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Gap analysis for the purpose of facilitating the discussions on how to improve and strengthen the science-policy interface on biodiversity and ecosystem services

The annex to the present note contains a gap analysis for the purpose of facilitating the discussions on how to improve and strengthen the science-policy interface on biodiversity and ecosystem services. It has been reproduced as received, without formal editing.

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Gap analysis for the purpose of facilitating the discussions on how to improve and strengthen the science-policy interface on biodiversity and ecosystem services[1]

Contents

[1] This report was prepared with the support of the UNEP World Conservation Monitoring Centre (UNEP-WCMC), with substantive input and comment from a wide range of governments, IGOs, NGOs and individuals.

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A. Executive summary

A.1. Introduction

1. Over the past decades the international community has established a number of regimes to conserve and use sustainably biodiversity and ecosystem services. These efforts have led to the development of a considerable, continuously evolving and ever-more complex system of environmental governance. Nonetheless, notwithstanding significant progress in science and the increasing recognition of the importance of using science effectively in decision-making, biodiversity and ecosystem services continue to be used unsustainably and inequitably, and are being degraded at increasing rates.

2. The Millennium Ecosystem Assessment showed that over the past 50 years humanity has caused unprecedented losses in biodiversity and declines in ecosystem services. Of the 24 assessed ecosystem services, 60 per cent recorded a decline, with further degradation expected unless immediate action is taken. This is expected to have a negative impact on development processes in all countries, but in particular in developing countries, and is impeding the attainment of both the Millennium Development Goals and the internationally agreed target to reduce significantly the rate of biodiversity loss by 2010.

3. While there are many reasons for this situation, there is growing consensus that strengthening the interrelations between science and policy at all levels is necessary (but not sufficient) for more effective governance of biodiversity and ecosystem services. Current environmental problems, often of considerable magnitude and complexity, challenge science, politics, policy and their interrelations in unprecedented ways, confronting them with situations in which facts are uncertain, values in dispute, stakes high and decisions urgent.

4. In recent years considerable attention has been paid to tackling inadequacies in the interrelations between science and policy, insofar as this is possible within given mandates, budgets and decision-making processes, and to exploring options for a more effective science-policy interface, as in the case of the ad hoc international and multi-stakeholder meeting on an intergovernmental science-policy platform on biodiversity and ecosystem services, convened in Putrajaya, Malaysia, from 10 to 12 November 2008.[2]

5. In the Putrajaya Road Map, set out in the annex to the report of the meeting (document UNEP/IPBES/1/6), participants recognized that mechanisms to improve the science-policy interface for biodiversity and ecosystem services for human well-being and sustainable development should continue to be explored and called for a gap analysis to be undertaken with the aim of supporting future discussion by reviewing the strengths and weaknesses of existing science-policy interfaces and the coordination between them across all spatial scales. They requested a preliminary report to be made available at the twenty-fifth session of the United Nations Environment Programme (UNEP) Governing Council/Global Ministerial Environmental Forum, in February 2009. At that meeting, representatives called upon UNEP to complete the gap analysis for presentation at the next ad hoc intergovernmental and multi-stakeholder meeting, building on comments received through an open review process.

6. The full gap analysis builds on the preliminary version, incorporating the comments received during the review process and further drawing on scientific literature, policy reports, institutional research and consultations with experts.

7. In answering the mandate accorded by the Governing Council and the related discussions, the objectives of this analysis are:

a) To review the institutional landscape relevant to the discussion and to analyse the strengths and weaknesses of existing science-policy interfaces and coordination between them at the national, regional and global levels of governance;

b) To present the findings of this review and analysis in such a manner as to help to orient future discussion on strengthening the science-policy interface on biodiversity and ecosystem services.

[2] While much of this is described in the gap analysis, particularly relevant to the current discussions on strengthening the science-policy interface on biodiversity and ecosystem services is the “assessment of assessments” reviewing the global marine assessment landscape for the purpose of determining possible options and a framework for a regular process for global reporting and assessment of the state of the marine environment. This process is currently in an advanced and critical phase, with a meeting of the Ad Hoc Working Group of the Whole convened by the General Assembly in paragraph 157 of its resolution 63/111 of 5 December 2008 to be held in New York from 31 August to 4 September. The Working Group plans to submit its proposals to the General Assembly at its sixty-fourth session.

A.2. Key findings

8. The gap analysis identified six key findings, ranging from the complexity of science-policy interfaces to the lack of coordination between the many stakeholders in covering the broad spectrum of biodiversity and ecosystem services in a comprehensive manner, which is essential for effective policymaking in the development field.

Finding No. 1: Multiple science-policy interfaces

9. A wide range of science-policy interfaces of varying types, sizes and purposes already exist for the many multilateral environmental agreements and other bodies relating to biodiversity and ecosystem services at all levels. Between them they have, to a certain extent, enriched decision-making and raised awareness of biodiversity and ecosystem services among the environmental community.

10. The specific findings are as follows:

a) *Finding No. 1.1:* The existing landscape of science-policy interfaces and interactions provides an important basis that can be built upon and strengthened;

b) *Finding No. 1.2:* The variety of existing science-policy interfaces is in part historic as institutions have been created on an ad hoc basis to deal with problems and issues as they have emerged. Much of this variety is, however, likely to be inherent, given the complexity of governance arrangements, the multiple levels of governance, the broad range of sectoral interests and the variety of purposes.

Finding No. 2: Effectiveness of science-policy interfaces

11. Notwithstanding the progress made by many of the existing science advisory bodies to improve the focus and quality of scientific inputs into policymaking processes, there is scope for further improvement in scientific independence through increased credibility, relevance and legitimacy.

12. The specific findings are as follows:

a) *Finding No. 2.1:* Most science-policy interfaces have relatively modest budgets for the size of the task that they are expected to perform, potentially limiting their ability to assess knowledge comprehensively and ensure the input of the best available science, leaving them to rely on inputs from other bodies and processes that might not be best suited to their needs;

b) *Finding No. 2.2:* Each science-policy interface works in a separate manner and each mechanism can bring its own limitations, such as the problems that can be encountered when an advisory body is responsible for providing scientific input to the policy process while acting as an initial negotiating platform.

Finding No. 3: Common and shared knowledge base

13. Although an extensive knowledge base exists to support decision-making in each of the many science-policy interfaces, shared frameworks, methodologies and basic understandings to respond to the complex nature of biodiversity and ecosystem services issues remain missing or incompletely implemented. There are also significant gaps in knowledge that need to be filled.

