed in section II of the present note, especially in those regions, subregions and ecosystem types that are particularly vulnerable to the impacts of climate change and/or play an important role in climate-change mitigation and adaptation;

(c) *Request* Parties, other Governments and relevant organizations to take note of the findings of the global Assessment on Peatlands, Biodiversity and Climate Change undertaken by Wetlands International and the Global Environment Centre and *consider*, as appropriate, taking actions, such as the ones listed in paragraph 65 below, that could contribute to the conservation and sustainable use of peatlands and their positive contributions to climate change mitigation and adaptation.

I. INTRODUCTION

1. Biodiversity is affected by climate change through shifts in suitable climatic conditions (towards the poles, upwards in elevation or along precipitation gradients); increased die-offs and extinctions of species and ecosystems; and changes in body size, timing of life cycles, and distribution and abundance of species. 5/

2. In paragraph 8 of decision VIII/30, the Conference of the Parties to the Convention on Biological Diversity requested the Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA), while respecting the mandate of the United Nations Framework Convention on Climate Change, to develop draft guidance on how to integrate relevant climate change impacts and response activities into the programmes of work of the Convention, building on the findings of the reports on biodiversity and climate change (Technical Series No. 10 and UNEP/CBD/SBSTTA/11/INF/5, published as Technical Series No. 25), taking into account *inter alia*: (a) vulnerable regions, subregions and ecosystem types; (b) characterization of tools and methods in terms of effectiveness, costs and ecosystem vulnerability; (c) best practices based on the analysis of case studies; and (d) the contributions that protected areas can make in this context.

3. In paragraph 9 of the same decision, the Conference of the Parties requested the Executive Secretary, through the Joint Liaison Group of the Rio Conventions, to consider options for enhanced cooperation among the Rio conventions, as presented in the note by the Executive Secretary submitted to the Ad Hoc Working Group on Review of Implementation of the Convention (UNEP/CBD/WGRI/1/7/Add.1). In considering these options, the Joint Liaison Group may identify mutually supportive activities to be conducted by the secretariats of the Rio Conventions, Parties and relevant organizations, taking into account the findings in Technical Series No. 10 and UNEP/CBD/SBSTTA/11/INF/5 (published as Technical Series No. 25) for consideration by SBSTTA prior to the ninth meeting of the Conference of the Parties.

4. In paragraph 10 of decision VIII/2, the Conference of the Parties requested SBSTTA, recalling in particular decision VII/15, paragraph 13 and decision VIII/30, to present a progress report to the ninth meeting of the Conference of the Parties on the incorporation of climate-change adaptation considerations into the programme of work on dry and sub-humid lands, in particular in Activities 1, 2, 4, 7 (i) and 7 (m).

5. Furthermore, in decision VII/15, the Conference of the Parties requested SBSTTA to consider, prior to the ninth meeting of the Conference of the Parties, the findings of the global Assessment on Peatlands, Biodiversity and Climate Change being undertaken by Wetlands International and the Global Environment Centre.

6. In light of the above requests, section II below presents proposals on ways to integrate climate change impacts and response activities into the programmes of work of the Convention; section III refers to the forthcoming meeting of the Joint Liaison Group; and section IV presents a summary of the findings of the global Assessment on Peatlands, Biodiversity and Climate Change and areas that could be considered to conserve peatlands.

II. PROPOSED GUIDANCE ON THE INTEGRATION OF RELEVANT CLIMATE CHANGE IMPACTS AND RESPONSE ACTIVITIES INTO THE PROGRAMMES OF WORK OF THE CONVENTION

7. Relevant climate change impacts and response activities include, in general, activities that respond to threats from climate change to the achievement of the goals of the Convention, and in particular, activities of the programmes of work. Examples of threats are presented in annex I below.

5/ Convention on Biological Diversity. Technical Series No. 25 – Guidance for Promoting Synergy Among Activities Addressing Biological Diversity, Desertification, Land Degradation and Climate Change. 2006. page 5, para. 10.

A. General guidance

8. In order to enhance the integration of relevant climate change impacts and response activities within implementation of all programmes of work of the Convention, Parties may wish to consider the following proposals:

(a) Identify vulnerable regions, subregions and ecosystem types, including vulnerable biodiversity within these areas;

(b) Assess the threats and likely impacts of climate change on biodiversity in identified vulnerable areas;

(c) Identify and evaluate climate change adaptation and mitigation options and evaluation of their impacts on biodiversity; and

(d) Implement and monitor the selected adaptation and mitigation plans.

B. Identify vulnerable regions, subregions and ecosystem types, including vulnerable biodiversity within these areas

9. The Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC), which includes information contained in all previous IPCC reports, in combination with the CBD Technical Series No. 10 and No. 25, yields the following list of vulnerable regions, subregions and ecosystem types: islands, mountains (especially near ridges and mountaintops), tropical and boreal forests, marine and coastal zones (especially mangroves, coral reefs and coastal wetlands), wetlands (especially prairie wetlands), polar regions, rangelands/savannahs (especially remnant native grasslands) and *fynbos*, and ecosystems overlying permafrost.

