CBD

UNEP

Convention on Biological Diversity

Distr.
GENERAL

UNEP/CBD/AHTEG/BD-CC-2/2/4
30 March 2009

ORIGINAL: ENGLISH

SECOND AD HOC TECHNICAL EXPERT GROUP ON BIODIVERSITY AND CLIMATE CHANGE
Second meeting
Helsinki, 18 – 22 April 2009
Items 5.1 and 5.2 of the provisional agenda

VALUE AND BENEFITS FROM INTEGRATING BIODIVERSITY WITHIN CLIMATE CHANGE ADAPTATION

I. INTRODUCTION

1. The Ad Hoc Technical Expert Group (AHTEG) on biodiversity and climate change is being convened in response to decision IX/16 of the Conference of the Parties to the Convention on Biological Diversity (CBD). The purpose of this AHTEG is to provide biodiversity-relevant information to the United Nations Framework Convention on Climate Change (UNFCCC) 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.

2. In order to facilitate the full and effective completion of the terms of reference as outlined in annex III to decision IX/16, the AHTEG will convene at least two meetings. The first meeting addressed two main issues: (i) identifying risks and vulnerabilities and (ii) enhancing scientific and technical links between biodiversity and climate change mitigation. The second meeting of the AHTEG will address the links between biodiversity conservation and sustainable use and climate change adaptation, risks and vulnerabilities.

3. In order to facilitate consideration of the following three items in the terms of reference which will be considered at the second meeting of the AHTEG, the present document was developed to provide background information that the AHTEG can use in: (i) highlighting case-studies and identifying methodologies for analysing the value of biodiversity in supporting adaptation in communities and sectors vulnerable to climate change, (ii) analysing the social, cultural and economic benefits of using ecosystem services for climate change adaptation and of maintaining ecosystem services by minimizing adverse impacts of climate change on biodiversity and (iii) identifying means to incentivise the implementation of adaptation actions that promote the conservation and sustainable use of biodiversity.

4. This document builds on the findings of the first meeting of the second AHTEG on biodiversity and climate change which concluded that the negative impacts of climate change on biodiversity have significant economic and ecological costs since:

- A key property of ecosystems that may be affected by climate change is the values and services they provide.
- There is ample evidence that warming will alter the patterns of plant and animal diseases.

- The impacts of climate change on biodiversity will change human disease vectors and exposure.
- Climate change affects the ability of ecosystems to regulate water flows.
- Climate change will have important impacts on agricultural biodiversity.
- Changes and shifts in the distribution of marine biodiversity resulting from climate change could have serious implications for fisheries.
- Biodiversity loss and ecosystem service degradation resulting from climate change has a disproportionate impact on the poor and may increase human conflict.
- Indigenous people will be disproportionately impacted by climate change because their livelihoods and cultural ways of life are being undermined by changes to local ecosystems.
- Shifts in phenology and geographic ranges of species could impact the cultural and religious lives of some indigenous peoples.

II. VALUING ECOSYSTEM SERVICES

5. There are many methodologies available for the economic valuation of biodiversity benefits. 1/ The appropriateness of various methodologies is determined by the biodiversity beneficiary (local versus global, private sector versus non-profit, etc) and the types of biodiversity benefits realized (direct versus indirect use values; use versus non-use values). 2/

6. Some techniques are based on actual observed behaviour data, including methods that deduce values indirectly from behaviour in surrogate markets, which are hypothesized to have a direct relationship with the ecosystem service of interest (so-called revealed preference techniques). Other techniques are based on hypothetical rather than actual behaviour data, where people's responses to questions describing hypothetical markets or situations are used to infer value (so-called stated preference techniques). Some techniques are broadly applicable, some are applicable to specific issues, and some are tailored to particular data sources.

7. As in the case of private-market goods, a common feature of all methods of economic valuation of ecosystem services is that they are founded in the theoretical axioms and principles of welfare economics. These measures of change in well-being are reflected in people's willingness to pay 3/ for changes in their level of use of a particular service or bundle of services.