14. The specific findings are as follows:

a) *Finding No. 3.1*: Notwithstanding the considerable progress in and growth of the relevant sciences, some fundamental knowledge gaps exist, in particular with regard to the dynamic interactions between drivers of change, ecosystems and human well-being. This is of particular concern at the regional, national and local scales, where many of the most important interactions of this nature occur and where human well-being depends most directly on ecosystem services;

b) *Finding No. 3.2*: Although a range of institutions support the development of research strategies to meet policy needs, there is currently no process providing common and regularly reviewed guidance on a strategic approach to research to ensure that the most important needs in terms of knowledge to support more effective governance at all levels are being identified and responded to in a coordinated manner;

c) *Finding No. 3.3*: While awareness of the need to draw more systematically on a broad range of knowledge types is growing, there remains a lack of processes for ensuring the effective incorporation of types of knowledge into the knowledge base, including the incorporation of knowledge from other sectors and disciplines, non-formal knowledge and mutual learning;

d) *Finding No. 3.4*: Notwithstanding continuing efforts, there remain significant gaps in long-term observation and monitoring programmes, in particular as regards data and information on interactions between drivers of change, ecosystems and human well-being, and on particular geographic regions;

e) *Finding No. 3.5*: While progress has been made, there remain significant barriers to the effective use of existing data and knowledge resulting from institutional and technical impacts on both the availability of data and information and on the ability of users to gain access to such data and information in meaningful ways.

Finding No. 4: Policy impact

15. Various mechanisms synthesize, present and communicate knowledge to inform policy. There is, however, a lack of regular processes providing periodic, timely and policy-relevant information covering the full range of biodiversity and ecosystem service issues to the broader development community. This information and knowledge is not always translated and communicated in the most efficient way or the most useful format.

16. The specific findings are as follows:

a) *Finding No. 4.1*: As a result of the vast quantity and varying quality of differing, fragmented and sometimes even contradictory knowledge currently available, together with the lack of clear authoritative synthesis and a clear and targeted communication thereof, decisions taken are not necessarily informed by the best available knowledge;

b) *Finding No. 4.2*: Knowledge is often not presented in the form of clear policy alternatives that systematically outline the implications of policy options under detailed framing assumptions and provide better guidance in policy implications;

c) *Finding No 4.3*: In discussions on science-policy interfaces there is far more focus on identifying issues and formulating policies with regard to multilateral environmental agreements at the global level than on supporting policy implementation and policy evaluation, particularly at the national and regional levels of governance, and on the extent to which effective information and advice pertains to and is used by the development community at the lower governance levels;

d) *Finding No. 4.4:* There is a need for more integrated quantitative models, scenarios and indicators that will aid understanding of not only biodiversity and ecosystem services, but also the relevance of biodiversity and ecosystem services to human well-being;

e) *Finding No. 4.5:* Notwithstanding the range of assessments relating to biodiversity and ecosystem services, no regular periodic multi-level assessment process exists that provides the conceptual and institutional framework coherently to gather, review, synthesize, communicate and monitor information and track changes in biodiversity and ecosystem services and their consequences for human well-being at the global, regional and national levels and on the interrelation across these levels;

f) *Finding No. 4.6:* There are continuing difficulties in ensuring timely scientific advice on emerging issues of concern at and across all levels, whether in response to policymakers' requests or resulting from concerns arising from the scientific community.

Finding No. 5: Coordinated approach

17. Notwithstanding the existence of several mechanisms to improve the coordination of the wide range of science-policy interfaces for the many multilateral environmental agreements and other bodies related to biodiversity and ecosystem services, there is significant room for building on the existing experiences that would lead to better coordination between and across global and national mechanisms.

18. The specific findings are as follows:

a) *Finding No. 5.1*: There is significant potential to improve the effectiveness of science-policy interfaces through more coherent coordination within and across their various functions, integrating such aspects as research strategies, models and scenarios, assessments, knowledge-brokering and capacity-building;

b) *Finding No. 5.2*: Examples exist of thematic mechanisms such as expert groups or other collaborative arrangements that are providing valuable support to policy formulation and implementation on specific issues. Lessons can be learned from this;

c) *Finding No. 5.3*: There is a lack of coordination across sectors to allow for the constant exchange and joint creation of knowledge, leading to mismatches and duplications of information and policies relevant to the broader development community;

d) *Finding No. 5.4*: There is a lack of coordination across levels of governance to allow for the effective exchange of knowledge and experience back and forth across relatively diverse science-policy interfaces from the national to the global level that is necessary to avoid mismatches and duplications and to increase synergies between them.

Finding No. 6: Fundamental capacities

19. Numerous institutions and processes are helping to build capacity to use science effectively in decision-making at all levels. Further efforts, however, are required to integrate multiple disciplines and knowledge systems to produce relevant knowledge effectively; to translate knowledge into policy action and to coordinate these processes; and to build the capacities of developing countries to use science more effectively in decision-making and to participate fully in the science-policy dialogue.

20. The specific findings are as follows:

a) *Finding No. 6.1*: Notwithstanding continuing efforts and improvements in capacity-building supporting the various processes of interfacing science and policy, there remains a significant and widespread lack of capacity in interdisciplinary approaches for knowledge production relevant to biodiversity and ecosystem services for human well-being and governance that draw upon a variety of knowledge systems;

b) *Finding No. 6.2*: There is a widespread lack of capacity for brokering knowledge effectively so that it is used appropriately in decision-making, including by identifying the implications of various policy options;

c) *Finding No. 6.3*: There are geographical variations in capacity relevant to science-policy interfaces, with significantly reduced capacity in developing countries, and in particular the less developed countries and small island developing States, impeding these countries' full engagement in nearly all relevant processes.

B. Introduction

B.1. Mandate, objectives and methodology for the gap analysis

21. The *Ad hoc* intergovernmental and multi-stakeholder meeting on an intergovernmental science-policy platform on biodiversity and ecosystem services (IPBES Meeting) was convened in Putrajaya, Malaysia, from 10-12 November 2008, to consider ways and means of improving the science-policy interface on biodiversity and ecosystem services for human well-being, including possible establishment of an intergovernmental science-policy platform on biodiversity and ecosystem services (IPBES). The meeting recognised that mechanisms to improve the science-policy interface for biodiversity and ecosystem services for human well-being and sustainable development should continue to be explored, and called for a gap analysis to be undertaken with the aim of supporting future discussion, in particular at the second IPBES Meeting (scheduled for 5-9 October 2009, in Nairobi, Kenya).[3] Participants specifically requested that the gap analysis provide:

a) an analysis of the strengths and weaknesses of existing science-policy interfaces and coordination among them at all spatial scales, including the advisory bodies of biodiversity-related Multilateral Environmental Agreements and United Nations bodies; and

b) an assessment of the potential for strengthening existing science-policy interfaces, as well as the potential added value of a new mechanism complementing existing interfaces and helping to overcome the recognized weaknesses in the current system.

22. The gap analysis is based on the preliminary gap analysis submitted to the twenty-fifth session of the UNEP Governing Council/Global Ministerial Environmental Forum held 16-20 February 2009 in Nairobi;[4] the input of governments, intergovernmental organizations, non-governmental organizations, the scientific community and other relevant stakeholders that have provided comments on the preliminary gap analysis;[5] and further review of scientific literature, policy reports, institutional research, and consultation with stakeholders familiar with the different processes and mechanisms under review.