10. The relevance of these identified regions to each programme of work is expanded in table 1 below.

Table 1: Vulnerable regions, subregions and ecosystem types within the programmes of work

Programme of work	*Vulnerable regions, subregions and ecosystems*
Agricultural biodiversity	Agricultural systems already at the limit of their heat and drought tolerance, agricultural areas within low latitudes, rangelands, agricultural biodiversity in dry and sub-humid lands
Dry and sub-humid lands biodiversity	Prairies, wetlands in drylands, remnant grasslands,6 Mediterranean forests, desert margins, *fynbos*
Forest biodiversity	Mangroves, boreal forests, tropical forests, cloud forests
Inland waters biodiversity	Peatlands, oases, prairie wetlands, high-latitude and high-altitude inland water ecosystems (such as Arctic and sub-Arctic ombotrophic 7/ bog communities, and alpine streams and lakes)
Island biodiversity	Low-lying islands, polar islands, small-island developing States
Marine and coastal biodiversity	Mangroves and other coastal wetlands, polar seas, seagrass beds, coral-reef systems

6/ WWF. Buying Time: A User's Manual for Building Resistance and Resilience to Climate Change in Natural Systems. 2003.

7/ A condition in which a wetland is hydrologically independent of surface water or ground water and is almost exclusively supplied with water from precipitation.

Programme of work	*Vulnerable regions, subregions and ecosystems*
Mountain biodiversity	High-alpine ecosystems, 8/ cloud forests, remnant native montane grasslands
Protected areas	Protected areas of any of the above regions, sub-regions or ecosystems, small or isolated protected areas, protected areas with high- or low-altitude environments, coastal environments or interior wetlands, protected areas with abrupt land use transitions outside their boundaries, protected areas without usable connecting migration corridors
Traditional knowledge, innovations and practices	Arctic regions, small-island developing States, high-altitude communities, coastal zones and dry and sub-humid areas

C. Assess the threats and likely impacts of climate change on biodiversity in the identified vulnerable areas

11. Guidance on cost-effective tools and methods to assess the threats and likely impacts of climate change faced by biodiversity in the identified vulnerable areas was compiled from a literature review conducted by the Secretariat, as well as from the Technical Series No. 10 and No. 25; the report of the twenty-fourth meeting of the Subsidiary Body for Scientific and Technological Advice of the United Nations Framework Convention on Climate Change on the five-year programme of work on impacts, vulnerability, and adaptation to climate change, 9/ the IPCC Technical Guidelines for Assessing Climate Change Impacts and Adaptations, 10/ and the note by the Executive Secretary on further development of tool kits for the identification, designation, management, monitoring and evaluation of national and regional systems of protected areas (UNEP/CBD/WG-PA/1/4).

12. The above-mentioned IPCC Technical Guidelines identify six steps for analysing vulnerability: (i) definition of the problem; (ii) selection of methods; (iii) testing methods; (iv) selection of scenarios; (v) assessment of biophysical and socio-economic impacts; and (vi) assessment of autonomous adjustments.

13. Tools identified in the Technical Guidelines include: experimentation, impact projections, empirical analogue studies and expert judgment. To evaluate current impacts, observations and literature reviews are also useful tools.

14. The basis of most threat and impact assessments lies in general circulation models that use mathematical representations of climatic processes to predict the state of the climate. These models have evolved along with the increase in the availability of computational power to include physical processes in the atmosphere, ocean, cryosphere, land surface and biosphere. General circulation models are used in conjunction with scenarios that specify an initial state for the climate and forcing factors, as well as information on future inputs of various forcing factors. The models then step through time, predicting climate responses in each of the cells that make up the grid representation of the Earth.

15. General circulation models, however, suffer from two main limitations. First, general circulation models represent the Earth using grids with a resolution of about 200 by 600 km latitude/longitude with 10 to 30 vertical levels. As such, processes that are smaller than that are not resolved (e.g. certain cloud processes). In order to consider these processes, they are averaged over the larger scale, introducing a level of uncertainty. Second, we have an imperfect understanding of the climate system; only processes that are known can be included and the representation is not always accurate. Therefore, general circulation models are commonly used in conjunction with other tools and methods.

8/ Halloy SRP, Mark AF 2003. Climate-change effects on alpine plant biodiversity: A New Zealand perspective on quantifying the threat. Arctic, Antarctic and Alpine Research 35, 248-254.

9/ UNFCCC. 2006. FCCC/SBSTA/2006/L.17

10/ T.R.Carter, M.L.Parry, H.Harasawa, and S.Nishioka. Technical Guidelines for Assessing Climate Change Impacts and Adaptations. 1994

16. Examples of additional tools and methods are presented in table 2 below. The tools and methods presented below do not represent all possibilities; rather, they provide examples of some of the more commonly implemented tools and methods as identified through research conducted by the Secretariat.