8. These approaches have been used extensively in recent years, in a wide range of policy-relevant contexts. However it is suggested that some biodiversity functions are key to the survival of global ecosystems including humans (the so-called life support function) and should, therefore, be treated as a fundamental constraint and not an element of the set of possible economic choices. 4/

9. In reality, valuation typically focuses on the economic values of ecosystem goods and services generated by biodiversity rather than biodiversity as such. 5/ A comprehensive assessment of the values of ecosystem services was undertaken by the Millennium Ecosystem Assessment (MA). The MA examined all use and non-use values of a variety of ecosystems revealing the importance of full accounting. For example, the MA revealed that as much as 96 per cent of the economic value of forests can be attributed to non-wood forest products, recreation, hunting, watershed protection, carbon sequestration, and passive use.

1/ See for an overview 'An Exploration of Tools and Methodologies for Valuation of Biodiversity and Biodiversity Resources and Functions' CBD Technical Series No. 28, Montreal.

2/ Ibid, p. 14.

3/ Dependent on the question that is to be investigated, focus is sometimes also given to the so-called 'willingness to accept' compensation. See Ibid, footnote 10, for a brief discussion.

4/ Ibid, pages 10, 13-14.

5/ Ibid, page 7-8

10. One option to put a monetary value on biodiversity benefits is through replacement costs or lost income. While not a valuation method in the strict sense, cost-based approaches can provide useful guidance under certain conditions. 6/ The MA highlighted a number of examples in this regard including:

- The collapse of the Newfoundland cod fishery in the early 1990s cost at least US$ 2 billion in income support and retraining;
- The damage costs of freshwater eutrophication in England and Wales was estimated to be US$ 105–160 million per year in the 1990s; and
- An algal bloom in Italy in 1989 cost the coastal aquaculture industry US$10 million and the Italian tourism industry US$ 11.4 million.

11. There are, however, very few peer reviewed studies on the social and cultural benefits from using ecosystems services for climate change adaptation (see the UNEP-WCMC literature review for some examples of associated studies). Those studies that do exist highlight the importance of biodiversity conservation and sustainable use in reducing the vulnerability of the poor in the face of climate change 7/ and maintaining traditional knowledge, 8/ innovations and practices. 9/

12. Regardless of the methodology employed, the interim report of TEEB outlined nine key principles of best practices for ecosystem valuation including: 10/

i. The focus of valuation should be on marginal changes rather than the “total” value of an ecosystem;

ii. Valuation of ecosystem services must be context specific, ecosystem-specific and relevant to the initial state of the ecosystem;

iii. Good practices in “benefit transfers” need to be adapted to biodiversity valuation, while more work is needed on how to aggregate the values of marginal changes;

iv. Values should be guided by the perception of the beneficiaries;

v. Participatory approaches and ways of embedding the preferences of local communities may be used to help make valuation more accepted;

vi. Issues of irreversibility and resilience must be kept in mind;

vii. Substantiating bio-physical linkages helps the valuation exercise and contributes to its credibility;

viii. There are inevitable uncertainties in the valuation of ecosystem services, so a sensitivity analysis should be provided for decision makers; and;

ix. Valuation has the potential to shed light on conflicting goals and trade-offs but it should be presented in combination with other qualitative and quantitative information and may not be the last word.

6/ Ibid, page 16-17.

7/ Abramovitz et al. Adapting to Climate Change: Natural Resource Management and Vulnerability Reduction. 2006.

8/ CBD. Indigenous Peoples and Tradition Knoweldge Related to Biological Diversity and Responses to Climate Change in the Arctic Region. 2009.

9/ UNEP. Pacific Island Mangroves in a Changing Climate and Rising Sea. UNEP Regional Seas Reports and Studies No. 179. 2006.

10/ UNEP. The Economics of Ecosystems and Biodiversity: An interim report. http://www.ufz.de/data/economics_ecosystems_biodiversity8717.pdf . European Communities, 2008.

III. VALUE DERIVED FROM LINKING BIODIVERISTY CONSERVATION AND SUSTAINABLE USE AND CLIMATE CHANGE ADAPTATION

13. As outlined in the previous section, the valuation of biodiversity should consider both direct and indirect values as well as concepts such as discounting, opportunity costs and identification of both local and global benefits. When consider the links between biodiversity and climate change adaptation, however, since no direct valuation studies have been conducted, it is necessary to infer valuation based on (1) the relative importance of ecosystem services weighed against projected impacts of climate change and (2) willingness to pay inferred from investments in adaptation programmes which integrate biodiversity conservation and sustainable use. This need to infer costs is recognized by the interim report of TEEB which highlights that there is an urgent need for a deeper dialogue between economists, climate scientists and ecologists.