23. In preparing the gap analysis there are inevitable limitations in what can be achieved, given the breadth and complexity of the issue, and the time and resources available. In particular the following should be born in mind:

a) Widely differing views of stakeholders*:* Given the complexity of the issue and the wide range of perspectives, different stakeholders have views and positions on how to improve the science-policy interface (or components of it) that differ significantly from those of others. Aware of the broad range of perspectives, every effort has been taken to ensure an inclusive and balanced approach in this analysis.

b) Large and varied institutional landscape*:* There is a significant number and variety of relevant scientific advisory bodies and processes, and associated political and scientific institutions, differing in type, size, mandate, purpose and nature, and spanning different scales, sectors and regions. Inevitably the gap analysis cannot provide an exhaustive description of the complete landscape of interfaces, organizations and networks, and instead draws on representative experiences while endeavouring to place this in context of the whole landscape.

c) Stakeholder input*:* Fewer comments have been received on the preliminary gap analysis than was anticipated, despite direct request to governments and additional approaches to other stakeholders with the support of IUCN and DIVERSITAS. It is therefore hoped that the input received covers the full range of views and positions.

d) Time and resources*:* The preliminary gap analysis was peer reviewed and the current paper draws on those review comments, however it was not possible to provide the full gap analysis for further wide-scale peer review, although parts of it were commented on by a number of stakeholders.

24. Given the orientation provided by the IPBES meeting, and the various comments and inputs provided, this gap analysis aims to: clearly define the concepts and outline the context relevant to the discussion on

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[3] UNEP/IPBES/1/6

[4] UNEP/GC.25/INF/30

[5] A total of 739 comments were received from 54 different submissions, 21 from Governments (including the EC), six from IGOs, 12 from universities and research institutes (often individuals) and 15 from civil society organizations. A number of the comments received related to the potential outcomes rather than the gap analysis itself, but otherwise the comments have been addressed as far as possible. A copy of the comments received can be found on www.ipbes.net.

improving the science-policy interface in order to provide for a common ground of understanding; review the institutional landscape relevant to the discussion and to analyze strengths and weaknesses of existing science-policy interfaces and coordination among them at all levels; and present the findings of this review and analysis in such a manner as to help orient future discussion on strengthening existing science-policy interfaces and addressing gaps and weaknesses.

B.2. Background and context

25. Over the last few decades of the twentieth century the international community established an international regime which aimed to conserve and use sustainably biological diversity and ecosystem services. These efforts have led to the development of: a considerable, continuously evolving and ever more complex governance system, including substantial networks of actors, complex institutional settings extending across sectors and scales; a constantly growing body of decisions, policies, programmes and agreements; and a constantly growing body of knowledge on which actors draw to inform these.

26. However, despite this multiplication of policy processes and increase of knowledge production, according to the Millennium Ecosystem Assessment, biological diversity and ecosystem services continue to be used unsustainably and inequitably, and biodiversity is changing and being lost at increasing rates.[6] This is likely to have a negative impact on development processes in all countries, but in particular on developing countries, and is impeding achievement of both the Millennium Development Goals and the internationally agreed target to significantly reduce the current rate of biodiversity loss by 2010.[7]

27. Today's environmental problems, often of considerable magnitude and complexity, challenge science, politics, policy and their interrelations in unprecedented ways, confronting them with situations where facts are uncertain, values in dispute, stakes high, and decisions urgent. Ensuring an effective interface between science and policy is fundamental to good decision-making and effective governance, as the extent to which decisions lead more reliably to desired outcomes is critically influenced both by the scope of the knowledge that key actors have available to them, and the power and influence that they are able to mobilise.

28. In recent years considerable attention has been given to options for developing a more effective interface between science and policy with respect to biodiversity and ecosystem services. While much of this is described elsewhere in this document, particularly relevant to the lead up to the current discussions and the preparation of the gap analysis are the following two initiatives:

a) The International Mechanism of Scientific Expertise on Biodiversity (IMoSEB) consultative process was carried out between February 2006 and November 2007, and included six regional meetings, case studies, briefings, presentations and discussions at numerous other scientific and policy meetings, written input from a wide range of other sources, and dialogue with a number of stakeholders.[8] The consultation identified a number of key needs, and criteria for ensuring that these needs were addressed in an appropriate manner, which are summarized in Annex A. The final meeting of the International Steering Committee[9] also invited the Executive Director of UNEP to convene an intergovernmental meeting with all key stakeholders, both governmental and non-governmental, to consider establishing an efficient international science-policy interface addressing the findings of the consultation.

b) The Millennium Ecosystem Assessment (MA) follow up process was developed following completion of the MA in 2005, and taking account of the experience of the MA,[10] the recommendations of two independent evaluations of the MA conducted in 2006 and 2007[11] and discussion during the Conference of the Parties to the Convention on Biological Diversity (decisions VIII/9 and IX/15). This process aims to strategically address the following four issues: continuing to build the knowledge base through sub-global assessments; promoting the consideration of ecosystem services in decision making processes; making

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6 Millennium Ecosystem Assessment. 2005. *Ecosystems and Human Well-being: Synthesis*. Island Press.

7 Agreed in April 2002 by the Parties to the CBD and subsequently endorsed at the World Summit on Sustainable Development in Johannesburg and incorporated as a target under the Millennium Development Goals.

8 Information on the process, and copies of all reports and submissions, can be found at www.imoseb.net

9 Their final report can be found at www.imoseb.net/international_steering_committee_2

10 See: Millennium Ecosystem Assessment. 2003. *People and Ecosystems: A Framework for Assessment and Action.* World Resources Institute; Millennium Ecosystem Assessment. 2005. *Ecosystems and Human Well-being: Synthesis*. Island Press; Reid, W.V. *et al.* 2006. *Bridging Scales and Knowledge Systems: Concepts and Applications in Ecosystem Assessment.* Island Press, the Global Environmental Assessment Project lead by Harvard University (www.hks.harvard.edu/gea).

11 The GEF review was completed in 2006 (www.unep.org/eou/Pdfs/Millennium Eco Assessment Report unedited.pdf). The review conducted by the United Kingdom's Environmental Audit Committee of the House of Commons was published in 2007 (www.publications.parliament.uk/pa/cm200607/cmselect/cmenvaud/77/77.pdf)

assessment tools and methodologies widely available; and exploring needs, options and modalities for further global assessments (see Annex B).

29. Following completion of the IMoSEB consultation, and as part of the MA follow-up, the UNEP Executive Director convened the *ad hoc* intergovernmental and multi-stakeholder meeting on an intergovernmental science-policy platform on biodiversity and ecosystem services from 10-12 November 2008 in Putrajaya, Malaysia to consider establishing an efficient intergovernmental science-policy interface on biodiversity and ecosystem services for human well-being and sustainable development. At the meeting it was agreed that no recommendations would be adopted, but that the Chair's summary, annexed to the meeting report, would serve as the outcome.[12]

30. Participants at the IPBES Meeting recognized that there were currently numerous national and international science-policy interfaces for biodiversity and ecosystem services. But there was also broad recognition that there was a need to improve the science-policy interface, which should draw on the best available knowledge. Participants recognised that mechanisms to improve the science-policy interface for biodiversity and ecosystem services for human well-being and sustainable development should continue to be explored, and:

a) recommended that the Executive Director of UNEP should report at the twenty-fifth session of the Governing Council/Global Ministerial Environment Forum on the outcome of the meeting;

b) recommended that the UNEP Governing Council should request the Executive Director to convene a second intergovernmental multi-stakeholder meeting on an intergovernmental science-policy platform on biodiversity and ecosystem services with a view to strengthening and improving the science-policy interface for biodiversity and ecosystem services for human wellbeing, including consideration of a new science-policy platform; and

c) called for a gap analysis to be undertaken with the aim of supporting future discussion by reviewing the existing mechanisms and processes, and requested that a preliminary report be made available at the twenty-fifth session of the Governing Council/Global Ministerial Environmental Forum.[13]