Table 2: Examples of tools and methods to assess vulnerability

Impacts of climate change	***Tools and methods***	
	Physical processes	***Vulnerability***
Sea level	Sea level Fine Resolution Acoustic Measuring Equipment (SEAFRAME) 11/	Coastal Vulnerability Index (CVI) 12/
	Continuous Global Positioning System 13/	
Increased air/ocean temperatures	Ocean Monitoring (e.g. Global Ocean Data Assimilation System,, 14/ National Oceanographic Data Center) 15/	Coral reefs monitoring protocols (e.g. reef resilience toolkits) 16/
	Meteorological stations (e.g. National Climate Data Center, 17/ Climate Anomaly Monitoring System) 18/	Glacial lake outburst vulnerability assessment
Changing precipitation regimes	Meteorological Stations (e.g. Global Precipitation Measurement) 19/	Fire risk assessment
	Satellite Monitoring (e.g. International Satellite Land Surface Climatology Project) 20/	Drought vulnerability assessment
	Palmer Drought Severity Index 21/	Global Information and Early Warning System 22/
Increased frequency of extreme events	Global hazards/extremes monitoring (e.g. Tropical Atmosphere Ocean Project) 23/	Household vulnerability assessments
		Disaster Risk Index 24/

D. Identify and evaluate climate change mitigation and adaptation options and evaluation of their impacts on biodiversity

17. Tools to assess adaptation options, as identified in Technical Series No. 10 and No. 25, include: environmental impact assessments, strategic environmental assessments, decision analytical frameworks and valuation techniques. Additional tools currently under development include: a matrix approach

11/ http://www.icsm.gov.au/icsm/tides/SP9/PDF/IOCVIII_acoustic_errors.pdf

12 / http://cdiac.ornl.gov/epubs/ndp/ndp043c/sec9.htm

13/ http://www.bom.gov.au/pacificsealevel/cgps/cgps_fact_sheet.pdf

14/ http://www.cpc.ncep.noaa.gov/products/GODAS/

15/ http://www.nodc.noaa.gov/

16/ The Nature Conservancy and Partners R2- Reef resilience: building resilience into coral reef conservation; additional tools for managers: Volume 2.0. CD ROM Toolkit, 2004.

17/ http://www.ncdc.noaa.gov/oa/ncdc.html

18/ http://www.cpc.noaa.gov/products/global_precip/html/wpage.cams_opi.shtml

19/ http://gpm.gsfc.nasa.gov/

20/ http://www.gewex.org/islscp.html

21/ http://www.drought.noaa.gov/palmer.html

22/ http://www.fao.org/giews/english/index.htm

23/ http://www.pmel.noaa.gov/tao/

24/ http://gridca.grid.unep.ch/undp/

(OECD), 25/ risk management approach (Ramsar) 26/ and a screening tool for assessing climate risk to biodiversity (World Bank). 27/

18. At its fourth meeting, held in Helsinki from 13 to 16 September 2005, the Ad Hoc Technical Expert Group on Biodiversity and Climate Change produced a method to evaluate the risks to biodiversity from adaptation projects (CBD Technical Series No. 25). This framework uses a matrix to identify adaptation activities, potential impacts on and risks to biodiversity, and actions for risk management. This matrix could be employed to assist Parties to assess adaptation options in terms of their expected impacts on biodiversity.

19. Assessing the cost-effectiveness of tools and methods requires a large amount of site-specific information, as costs can be impacted by: the amount of existing data, the scale of the site being evaluated, the degree of detail required during data collection, the timeframe selected for the analysis, the technology available, and the level of institutional and organizational structure already in place.

E. Implement and monitor selected mitigation and adaptation plans

20. Important considerations for the implementation of adaptation plans, as discussed in the CBD Technical Series No. 10 and No. 25 and reports from the Tyndall Centre 28/ and the above-mentioned IPCC Technical Guidelines include:

(a) Establishing clear climatic and environmental baselines;

(b) Ensuring adequate data availability;

(c) Selecting appropriate indicators of change;

(d) Involving all relevant stakeholders; and

(e) Paying special attention to equity.

21. A selection of case-studies and best-practice examples were reviewed to identify and extract examples of the successful integration of climate change impacts and response activities within adaptation planning. Table 3 presents some key lessons learned for the successful design and implementation of adaptation plans from the case studies.

Table 3: Lessons learned from case-studies on adaptation and mitigation and examples of implementation of related tools

Lessons	*Rationale*	*Examples of implementation tools*
Ensure stakeholder participation	Engaging a broad range of stakeholders in impact and response activities will (i) ensure that activities respond to local needs; (ii) create a stronger sense of ownership; and (iii) ensure a multi-sector approach.	Hold annual regional and national biodiversity focal point meetings.
		Hold regular community meetings and exhibitions.
		Hire project staff from the local communities.