14. Examples of such valuation attempts are presented below with regards to the role of biodiversity in providing cost effective protection from natural disasters, enhancing food security and sustaining local livelihoods.

Cost effective protection from natural disasters

15. Protecting and restoring ecosystems can be affordable and is an essential long-term strategy to help human communities defend against the effects of climate change on exposure to natural disasters. Consider alternative approaches to shoreline protection. Hard infrastructure like seawalls and levees is expensive, requires ongoing maintenance, and can fail catastrophically under severe storm conditions. Alternatively, the protection and restoration of "green infrastructure" such as healthy coastal wetlands (including mangrove forests) and coral reefs could be more cost-effective means for protecting large coastal areas, and requires less maintenance since they are living systems. 11/ Intact coastal ecosystems also provide additional community benefits in terms of food, raw materials and livelihoods as well as benefiting biodiversity. Examples include:

- In the spirit of preventive disaster relief, Red Cross of Vietnam began planting mangroves in 1994. By 2002, those 12,000 hectares had cost US$ 1.1 million, but saved annual levee maintenance costs of US$ 7.3million, shielded inland areas from typhoon Wukong in 2000, and restored livelihoods in planting and harvesting shellfish. 12/
- In Malaysia, the value of existing mangroves for coastal protection is estimated at US$ 300,000 per kilometer of coast based on the cost of installing artificial structures that would provide the same coastal protection. Indeed, in the Maldives, the degradation of protective coral reefs around Malé required construction of artificial breakwaters at a cost of US$ 10 million per kilometer. 13/
- In the United States, coastal wetlands reduce the damaging effects of hurricanes on coastal communities by acting as "horizontal levees." An economic analysis of wetland losses and hurricane damage since 1980 in the United States suggests that a one hectare loss of wetland resulted in an average increase of US$ 33,000 in damage from a single storm. 14/

Enhancing food security

16. The conservation and sustainable use of biodiversity can contribute to enhanced food security by providing a number of ancillary benefits such as reducing land degradation and desertification, improving the resilience of crop and livestock systems and ensuring access to wild sources of protein when crops fail. Examples include:

11/ Moberg and Rönnbäck (2003), cited in WWF's 2003 study Buying Time.

12/ Reid,H. & Huq,S. (2005) Climate change - biodiversity and livelihood impacts. Tropical forests and adaptation to climate change: in search of synergies. Adaptation to climate change, sustainable livelihoods and biological diversity, Turrialba, Costa Rica, March 2004., 57-70

13/ In the Front Line: Shoreline Protection and other Ecosystem Services from Mangroves and Coral Reefs. United Nations Environment Programme, 2006

14/ Costanza et al (2008) The Value of Wetlands for Hurricane Protection, Ambio 37:241-248

- In Djibouti, the country's only protected forest helped avert a famine by providing a temporary reserve for grazing during a five-year drought which is expected to increase in frequency as a result of changing precipitation patterns. Djibouti and other African countries need help to secure and expand such areas in anticipation of more frequent and intense periods of drought.

Sustaining local livelihoods

17. From farming, ranching, timber and fishing, to water, fuelwood, and subsistence resources, human welfare is inextricably tied to natural resources and the benefits that ecosystems provide. 15/ The World Bank's Climate Change Framework Strategy warns that the disproportionate impacts of climate change on the poorest and most vulnerable communities could set back much of the development progress of the past decades and plunge communities back into poverty. By protecting and restoring healthy ecosystems that are more resilient to climate change impacts, ecosystem-based adaptation strategies can help to ensure continued availability and access to essential natural resources so that communities can weather the conditions that are projected in a changing climate. Strategies that involve local governance and participation will also benefit from community experience with adapting to changing conditions, and may create greater commitment among communities for implementation. Examples include:

- In Kimbe Bay, Papua New Guinea, coral reef resilience principles were applied to design a network of marine protected areas that can withstand the impacts of a warming ocean and continue to provide food and other marine resources to local communities. This approach is already being implemented at several more sites in Indonesia and for the Meso-American reef.
- In Southern Africa, the tourism industry has been valued at US$ 3.6 billion in 2000, however, the Intergovernmental Panel on Climate Change projects that between 25 and 40 per cent of mammals in national parks will become endangered as a result of climate change. As such, the National Climate Change Response Strategy of the Government of South Africa includes interventions to protect plant, animal and marine biodiversity in order to help alleviate some of this projected lost income. 16/

IV. ESTIMATES OF LOST VALUE ASSOCIATED WITH THE IMPACTS OF CLIMATE CHANGE ON BIODIVERSITY

18. A number of studies have estimated the costs of climate change under different scenarios. For a 2°C increase in global mean temperatures, for example, annual economic damages could reach US$ 8 trillion by 2100 (expressed in U.S. dollars at 2002 prices). 17/

19. There are few studies available, however, on the lost value associated with the impacts of climate change specifically on biodiversity in large part because of the difficulty in separating climate change impacts from other drivers of biodiversity loss. Some case-studies include:

- A study by the World Bank for Fiji revealed that coral reef degradation attributable to climate change is expected to cost between US$ 5 million and US$ 14 million a year by 2050. This cost represents the loss of value from fisheries, tourism and habitat. 18/

15/ Millennium Ecosystem Assessment. 2005. www.millenniumassessment.org.

16/ A National Climate Change Response Strategy for South Africa. Department of Environmental Affairs and Tourism, 2004

17/ Ackerman, F. and E. Stanton. Climate Change – the costs of inaction. Global Development and Environment Institute, Tufts University. October, 2006

18 Papua New Guinea and Pacific Island Unit; The World Bank. 2000. Cities, Sea and Storms: Managing Change in Pacific Island Economies Volume IV Adapting to Climate Change Summary Version. World Bank, Washington D.C

- An estimate of the impacts of climate change on trout populations in Taiwan reveals a mean willingness to pay to avoid change in trout populations of US$ 16.22 per person for 0.9 °C increase, US$ 25.72 per person for a 1.8 °C increase, and US$ 33.60 per person for a 2.7 °C increase. 19/
- The loss in welfare associated with climate change in a mesic-Mediterranean landscape in Israel is estimated at US$ 51.5 million if conditions change to Mediterranean climate, US$ 85.5 million if conditions change to a semi-arid landscape and US$ 107.6 million for conversion to an arid landscape based on loss grazing and willingness to pay. 20/
- The lost value for protected areas associated with the projected impacts of climate change in Africa, based on willingness to pay, is estimated at US$ 74.5 million by 2100. 21/
- The predicted negative impacts of climate change on coral reefs in the Bonaire National Marine Park in the Netherland Antilles, based on willingness to pay estimates by divers was US$ 45 per person per year if coral cover drops by from 35 per cent to 30 per cent and fish diversity drops from 300 species to 225 species and US$ 192 per person if coral cover drops from 35 per cent to 5 per cent and fish diversity drops from 300 species to 50 species. 22/

20. In conducting the above studies, however, a number of assumptions had to be taken and choices made which could affect the outcomes including:

- The discounting rate used;
- The General Circulation Model that the impacts are based upon;
- The future scenarios (in terms of levels of emission reductions).

19/ Tseng, W.C. / Chen, C.C., Valuing the Potential Climate Change Impacts on the Taiwan Trout. Ecological Economics, 65 (2), p.282-291, Apr 2008.

20/ Fleischer, A. / Sternberg, M., The economic impact of global climate change on Mediterranean rangeland ecosystems: A Space-for-Time approach. Ecological Economics, 59 (3), p.287-295, Sep 2006.

21/ Velarde, S.J. / Malhi, Y. / Moran, D. / Wright, J. / Hussain, S., Valuing the impacts of climate change on protected areas in Africa. Ecological Economics, 53 (1), p.21-33, Apr 2005.

22/ Parsons,G / S. M. Thur Valuing Changes in the Quality of Coral Reef Ecosystems: A Stated Preference Study of SCUBA Diving in the Bonaire National Marine Park. Environmental and Resource Economics, Volume 40, Number 4 / August, 2008.