31. As requested, a preliminary gap analysis was provided as information document UNEP/GC.25/INF/30 to the UNEP Governing Council in February 2009. The UNEP Governing Council took note of the preliminary gap analysis, and in decision 25/10:

a) invited Governments and relevant organizations to continue to explore the mechanisms to improve the science-policy interface for biodiversity, long-term human well-being and sustainable development, taking into account the special need to develop and maintain the technical and scientific capacity of developing countries in biodiversity-related issues;

b) requested the Executive Director to undertake a further process to support these efforts aiming to report on its progress at the special session on biodiversity of the sixty-fifth session of the General Assembly and other relevant meeting; and

c) requested the Executive Director to convene a second intergovernmental and multi-stakeholder meeting at the earliest possible convenience in 2009 following the completion of the full gap analysis.

32. During review of the preliminary gap analysis, several Governments drew attention to the need to relate discussions to two further ongoing processes, so as to ensure complementarity:

a) The Assessment of Assessments and the Regular Process for Global Reporting and Assessment of the state of the Marine Environment (GRAME) are being carried out under UN General Assembly Resolution 60/30 to review available knowledge and the ways in which it is used in the marine environment, and to propose options and a future framework[14] for ensuring an adequate reporting and assessment of the state of the marine environment in order to support decision making, including aspects of building capacity, improving the knowledge base, improving networking among assessment and monitoring processes, and improving communication tools (see Annex C). The AoA/GRAME process is currently in a very advanced and critical phase, with an *Ad hoc Working Group of the Whole* 31 August - 4 September 2009, and plans to submit its proposals to the UN General Assembly in October 2009. There are obviously close parallels with IPBES, warranting tracking of the reports and outcomes of meetings later this year.

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[12] Copies of reports and documents for the IPBES Meeting can be found at www.ipbes.net

[13] UNEP/IPBES/1/6

[14] Available at www.unga-regular-process.org

b) Moves towards increased coherence within the UN and environmental governance have been under way for a number of years, recognizing the potential for missed opportunities for synergy, and duplication of effort if this is not addressed. Discussion on increasing coherence in both the UN system and international environmental governance is likely to continue for some time, and its final outcome cannot be predicted. However it can be assumed that emphasis will remain on the need for greater coherence, that improvements in the ways in which science can be used to support decision making will continue to be recognised as a key issue, and that improvements in delivery and use of such information now will be important for whatever governance landscape exists in the future. This is discussed further in Annex D.

C. Setting the Context

33. There is significant variation in understanding of what science-policy interfaces are, how they work, and what they can achieve, and this variation in understanding is contributing to delays in consensus building and potentially hindering opportunities for full agreement on how to improve the current science-policy interface. It is not entirely clear to all of those participating what issues are being addressed, and what the scope of the discussion is.

34. In practice, there is a range of scientific advisory bodies and processes of different type, size, purpose, and spanning different levels and sectors. These can be very different in nature, some being very formal and others rather informal in character, some being closer to scientific processes while others are closer to the political process. They may also have different functions, or operate at different stages of the policy process.

35. In order to provide a common ground of understanding for discussions on mechanisms to improve the science-policy interface for biodiversity, long-term human well-being and sustainable development, it is important to define the concepts central to the gap analysis, and define to the scope.

C.1. Defining the scope of the gap analysis

36. Given the mandate to support discussions exploring the mechanisms to improve the science-policy interface for biodiversity and ecosystem services, long-term human well-being and sustainable development, the scope of the science-policy interface, and hence of the gap analysis, is taken to encompass the following with respect to biodiversity and ecosystem services:

a) all aspects of the conservation and sustainable use of biodiversity in all Earth's environments, whether terrestrial, freshwater, coastal or marine;

b) a wide range of other relevant sectors, including agriculture, forestry and fisheries, trade, development, and poverty reduction; and

c) multiple levels of governance addressing institutions at national, regional and global levels and the interactions between them.

37. The analysis therefore implicitly or explicitly includes institutions, networks and processes related directly to biodiversity and ecosystem services governance, as well as those that address sustainable development, and others that impact one or more aspects of biodiversity and ecosystem services.

C.2. Defining concepts central to the gap analysis

38. Science can be defined as the systematic pursuit of objective knowledge, involving formalised and disciplined methods of knowledge production which include the observation, identification, description, experimental investigation, theoretical explanation and prediction of phenomena. In trying to attain objectivity, science relies on the minimisation of any kind of influence that would introduce bias in knowledge production, and on validation of results through peer-review. Science encompasses all natural and social sciences, although the various disciplines differ significantly in their methods and concepts, and this has implications for developing interdisciplinary approaches, as is discussed later.

39. In addition to disciplined scientific knowledge there are other, non-formal types of knowledge, such as local, practical or traditional knowledge, that differ from scientific knowledge in essential ways. This non-formal knowledge often rests on experience and customs, and does not separate 'secular' or 'rational' knowledge from spiritual knowledge, intuitions and wisdom. It is often highly dependent on context, dynamic, collectively held and inter-generational in nature. Nonetheless, much non-formal knowledge exists that has the potential to considerably enhance the effectiveness of policies.

40. Policies can be defined as commitments to definite courses or methods of action with broad implications, selected from among alternatives in light of given conditions, and taking account of norms, values and motives, to increase the certainty of realising desired outcomes. Policies are adopted not only by governments and

intergovernmental bodies, but are also made by companies, interest groups and other organised forms of society. In contrast, politics can be understood as the set of practices and institutions through which an order is created in the context of power and conflict, including processes of bargaining, negotiation and compromise over policy development and implementation.

41. Science and politics are characterised by different types of knowledge and processes, and as such they are treated as independent and separable human activities. However, in reality the scientific and political spheres deeply intersect with one another through the intermingling of processes, products and actors.

42. It is in this context that science-policy interfaces can be defined as structures and processes that aim to improve the identification, formulation, implementation and evaluation of policy to render governance more effective by: defining and providing opportunities for processes which encompass interrelations between science and policy in a range of domains; assigning roles and responsibilities to scientists, policy-makers and other relevant stake- and knowledge-holders within these processes; and facilitating improved coordination within and between the different stakeholder groups.

43. With this in mind, science-policy interfaces need to be understood both as a means to more effectively link knowledge to action by providing for a flow of credible, policy-relevant and authoritative information to those actors who have the influence to actually make a difference, and as core elements of international governance that have the potential to shape governance systems significantly.