25/ http://www.oecd.org/dataoecd/9/21/1950084.pdf

26/ COP8 DR 3 Rev.2

27/ At: http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/ENVIRONMENT/EXTCC/0,,menuPK:407870~pagePK:149018~piPK:149093~theSitePK:407864,00.html

28/ Tyndall Centre for Climate Change Research. Surviving Climate Change in Small Islands. 2005

Lessons	*Rationale*	*Examples of implementation tools*
Develop an adequate technical and informational capacity	Identifying appropriate technologies and establishing a clear informational baselines can: (i) enhance the cost-effectiveness of implementation; (ii) facilitate learning-by-doing; (iii) ensure high-quality implementation; and (iv) facilitate adequate monitoring and evaluation.	Train local experts for community-based monitoring.
		Form a technical advisory panel to verify the validity, precision and thoroughness of procedures.
		Avoid, to the extent possible, technologies that are cost-intensive or have inconsistent economic returns.
Consider the long-term sustainability of activities	Climate change impact and response activities require a long time horizon; as such, financial and institutional sustainability is key.	Identify potential social consequences of the project.
		Mainstream income-generating activities within projects.
		Have a long-term planning horizon.
Develop an appropriate policy framework	An appropriate policy framework can alleviate obstacles due to (i) perverse incentives; (ii) conflict over access and use of biodiversity resources; and (iii) poor project management.	Clearly define use rights for biodiversity resources.
		Ensure adequate enforcement capacity.
		Secure strong political support at all levels.

F. Guidance on the programmes of work

22. For the thematic programmes of work on the biodiversity of forests, inland waters, islands and marine and coastal areas, climate change impacts and response activities are covered in many decisions of the Conference of the Parties (see annex II below). As such, proposals on guidance for these programmes of work focus on strengthening implementation of those activities, which are implemented by very few Parties. These activities were identified based on the information contained within the third National Reports submitted by Parties to the Convention on Biological Diversity.

23. The thematic programmes of work for agricultural, dry and sub-humid land and mountain biodiversity, however, present some gaps. As such, proposals on guidance on the integration of relevant climate change impacts and response activities within decisions for each of these programmes of work are presented below and summarized in table 4.

Table 4: Overview of guidance on the thematic programmes of work

Programme of work	*Guidance*
Agricultural biodiversity	Enhance climate change impact and response activities and address identified gaps during the in-depth review of implementation of the programme of work.
Dry and sub-humid lands biodiversity	Apply the general guidance presented below to activities 1, 2, 4, 7 (i) and 7(m) of the programme of work.

Programme of work	*Guidance*
Mountain biodiversity	Enhance corridors between mountain ecosystems in order to facilitate, to the extent possible, the migration of mountain animal species. When developing climate change adaptation plans, consider the links between climate change in mountain ecosystems and its impact on biodiversity in surrounding areas.
Forest biodiversity	Expand integration of the impact and response activities identified as being poorly implemented (see below).
Inland waters biodiversity	
Island biodiversity	
Marine and coastal biodiversity	
Protected areas	
Incentive measures	
Article 8(j) and related provisions	Guidance to be developed by the Working Group on Article 8(j).
Global Taxonomy Initiative	Link activities with the protected areas programme of work.
Communication, education and public awareness	Provide adequate support for the Executive Secretary to carry out requested activities.
Transfer of technology and technological and scientific cooperation	Continue to enhance collaboration within the framework of the technology transfer programme of the United Nations Framework Convention on Climate Change.

1. Agricultural biodiversity

24. In the appendix to decision V/5, climate regulation and carbon sequestration are recognized as ecological services provided by agricultural biodiversity. In the review of the third national reports, however, only four countries 29/ reported on the identification of agricultural biodiversity components that provide such ecological services.

25. The current programme of work does not address the role of agricultural biodiversity in climate change adaptation planning. There is also currently no consideration of the vulnerability of agricultural biodiversity to the impacts of climate change and the associated predicted increase in extreme climatic events. Furthermore, there exist significant information gaps on agricultural biodiversity and climate change links with regards to livestock, food and nutrition, soil biodiversity and pollinators.

26. In order to fill the identified gaps, the Conference of the Parties may wish to revise the programme of work during the in-depth review of implementation, considering options for requests to:

(a) The Executive Secretary, in collaboration with the Food and Agricultural Organization and other relevant organizations, to identify agricultural biodiversity that can contribute to climate change adaptation in agricultural areas, especially within vulnerable regions, to assist Parties to integrate such biodiversity into climate change planning;

(b) Parties to document observed impacts, consider the projected impacts of climate change on agricultural biodiversity and use the information in cross-sectoral planning in agricultural areas;

29/ Argentina, Canada, Kazakhstan, Uganda

(c) The Executive Secretary, in collaboration with partners and relevant organizations, to compile information on the impacts of climate change on livestock, food and nutrition, pollinators and soil biodiversity and to develop proposals on options for adaptation, taking into account ongoing initiatives.

2. Mountain biodiversity

27. Decision VII/27 of the Conference of the Parties considers: (i) the need for more information on climate change and mountain biodiversity; (ii) the vulnerability of mountain biodiversity to climate change impacts; and (iii) the need to collaborate with the United Nations Framework Convention on Climate Change.

28. Specific work programme activities relevant to climate change include:

(a) Actions 1.1.5, 1.1.9 (c), 3.1.1 and 3.2.4 on information gathering, and monitoring and evaluation of areas susceptible to climate change and the impacts of climate change on mountain biodiversity;

(b) Action 1.2.1 on enhancing the capacity of mountain ecosystems to resist and to adapt to climate change;

(c) Action 2.3.4 on strengthening collaboration with global conventions and agreements including on climate change; and

(d) Action 3.1.6 on developing adaptive strategies for mountain ecosystems to respond to global change, including climate change.