44. A wide range of reviews and studies related to the use of science in policy formulation and decision making has identified relevance (or salience), credibility and legitimacy as amongst the most important attributes of effective science-policy interfaces.[15] The following definitions are consistent with those used in the Assessment of Assessments/Regular Process for Global Reporting and Assessment of the state of the Marine Environment:

a) Relevance reflects the extent to which the approach and findings of a science-policy interface are closely related to the needs of decision-making processes, and the extent to which a science-policy interface identifies key target audiences and ensures effective consultation and communication between them and the knowledge holders, and strengthens the capacity of both experts and decision-makers to interact productively.

b) Credibility reflects the perceived validity of information, methods and procedures to a defined audience, and thus the extent to data of appropriate quality and established methods are used, availability of results and methods for peer review, absence of bias, selection of knowledge holders through appropriate and transparent procedures and so on.

c) Legitimacy reflects the perceived fairness, balance, political acceptability and trust, in particular the extent to which the processes are perceived as respectful of stakeholders' contributions, concerns and their divergent values and beliefs, including the extent to which these processes provide for transparency and availability of data and information and efforts to strengthen the capacity of all interested groups to contribute.

45. In addition it is assumed that science-policy interfaces should also be efficient in the sense of being costs-effective, and building on existing experience, organizations, processes, networks and programmes. Throughout the following analysis consideration is given to these characteristics and whether they are being adequately addressed.

46. Four main categories and/or areas of work of a science-policy interface emerge from the discussion at both the IPBES Meeting in Putrajaya and the UNEP GC/GMEF:[16]

a) building a common and shared knowledge base;

b) effectively informing policy formulation and other relevant decision making;

c) providing fundamental capacity for all stakeholders and knowledge holders; and

d) facilitating a coordinated response to various issues by different actors.

[15] Cash, D.W. *et al*. 2003. Knowledge systems for sustainable development. PNAS 100 (14), 8086-8091; Farrell, E.F., Jäger, J. 2006 Assessments of Regional & Global Environmental Risks. Resources for the Future, Washington, D.C.; Assessment of Assessments Report and Summary for Decision Makers, 2009 (www.unga-regular-process.org)

[16] See UNEP/IPBES/1/6 and UNEP/GC.25/15

D. Description of the Institutional Landscape

Finding #1. A wide range of science-policy interfaces of varying types, sizes and purposes already exist for the many multilateral environmental agreements and other bodies relating to biodiversity and ecosystem services at all levels. Between them they have, to a certain extent, enriched decision-making and raised awareness of biodiversity and ecosystem services among the environmental community.

47. Throughout the last few decades there has been significant increase in the arrangements made at all levels to conserve and sustainably use biodiversity and ecosystem services. These arrangements range from legally binding treaties to disbursement of multilateral assistance, and from national policy development to setting fisheries quotas. Meanwhile there has been significant advance in science, and increasing recognition of the importance of effective use of science in decision making. Therefore, as environmental governance arrangements have proliferated, mechanisms for ensuring that these are advised by science have also developed.

48. The landscape of processes, organizations, networks, programmes and other arrangements promoting, ensuring and supporting the use of science in decision making is now large and complex, and it is in the context of that landscape that consideration needs to be made of how to most effectively improve the science-policy interface and ensure the effective incorporation of biodiversity and ecosystem service science into decision making at all levels and across all sectors.

D.1. Setting the scene

49. This section aims to describe that landscape, to identify by examples the range of individual scientific advisory bodies and processes involved, and the range of support they have available. In addition, Annexes E-J and T-W provide further descriptions of a range of examples of scientific advisory bodies and processes, and of some of the plethora of organizations, networks and programmes that support them.

Institutions and processes at global and regional levels

Finding #1.1 The existing landscape of science-policy interfaces and interactions provides an important basis that can be built upon and strengthened.

Finding #1.2 The variety of existing science-policy interfaces is in part historic as institutions have been created on an ad hoc basis to deal with problems and issues as they have emerged. Much of this variety is, however, likely to be inherent, given the complexity of governance arrangements, the multiple levels of governance, the broad range of sectoral interests and the variety of purposes.

50. The United Nations system and related governance processes have over the years demonstrated a steadily increasing interest in drawing on scientific information and advice in order to fulfil their responsibilities to advance human health, welfare, and development, while better managing and conserving the environment and natural resources. This need for scientific advice has been approached by different organs of the system, at different times, in different ways. Some of the most relevant examples include the following.

a) The Multilateral Environmental Agreements, which have each established subsidiary bodies or other mechanisms to provide scientific and technical advice, including, for example, the Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA) of the Convention on Biological Diversity (CBD), the Animal and Plant Committees of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), and the Scientific and Technical Review Panel (STRP) of the Ramsar Convention on Wetlands (see Annexes E-G).

b) UN Programmes such as the United Nations Environment Programme, which acts as the convener for a number of scientific advisory groups and processes, and mobilizes scientific and technical knowledge to support international environmental norm setting, activities which have over time culminated in adoption of conventions, action plans and strategies, research agendas, and political declarations (see Annex H).

c) International Commissions such as the Commission on Sustainable Development (CSD), set up under the UN Economic and Social Council (ECOSOC) to implement the Agenda 21, which relies on a wide variety of advisory inputs, most of which are provided through consultancy reports, or the Commission on Genetic Resources for Food and Agriculture which draws *inter alia* on the periodic review of *State of the World's Animal Genetic Resources for Food and Agriculture* developed through a participatory, country-driven process under the guidance of the Commission.

d) Scientific advisory groups such as the Scientific and Technical Advisory Panel (STAP) which supports the Global Environment Facility (GEF); the Joint Group of Experts on the Scientific Aspects of Marine Environment Protection (GESAMP) which advises a range of sponsoring organizations;[17] and the Intergovernmental Panel on Climate Change (IPCC), the leading body for the assessment of climate change, established in 1988 by UNEP and the World Meteorological Organization (WMO), all of which are described further in Annex H.

e) Specialized agencies, such as the UN Food and Agriculture Organization and the UN Educational, Scientific and Cultural Organization, which have a range of scientific advisory processes in addition to being responsible for specific international agreements (and their advisory processes), and in the case of FAO also for administering Commission on Genetic Resources for Food and Agriculture (see Annex H).

51. There is also an increasing number of intergovernmental arrangements at the regional level that play important roles in interfacing science and policy in biodiversity and ecosystem governance. For example, the following three organizations (see Annex J):

a) The Association of Southeast Asian Nations' (ASEAN) Centre for Biodiversity (ACB), which aims to facilitate cooperation and coordination among the Member States on the conservation and sustainable use of biological diversity in the region, focusing on issues such as information sharing and access, monitoring and assessment, and capacity building.

b) The African Union's Scientific, Technical and Research Commission (AU/STRC), established to coordinate and promote scientific and technological research and findings, and to serve as a clearing house for all scientific and technical activities of the continent through a sharpening of the overall national and regional development plans, strategies and policies in order to ensure full exploitation of national and natural resources for durable long term growth and development.

c) The European Environmental Agency (EEA) and European Environment Information and Observation Network (EIONET) of the European Union, established to support sustainable development and to help achieve significant and measurable improvement in Europe's environment through the provision of timely, targeted, relevant and reliable information to policy-making agents and the public.

52. Other key institutions which play important roles in interfacing science and policy are within or closely linked with the scientific community. Examples of such institutions include the following:

a) Organisations such as the International Council for Science (ICSU), the International Social Science Council (ISSC) and the Third World Academy of Sciences (TWAS), which among other things often represent the scientific community in, and coordinate their input to, high-level processes (see Annex J).

b) Scientific programmes, such as DIVERSITAS, the International Geosphere-Biosphere Programme (IGBP), and the International Human Dimension Programme on Global Environmental Change (IHDP), which promote and facilitate research in key areas.

c) Scientific networks, such as the Species Survival Commission (SSC) of the International Union for the Conservation of Nature (IUCN), the global network of International Long Term Ecological Research (ILTER), and information sharing networks and programmes such as the Inter American Biodiversity Information Network (IABIN) and the Global Biodiversity Information Facility (GBIF).

d) The research centres of the Consultative Group on International Agricultural Research (CGIAR), ranging from the Centre for International Forestry Research (CIFOR) to the WorldFish Centre, and from Bioversity International to the International Centre for Agricultural Research in the Dry Areas (ICARDA).

e) Specialist "boundary" organizations working in support of governance processes to improve the information available for decision making, such as the UNEP World Conservation Monitoring Centre, and the European Centre for Nature Conservation.

53. Finally there is the role played by civil society organizations and the private sector in providing support to science-policy interfaces. Some of the most relevant examples include:

a) World Business Council for Sustainable Development (WBCSD), a global association of some 200 companies which provides a platform for companies to explore sustainable development, share knowledge, experiences and best practices, and to advocate business positions on these issues in a variety of forums, working with governments, non-governmental and intergovernmental organizations (see Annex J).

[17] UN, FAO, IMO, UNESCO-IOC, WMO, IAEA, UNIDO and UNEP

b) Internationally active non-government organizations such as WWF, The Nature Conservancy (TNC), Conservation International (CI), BirdLife International and the World Resources Institute (WRI), which between them make substantive scientific input within the areas covered by their respective organizational interests and priorities.

54. In each case throughout this section it is important to remember that each of the institutions and processes referred to has its own mandate and its own governance arrangements, and their working arrangements vary widely depending on both their history and the particular mandate they have. It is therefore not surprising that this quick illustration of the institutional landscape shows that existing interfaces related to biodiversity and ecosystem services vary widely in nature, for example:

a) From institutions that are closer to political processes such as the subsidiary bodies of scientific and technical advice or the regional intergovernmental commissions to institutions that are closer to scientific processes, such as the international research programmes of DIVERSITAS, IGBP and IHDP or organisations like ICSU, ISSC and TWAS.

b) From institutions that intend to 'close down' policy processes decreasing the range of policy alternatives by developing clear authoritative recommendation as in the case of the subsidiary bodies of scientific and technical advice, to institutions that assist in 'opening up' policy processes brokering a range of policy alternatives by clearly associating scientific results with a range of choices and outcomes such as some assessment processes exploring different scenarios.

55. Together these individual science-policy interfaces and components of science-policy interfaces form a complex and continuously evolving interface between science and policy. As a result of this huge and varied landscape, there are many different approaches and messages, partly as a result of different mandates and interests, but also perhaps because there is no single frame of reference.

Institutions and processes at the national level

56. This complex landscape of internationally operating institutions and processes is complemented by similar sorts of arrangements at the national level, although the degree of complexity varies depending on national circumstances, as does the degree to which they interact with the international institutions and processes.

The special case of Multilateral Environmental Agreements (MEAs)

57. As an illustration of the workings of the science-policy interface it is worth looking more closely at the different types of arrangements used by a range of the MEA scientific advisory bodies, as is described here and in Annexes E-G. The MEAs covered are the six global biodiversity-related treaties (CBD, CITES, CMS, International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA), Ramsar and World Heritage, and the other two "Rio Conventions" (UNFCCC and the UN Convention to Combat Desertification (UNCCD)).

58. The existing scientific advisory bodies and processes vary in quite significant ways in practice. All the biodiversity-related and Rio Conventions have formal scientific advisory bodies, with the exception of the World Heritage Convention (which draws on the advisory capacity of three independent organisations), and the International Treaty on Plant Genetic Resources for Food and Agriculture (which has not yet identified a need to establish a standing scientific advisory body, and benefits from the work of the Commission on Genetic Resources for Food and Agriculture). All of the advisory bodies report to the relevant COP, with the exception of the Ramsar STRP which reports to and is overseen by the Standing Committee.

59. The tasks of these scientific bodies and processes are convention-specific, with the bodies of most treaties focusing on scientific advice, while some are also expected to also make strong technical input. For example, the UNFCCC SBSTA is tasked to provide scientific advice, but also to promote the development and transfer of technologies, to conduct technical work on national communications and emission inventories, and to carry out methodological work in a range of specific areas.

60. The membership of the advisory bodies of MEAs is either open to all Parties (CBD, CMS, UNFCCC, UNCCD) or consists of appointed members and/or regional representatives (CITES, CMS, Ramsar). Some conventions encourage Parties to nominate experts or scientists in their delegations to the scientific bodies (national representatives at the CITES Animals and Plant Committees are primarily drawn from the national Scientific Authorities to CITES, for example), but there are no mechanisms to guarantee this will happen. The number and proportion of scientists participating in advisory bodies varies greatly between conventions and, within conventions, between one national delegation and another.

61. There are various ways for the scientific advisory bodies to draw on external scientific and technical information, and independent experts are frequently invited to contribute in one way or another. For example CMS and Ramsar can appoint scientific experts as members of the science advisory bodies for specific issues, and as previously mentioned the World Heritage Conventions uses the expertise of three independent organizations. For the UNFCCC, a completely independent external institution exists with the Intergovernmental Panel on Climate Change (IPCC) which provides advice for SBSTA to consider and make available to other Convention bodies and Parties.

62. Several conventions make use of expert groups. For example, limited duration *ad hoc* technical expert groups play a particularly important part in the CBD, where they address specific issues and provide input to SBSTTA, while the UNCCD has established a Group of Experts on Combating Desertification and Mitigating the Effects of Drought and the UNFCCC an Expert Group on Technology Transfer. In a few cases expert groups are used by more than one convention, as is the case with the Scientific Task Force on Avian Influenza and Wild Birds which is used by Ramsar, CMS and one of the CMS daughter agreements.

63. The UNCCD is the only convention that foresees in its articles the establishment of a roster of experts. The COP has faced problems in receiving information from Parties on the extent to which they have made use of the roster of experts and, through establishing the Group of Experts, has found a way to formalise the roster. The CBD established a roster of experts under SBSTTA but later discontinued its use; it was preferred to invite Parties to nominate experts for the *ad hoc* technical expert groups and other purposes. The UNFCCC continues to use a Roster of Experts.

64. In most conventions, the COP has adopted a *modus operandi* or terms of reference for the scientific body in order to clearly define its work and the way it provides scientific and technical advice. These *modus operandi* vary between the conventions in length and detail. The CMS Scientific Council has adopted its own Strategic Implementation Plan, aligned to the Strategic Plan of the Convention. Various other ways and means to improve the effectiveness of the advisory bodies have been suggested, including closer links with the scientific community and different meeting styles. For example the UNCCD has agreed to hold its future Committee on Science and Technology meetings in the form of scientific conferences led by identified institutions.