29. Fourteen countries reported on implementation of at least one of the above activities. 30/ Activities on strengthening collaboration with global conventions and agreements were not reported on within the framework of mountain ecosystems; however, 69 countries reported on the development or implementation of activities to enhance synergies with the United Nations Framework Convention on Climate Change. 31/

30. The role of mountain corridors in responding to climate change is not contained within the programme of work. Neither does the programme of work consider the effects of climate change on mountain ecosystems on the biodiversity of surrounding areas. This is significant, given the importance of mountain biodiversity in maintaining important ecosystem services, such as hydrological cycling.

31. Given the limited number of countries reporting on the implementation of existing climate change impacts and response activities, Parties may wish to enhance implementation of the current climate change-related components of the programme of work on mountain biodiversity. SBSTTA may wish to draw particular attention to activities 1.1.5, 1.1.9 (c), 1.2.1, 2.3.4, 3.1.1, 3.1.6 and 3.2.4.

32. There is also a gap in the programme of work when considering:

(a) Altitudinal corridors between mountain ecosystems in order to facilitate, to the extent possible, the migration of mountain species following the upward shifting of suitable climatic conditions; and

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30/ Armenia, Australia, Canada, Colombia, Chile, Germany, India, Ireland, Lebanon, Morocco, Nepal, Norway, South Africa, Uganda

31/ Activities under development: Armenia, Bangladesh, Barbados, Belgium, Benin, Brazil, Chile, Comoros, Congo, Côte d'Ivoire, Democratic People's Republic of Korea, Denmark, Dominica, El Salvador, Eritrea, Finland, France, Guatemala, India, Kenya, Mexico, Morocco, Netherlands, Niue, Norway, Philippines, Poland, Romania, Senegal, Swaziland, Thailand, Viet Nam

Activities under implementation: Algeria, Australia, Austria, Cambodia, Canada, Chad, China, Colombia, Cuba, Egypt, Ethiopia, Germany, Indonesia, Japan, Kazakhstan, Latvia, Lebanon, Lesotho, Lithuania, Madagascar, Malawi, Mali, Mauritius, Namibia, Nicaragua, Niger, Republic of Korea, Republic of Moldova, Rwanda, Saint Lucia, Samoa, Slovakia, South Africa, Syria, Tunisia, Uganda, Zimbabwe

(b) Consideration by Parties, when developing climate-change adaptation plans, of the links between climate-change impacts in mountain ecosystems and their impact on biodiversity in surrounding areas.

3. Dry and sub-humid lands biodiversity

33. In decision VIII/2, the Conference of the Parties recognized the importance of the conservation of dry and sub-humid lands biodiversity for climate change adaptation in the preamble and called for SBSTTA to develop proposals on the incorporation of climate-change adaptation considerations into the programme of work on dry and sub-humid lands.

34. In decision VIII/2, the Conference of the Parties also requested SBSTTA to develop a progress report for the ninth meeting of the Conference of the Parties on the incorporation of climate-change adaptation considerations into the programme of work, in particular in activities described in decision VIII/2 as:

(a) Activities 1 and 2 (climate change as a threat to dry and sub-humid land biodiversity);

(b) Activity 4 (potential impacts of climate change on biodiversity, and the role of biodiversity in maintaining the resilience of dry and sub-humid lands to climatic variability, including prolonged drought, and other natural events, and on the role of dry and sub-humid lands biodiversity in climate-change adaptation measures);

(c) Activity 7 (i) (integration of climate-change considerations in training and education programmes); and

(d) Activity 7 (m) (consideration of dry and sub-humid lands by the Joint Liaison Group of the United Nations Framework Convention on Climate Change, the United Nations Convention to Combat Desertification and the Convention on Biological Diversity).

35. The Secretariat of the Convention conducted a review of the third national reports in order to determine progress in implementation. The review revealed that:

(a) Six Parties [32]/ reported on the identification of specific areas within dry and sub-humid lands under particular threat from climate change (activities 1 and 2);

(b) Ten Parties [33]/ reported on building knowledge on climate change impacts on the biological diversity of dry and sub-humid lands (activity 4); and

(c) Seven Parties [34]/ reported on the conservation, *in situ* as well as *ex situ*, of the biological diversity of dry and sub-humid lands, taking due account of better understanding of climate variability in developing effective in situ biological conservation strategies (activity 7 (f)).

36. No Parties reported on the implementation of climate change activities within the framework of activity 7 (i).

4. Forest biodiversity

37. Thirty-four Parties reported on the implementation of at least one of the climate change-related activities within the forest biodiversity programme of work. [35]/ No Parties reported on assessing how the conservation and sustainable use of forest biodiversity can contribute to international work on climate change. This lack of reporting may, however, be due to the fact that this activity overlaps with reporting activities conducted under the United Nations Framework Convention on Climate Change and the Kyoto

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[32]/ Australia, Bangladesh, Colombia, Israel, Morocco, South Africa

[33]/ Algeria, Armenia, Australia, Chile, Egypt, Ethiopia, Israel, Morocco, South Africa, Uganda

[34]/ Australia, Benin, Cuba, Israel, Lesotho, Morocco, South Africa

[35]/ Algeria, Armenia, Australia, Austria, Canada, Cambodia, Colombia, Cuba, Denmark, Egypt, El Salvador, Finland, Germany, India, Indonesia, Israel, Kenya, Latvia, Lebanon, Malaysia, Mexico, Morocco, Nepal, Norway, Republic of Korea, Romania, Rwanda, Saint Lucia, Syria, Thailand, the former Yugoslav Republic of Macedonia, Uganda, Viet Nam, Zimbabwe

Protocol. Furthermore, only two Parties 36/ reported on exploring possibilities for establishing an international network to monitor and assess the impact of climate change on forest biodiversity.

38. There may be a need to strengthen implementation of:

(a) Assessments of how the conservation and sustainable use of forest biodiversity can contribute to international work relating to climate change; and

(b) Possibilities for establishing an international network to monitor and assess the impact of climate change on forest biodiversity.

5. Inland waters biodiversity

39. Eleven Parties reported on some activities that integrate climate change within the inland waters biodiversity programme of work. 37/ A majority of the reported activities involved the conservation, restoration or sustainable use of peatlands. Only two Parties reported on activities to ensure the availability of freshwater resources to maintain ecosystem functions within changing climatic conditions.

40. There may be a need, through either the Convention on Biological Diversity or another relevant forum, to strengthen, including through policy frameworks, the integration of climate change considerations within water resource management for the benefit of biodiversity conservation.

6. Marine and coastal biodiversity

41. The climate change components of the marine and coastal biodiversity programme of work are the most widely implemented of all climate change activities, with 36 Parties reporting on implementation of at least one relevant activity. 38/ The one activity with limited implementation is "human capacity building among reef managers to support access to and implementation of scientific and technical information on climate change and coral bleaching".

42. There may be a need to strengthen implementation of capacity-building for marine and coastal managers to support access to and implementation of scientific and technical information on adaptation to climate change.

7. Island biodiversity

43. Since the programme of work on island biodiversity was adopted at the eighth meeting of the Conference of the Parties, it is not possible to report on implementation. However, given their heightened vulnerability, Parties may wish to pay particular attention to implementing relevant activities in polar islands, low-lying islands and small-island developing States.

8. Protected areas

44. Goal 1.4.5 of the programme of work on protected areas refers to the integration of climate change adaptation measures in protected area planning, management strategies, and in the design of protected area systems.

45. Within the programmes of work of the Convention, protected areas are also integrated within climate change components of the marine and coastal and island biodiversity programmes of work. Climate change is also recognized as a threat to deep sea ecosystems and as an issue to be considered in protected-area management in general in the report of the first meeting of the Ad Hoc Open-Ended Working Group on Protected Areas (UNEP/CBD/WG-PA/1/6) and the note by the Executive Secretary

36/ Australia, Indonesia

37/ Australia, Brazil, Chile, China, Democratic People's Republic of Korea, India, Lebanon, Malaysia, Mexico, Morocco, Uganda.

38/ Algeria, Australia, Bahamas, Barbados, Brazil, Cambodia, Chile, Colombia, Comoros, Cuba, Egypt, El Salvador, France, India, Ireland, Israel, Japan, Jordan, Kenya, Madagascar, Malaysia, Mauritius, Mexico, Norway, Philippines, Republic of Korea, Saint Lucia, Samoa, Singapore, South Africa, Sweden, Thailand, Trinidad and Tobago, Tunisia, United Kingdom, Viet Nam

on options for cooperation for the establishment of marine protected areas in marine areas beyond the limits of national jurisdiction (UNEP/CBD/WG-PA/1/2) prepared for that meeting.

46. The negative impacts of climate change on protected areas are manifested within at least 79 Natural and Mixed World Heritage Sites identified as being threatened by climate change. Of these, 17 sites have already lost biodiversity as a result of climate change. 39/

47. Protected areas are also an important component of many adaptation and mitigation strategies. In particular, protected areas allow a refuge for biodiversity to adapt to the impacts of climate change by removing additional pressures, such as habitat loss and over-harvesting. Protected corridors, which allow migrations, are also important for biodiversity seeking to shift poleward or upward in response to changing climatic conditions.

9. Incentive measures

48. In adopting the programme of work on incentive measures, the Conference of the Parties called for Parties and other Governments to explore possible ways and means by which incentive measures promoted through the Kyoto Protocol can support the objectives of the Convention ((decision V/15, para. 6). This call is supported by paragraph 14 of annex II of decision VI/15, which addresses the interlinkages between multilateral environmental agreements in respect of incentive measures.

10. Article 8(j) and related provisions

49. Decision VIII/5 B of the Conference of the Parties notes the specific vulnerabilities of indigenous and local communities to the impacts of climate change and requests that further research be conducted into highly vulnerable indigenous and local communities, with a focus on causes and solutions. This information will be submitted to the Working Group on Article 8(j) and related provisions for attention at its fifth meeting.

11. Global Taxonomy Initiative

50. In paragraphs 16 and 17 of decision VIII/3, the Conference of the Parties referred specifically to climate change threats to protected areas; therefore guidance on the implementation of these activities is covered under the protected areas programme of work.