65. In addition the forward agendas of most of the scientific advisory bodies are known, or can be inferred from their strategic plans or work plans.

D.2. Potential limitations of science-policy interfaces

Finding #2. Notwithstanding the progress made by many of the existing science advisory bodies to improve the focus and quality of scientific inputs into policymaking processes, there is scope for further improvement in scientific independence through increased credibility, relevance and legitimacy.

66. In general the scientific advisory bodies and processes established by different governance bodies at whatever level have mandates and/or terms of reference that define how they work. These mandates are one of the strengths of the existing science advisory bodies just described, not least because it means that the governance bodies are likely to be listening to the advice given (even if there are other reasons why that advice is not ultimately followed). Additionally the *modus operandi* of the scientific advisory processes discussed above suggest that they are both expected to take account of scientific learning and experience, and have the potential to call on and involve scientists, which they all regularly do in one way or another.

67. As with any ongoing process it is important to regularly review and hopefully to improve the efficiency and effectiveness of scientific advisory bodies and processes, building on experience gained through practice. For example, several of the biodiversity-related treaties have initiated reviews of the effectiveness of their scientific advisory bodies. CITES established an external evaluation working group to review the scientific committees. UNCCD initiated extensive consultations on ways of improving the efficiency and effectiveness of the Committee on Science and Technology. CBD has considered suggestions for improving the workings and operations of SBSTTA on a number of occasions. Ramsar reviews the effectiveness of its STRP on an ongoing basis and has made adjustments to both membership arrangements and *modus operandi* in recent years.

68. However there are a range of recognised limitations which are common to almost the whole science-policy interface. To a large extent these occur because of the wide range of activities and relationships inherent in the complex landscape described above, and in each case the limitations could lead to mismatches, inefficiencies and duplication at all levels. These limitations are:

a) the need for a common and shared knowledge base, rather than the fragmented knowledge base currently available, which is addressed in Section E.1;

b) the need for more effective communication of policy relevant information, based on addressing clearly identified and understood needs, which is addressed in Section E.2;

c) the need for improved coordination across the many components of the science-policy interface, building on existing experience and activities, which is addressed in Section E.3; and

d) the need to build capacity at all levels to adequately address these issues both within the biodiversity sector and across sectors, which is addressed in Section E.4.

69. Meanwhile, two further distinct sets of challenges have been identified in reviewing these particular science advisory processes, those that are concerned with the increasing workload coupled with lack of (financial) resources and capacity, and those that are concerned with specific aspects of the processes employed. Some of the key concerns raised are discussed in the rest of this section, but it should be born in mind that these relate to the science-policy interface in general, and not just to the science advisory bodies and processes of the MEAs.

Capacities, budgets and agendas

Finding #2.1 Most science-policy interfaces have relatively modest budgets for the size of the task that they are expected to perform, potentially limiting their ability to assess knowledge comprehensively and ensure the input of the best available science, leaving them to rely on inputs from other bodies and processes that might not be best suited to their needs.

70. The first series of interconnecting issues which potentially result in limitations to the workings of scientific advisory bodies and processes are those concerned with their workload and resources. The challenges that can result are discussed in generic terms without specific examples, so as to avoid the potential for argument about the detail and any feeling that defensive positions need to be taken. Note that different scientific advisory bodies and processes are affected in different ways by these challenges, for some there is no problem, while for others the challenges are quite significant.

71. Agendas getting more crowded: In many cases more and more issues are being added to the agendas of those working at the interface between science and policy, in part because of increasing awareness of the relevance of biodiversity and ecosystem services to many aspects of society. This can potentially lead to:

a) an insufficient time for full discussion of issues at meetings;

b) issues not getting the level of attention that they need or deserve; and

c) delay in addressing issues.

72. Insufficient budget to prepare for issues adequately: Budgets are inevitably limited, and given the growing agendas and increasing complexity (as links to other sectors are increasingly being addressed), the budgets of most scientific advisory bodies and processes are relatively modest considering the breadth of issues they are expected to address. This can potentially lead to:

a) insufficient preparation for discussion unless additional resources can be found;

b) using what is available rather than commissioning what is required;

c) using whoever can deliver input at lowest cost, rather than whoever is best to do it; and

d) reduction in time available for consultation and peer review.

73. Unrealistic expectations: Depending on the issue of concern, research can take some time to complete, and in some cases scientific research over a period of time is essential (for example where aspects of change are being investigated). The scientific advisory bodies and processes can be severely challenged when they are set unrealistic timeframes for providing advice. This can potentially lead to:

a) insufficient preparation for discussion; and

b) using what is available rather than what is required.

74. The potential results if any of these concerns are realised are an increased risk of failure of uptake at the policy level, criticism of output and outcomes, and a dissatisfaction with the process that has led to them. This may then also lead to request for further input (which takes even more time), with concomitant delays in decision making.

Processes

Finding #2.2 Each science-policy interface works in a separate manner and each mechanism can bring its own limitations, such as the problems that can be encountered when an advisory body is responsible for providing scientific input to the policy process while acting as an initial negotiating platform.

75. The second series of issues which potentially result in limitations to the workings of scientific advisory bodies and processes are those concerned with different aspects of process. Again the challenges that can result are discussed in generic terms, and again it is important to note that different parts of the science-policy interface are affected in different ways by these challenges.

76. Science advice verses negotiation: Some scientific advisory bodies are charged with both providing scientific advice to their respective governance bodies, and with initial negotiation on the text of decisions. This can potentially lead to:

a) loss of scientific independence in the process (possibly without even realising it); and

b) negotiators predominating in meetings rather than scientists.

77. Experts and expertise: Different processes have implications for the ways in which individuals are identified and involved, and the extent to which they can (or are qualified to) contribute. In particular the following are potential limitations:

a) where experts are chosen for a panel, the choice of the right experts is crucial, as is the manner in which they then call on the expertise of others;

b) with respect to participation in meetings, whether the right people attend, and related to this how small delegations cope with the broad range of issues that can be under discussion;

c) whether additional experts, and expert organizations and processes, are able to contribute in an appropriate manner so as to increase the scientific input and review; and

d) whether sufficient and appropriate expertise is brought in from other disciplines and sectors relevant to the issues being considered.

78. Relationship to other processes and initiatives: Given many components of the science-policy interface address the needs of specific governance bodies and processes, and given the cross-sectoral nature of biodiversity, there are potential limitations in what can be achieved. In particular the following are potential concerns:

a) governance processes tending to mandate tasks independently without reference to other relevant interests and processes, which can restrict the actions of science advisory bodies;

b) scientific advisory bodies not taking other processes and initiatives sufficiently into account in their discussions and advice;

c) participants in one process being unaware of the advice given and positions taken by their direct counterparts in other processes, even when from the same government or organization;

d) overlapping areas of competence, where issues that are explored for possibly being addressed with respect to biodiversity are effectively blocked by decisions already taken in other sectors; and

e) key opportunities missed because everyone thinks it is someone else's responsibility.