12. Communication, education and public awareness

51. In its decision VIII/6, the Conference of the Parties called for links with the United Nations Framework Convention on Climate Change in terms of the establishment of a global network for Communication, Education and Public Awareness. Since this is an activity for the Executive Secretary, there is no need to provide guidance to Parties.

13. Transfer of technology and technological and scientific cooperation

52. There are no climate-change-relevant activities in the programme of work on technology transfer and cooperation. There is nevertheless a need to ensure that technologies developed for climate change mitigation and adaptation do not have negative impacts on biodiversity.

53. Technology transfer has long been a key nexus for synergies between the Convention on Biological Diversity and the United Nations Framework Convention on Climate Change. Opportunities for enhanced synergies at both the Secretariat and the national levels should continue to be explored and exploited.

39/ UNESCO. Predicting and Managing the Effects of Climate Change on World Heritage. A joint report from the World Heritage Centre, its Advisory Bodies, and a broad group of experts to the 30th session of the World Heritage Committee. Vilnius, 2006

III. MUTUALLY SUPPORTIVE ACTIVITIES FOR THE SECRETARIATS OF THE RIO CONVENTIONS, PARTIES AND RELEVANT ORGANIZATIONS

54. In response to paragraph 9 of decision VIII/30, the Executive Secretary is consulting with the other members of the Joint Liaison Group to prepare for consideration by SBSTTA options for mutually supportive activities for the secretariats of the Rio Conventions, Parties and relevant organizations. The options will be discussed at a forthcoming meeting of the Joint Liaison Group, and the report will be issued as an addendum to this note.

IV. ASSESSMENT OF PEATLANDS, BIODIVERSITY AND CLIMATE CHANGE

55. A summary of the global Assessment on Peatlands, Biodiversity and Climate Change, referred to in paragraph 6 of decision VII/15, is presented in the following sections for consideration by SBSTTA.

A. Peatland nature and importance

56. Peatlands are wetland ecosystems that are characterized by an accumulation of organic matter (peat), which derives from dead and decaying plant material in water-saturated conditions. Covering only 400 million ha or about 3 per cent of the global land area, peatlands are one of the most important natural ecosystems in the world that have key values for biodiversity, climate regulation and support of human welfare.

B. Key overall findings of the Assessment

57. The Assessment confirms that peatlands are critical for biodiversity conservation, support specialized species and unique ecosystems, and increasingly provide refuge for threatened species that are expelled from intensively used and overexploited areas. Peatlands are recognized as the most efficient terrestrial ecosystem in storing carbon. While covering only 3 per cent of the world's land area, their peat contains as much carbon as all terrestrial biomass and twice as much as all forest biomass. Degradation of peatlands is a major and growing source of anthropogenic greenhouse gas emissions. Climate-change impacts are already visible through the melting of permafrost peatlands and desertification of steppe peatlands and associated climate-induced emissions. Conservation, restoration and wise/sustainable use of peatlands are essential and cost-effective measures for long-term climate change mitigation and adaptation as well as biodiversity conservation.

C. Peatlands and biodiversity

58. Peatlands are unique and complex ecosystems of global importance for biodiversity conservation at the genetic, species and ecosystem levels. Although species diversity may be lower, the proportion of unique or characteristic species is high in peatlands. Specialized peatland species are vulnerable to anthropogenic and climate-induced changes, as they often cannot survive in other habitats. Peatlands may support biodiversity beyond their borders by maintaining hydrology and microclimate of adjacent areas and by providing habitats for migrant and nomadic species.

D. Peatlands and climate regulation

59. Peatlands contain at least 550 Gt of carbon, which is equivalent to 30 per cent of the carbon in soils and 75 per cent of that in the atmosphere, and is equal to all terrestrial biomass. Peatlands are the most efficient carbon stores of all terrestrial ecosystems. In the sub-polar zone, they contain 3.5 times, in the boreal zone seven times, and in the tropical zone 10 times more carbon per ha than ecosystems on mineral soil. Peatlands are the top long-term carbon store in the terrestrial biosphere and have, since the last ice age, played an important role in global greenhouse gas balances by sequestering an enormous amount of atmospheric carbon. Anthropogenic disturbances (especially drainage and fires) have led to massive increases in net emissions of greenhouse gases from peatlands, which are now comparable to global industrial emissions.

E. Impact of climate change on peatlands

60. Climate is the most important determinant of the distribution and character of peatlands. Natural peatlands showed resilience to the changes in climate that have occurred in the past. However, the rate and magnitude of predicted future climate changes and extreme events may push many peatlands over their threshold for adaptation. Human activities such as vegetation clearance, drainage, and overgrazing increase the vulnerability of peatlands to climate change.

61. Impacts on peatlands will be regionally differentiated – such as melting of permafrost, inundation and salinization in coastal zones or desiccation in mountain and steppe regions. The most vulnerable peatland types (tropical peat swamp forests, and permafrost, steppe, mountain and coastal peatlands) require urgent adaptation measures

F. Integrated management and avoidance of conflicts with climate mitigation measures

62. Integrated management of peatlands incorporates a range of approaches on different land use areas. Integrated management requires close coordination between different stakeholders and economic sectors and also the integration of approaches for biodiversity, climate change and land degradation.

63. Measures for climate change mitigation may sometimes conflict with biodiversity and land degradation objectives. Climate mitigation measures, such as hydropower, wind energy or biofuel production, may have negative impacts on biodiversity, carbon storage and greenhouse gas flux when they are implemented on peatlands. Millions of hectares of tropical peatlands, especially in South-East Asia, are currently being converted to palm oil production, which is partly driven by the global demand for renewable biofuels. However, palm oil and other biofuels grown on drained peatlands have a life cycle greenhouse gas emission of three to five times more than petroleum oil fuels.

G. Areas for possible future action to conserve and sustainably use peatlands

64. Peatlands are mainly addressed within the framework of the Convention through the inland waters biodiversity programme of work. Peatlands are, however, absent from the programmes of work on mountain, forest and dry and sub-humid lands biodiversity and cross-cutting issues.

65. Key considerations for future action include:

(a) Strict protection of intact peatlands is critical for the conservation of biodiversity and maintenance of ecosystem functions, including carbon store/sequestration;

(b) Changes in peatland management (such as better water and fire control in drained peatlands) can improve land use sustainability and reduce impacts on biodiversity and climate;

(c) Restoration of peatlands can be a cost-effective way to generate immediate benefits for biodiversity and climate change mitigation;

(d) Enhancing awareness and capacity, addressing poverty and inequity, and removing perverse incentives are also important to address the root causes of peatland degradation.

Annex I

PROJECTED IMPACTS OF CLIMATE CHANGE ON BIODIVERSITY IN VULNERABLE REGIONS, SUBREGIONS AND ECOSYSTEM TYPES

Climate change impact	***Impacts***	***Impact on biodiversity in vulnerable regions, subregions and ecosystems***
Increased air temperatures	Increased number of hot days	• Increased heat stress on biodiversity • Increased exposure to pests and diseases • Increased drying of wetlands and waterways
	Melting permafrost	• Changes in nutrient cycling and soil biodiversity • Reduced access to food sources as a result of repeated freeze-thaw cycles • Loss of cryosoil-based ecosystems and species • Drainage of lowland Arctic tundra • Sea level rise and as a result, in particular on islands, salt water intrusion in coastal wetlands and other inland waters, increased mortality and disturbance of critical habitats, and increased erosion (beaches / coastal cliffs)
	Decreased ice cover (later freeze and earlier breakup)	• Reduced winterkills • Decreased deposition of sediments in floodplains • Sea level rise and as a result, in particular on islands, salt water intrusion in coastal wetlands and other inland waters, increased mortality and disturbance of critical habitats, and increased erosion (beaches / coastal cliffs)
	Increased water temperature	• Decreased dissolved oxygen • Increased vulnerability to invasive alien species • Coral die-offs (coral bleaching) • Increase in instances of disease among fish • Loss of habitat for cold- and cool-water fish • Reduced productivity of marine systems (coral reefs and seagrass beds)
	Glacial retreat and decreased snow cover	• Changing hydrological regimes • Changes in seasonal cues for mountain biodiversity • Increased predation • Disruptions in hibernation patterns • Reduced insulating protection from snow • Loss of snow bed ecosystems and species
Changes in precipitation regimes	Increased instances of drought during the dry season	• Loss of ground cover leading to desertification and loss of soil biodiversity • Increased water stress on biodiversity • Reduced availability of food and fodder • Salinization in irrigated areas • Increased risk of fire • Changes in natural flow regimes of rivers and streams • Changes of alpine grassland to steppe
	Increased flooding during the wet season	• Increased erosion of soil biodiversity • Increased land degradation • Increased threats from water-borne disease • Increased habitat destruction from flooding • Changes in natural flow regimes of rivers and streams • Increased winter snow leading to ice layer formation

Climate change impact	***Impacts***	***Impact on biodiversity in vulnerable regions, subregions and ecosystems***
Increased frequency of extreme climatic events	Disruption in growth and reproduction	• Decreased overall productivity • Increased mortality
	Heightened storm surges	• Increased mortality and disturbance of critical habitat • Habitat loss (especially mangroves, reefs, sandbars and beaches)
Sea level rise	Salt water intrusion in coastal wetlands	• Increased mortality and disturbance of critical habitat • Salt water intrusion (coastal wetlands) • Increased erosion (beaches / coastal cliffs)

Annex II

DECISIONS CONTAINING ACTIVITIES ADDRESSING CLIMATE CHANGE DIRECTLY

Programme of work	***Decisions***
Agricultural biodiversity	V/5
Dry and sub-humid lands biodiversity	V/23, VIII/2
Mountain biodiversity	VII/27
Forest biodiversity	V/4, VI/22
Inland water biodiversity	VII/4, VII/15
Island biodiversity	VIII/1
Marine and coastal biodiversity	IV/5, V/3
Article 8 (j) and related provisions	VIII/5
Incentive measures	V/15, VI/15
Global Taxonomy Initiative	VIII/3
Protected areas	VII/28
Communication, education and public awareness	VI/19, VIII/6
Technology transfer and technological and scientific cooperation	None

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