79. Flexibility: Depending on their mandates, terms of reference and/or *modus operandi*, it can be difficult for some science-policy processes to quickly react to emerging issues, something that can be compounded by other limitations identified above such as crowded agendas and limited budgets. The potential result is that key issues may be dealt with later than they should if the science-policy interface is not able to respond.

80. Again the potential results if any of these concerns are realised are an increased risk of failure of uptake at the policy level, criticism of output and outcomes, and a dissatisfaction with the process that has led to them. In particular this is so if the right experts and expertise are not involved in an open and transparent manner, as there is opportunity then to question both the credibility and legitimacy of the process.

81. But at the end of the day, however good the advice, politics can result in a decision that goes against that advice for one reason or another. The example of fisheries management in the European Union is a case in point. Despite having excellent scientists, a significant amount of research, and processes which generate officially agreed advice through the intergovernmental International Council for the Exploration of the Seas

(ICES), many European fisheries are regarded by the European Commission as being unsustainable. The reasons for this are explored further in Annex W.

E. Analysis of the Science-Policy Interface

82. The analysis of the science-policy interface on biodiversity and ecosystem services addresses in turn each of the main functional components of a science-policy interface identified in the previous section: building a common and shared knowledge base which effectively supports policy; effectively informing policy and other relevant stakeholders; providing the fundamental capacity to enable full engagement in the science-policy interface, and increasing synergy and coherence through coordination of the many different actors, activities and issues.

83. The first two of these functional aspects, building a common and shared knowledge base and effectively informing policy, are really part of a single continuum of producing knowledge and effectively communicating it, but they are here considered separately in order to clarify the different roles they play and the issues concerned. Meanwhile the other two function aspects, providing fundamental capacity and coordination, are the most essential cross-cutting functional aspects of a science-policy interface. Although they are inherently part of all other functional components, due to their crucial importance each of these cross-cutting aspects are also addressed separately.

E.1. Building a common knowledge base

Finding #3. Although an extensive knowledge base exists to support decision-making in each of the many science-policy interfaces, shared frameworks, methodologies and basic understandings to respond to the complex nature of biodiversity and ecosystem services issues remain missing or incompletely implemented. There are also significant gaps in knowledge that need to be filled.

84. A knowledge base that was jointly constructed and thus common to and shared by as many of the relevant knowledge holders and stakeholders as possible would provide substantial support for the effective identification, formulation, implementation and evaluation of environmental policy at a variety of levels and across a range of governance processes.

85. Facilitating opportunities for building such a common knowledge base could therefore be seen as one of the core functions of the broader science-policy interface. The processes involved in the joint creation and management of such a common knowledge base would be highly valuable in developing and maintaining coherence across the boundaries of science, politics, business or other relevant domains of societal organisation.

86. Those elements considered essential for a knowledge base on biodiversity and ecosystem services, and which are analyzed in more detail below, include:

a) basic knowledge needs;

b) processes for the incorporation of different types knowledge;

c) guidance on research strategies and long-term observation and monitoring systems;

d) availability and accessibility to data and information;

87. In reading this section it is important to remain aware of the wide variation geographically in the availability of data, information and knowledge, the ability to generate it, and the implications of this for planning decision making at all levels. In a review of CBD national biodiversity strategies and action plans (see Annex U) it was found that lack of scientific input in development of the strategies and plans was a major concern, with potential implications for subsequent implementation. This is addressed further later, in the section on providing fundamental capacity.

E.1.1 Basic knowledge needs and guidance on research strategies

Basic knowledge needs

Finding #3.1. Notwithstanding the considerable progress in and growth of the relevant sciences, some fundamental knowledge gaps exist, in particular with regard to the dynamic interactions between drivers of change, ecosystems and human well-being. This is of particular concern at the regional, national and local scales, where many of the most important interactions of this nature occur and where human well-being depends most directly on ecosystem services.

88. Full understanding of the interactions between human activity and biodiversity and ecosystem services is essential to ensuring improvements in the conservation and sustainable use of biodiversity and ecosystem

services. Exploration of the interactions between social and ecological systems has emerged as a vibrant field of research over the last two decades,[18] and in particular the Millennium Ecosystem Assessment (MA) triggered a range of innovations and advances in the field. However, significant gaps in knowledge remain.

89. The recent report by a high-level multidisciplinary group of experts led by ICSU, UNESCO and UNU,[19] which was established by the MA follow-up process to identify key gaps in knowledge and data, to design a research agenda, and to influence the priorities of research funding agencies, has identified[20] that there is a lack of basic information both on the dynamics of social–ecological systems and the relationships of ecosystem services to human well-being. In particular they have identified that:

a) Research is needed to better understand effects of biodiversity in social–ecological context focusing on controls of ecosystem services themselves, addressing the effects of multiple drivers, structural factors including biodiversity, and human feedbacks across temporal and spatial scale; and addressing needs for information about how drivers and management interventions change ecosystem services – effects that are essential for understanding changes in ecosystem services and projecting the consequences of policies intended to improve ecosystem services.

b) Research is needed to build the empirical base for understanding thresholds of massive persistent changes in social–ecological systems, the factors that control probabilities of such changes, and leading indicators of incipient thresholds; and to develop policy approaches that build resilience for massive changes that are hard to predict and have long-lasting consequences.

c) Research is needed to improve the methodologies of quantification of tradeoffs of ecosystem services, to understand the true social value of non-marketed ecosystem services, and to derive the value of the ecosystem configurations that deliver different bundles of services.

d) Research is needed to understand how changes in ecosystem services interact with other determinants of human well-being. In addition, research is needed to understand the effect of changes in ecosystem services on wealth and poverty. Research is needed to clarify how changing flows of ecosystem services affect the most vulnerable members of society.

90. This report further states that, although some key questions relate to the impacts of global processes on ecosystems (e.g. the impact of trade and economic drivers) and the consequences of changes in ecosystems on global scale processes, research at a global scale cannot address many of the most important research challenges because *research is essential at the scale at which interactions occur among ecosystem services and between drivers and ecosystem services and between ecosystem services and people. Many of the most important interactions of this nature occur at landscape and regional scales*.

91. Also according to the report, the relative lack of knowledge at these landscape and regional scales was one of the greatest barriers encountered in the development of the MA, and is one of the key issues in the MA follow-up process (see Annex B). It is also one of the greater impediments to national implementation of environmental provisions agreed in the various MEA governance bodies, as for example, clearly shown by the extent to which countries have been able to develop and implement their National Biodiversity Strategies and Action Plans as called for by CBD Article 6 (see Annex U).[21]

92. Particularly significant is the lack of such knowledge in developing countries. For example, according to a quantitative analysis of more than 6400 environmental sciences papers published 1993–2003, only 13% of the papers are based on research in the dry sub-tropical and tropical zones, although these eco-climatic zones account for more than half of the world's land area.[22] Further, according to former UN Secretary-General Kofi Annan, "*Ninety-five percent of the new science in the world is created in the countries comprising only one-fifth*

[18] Clark, W.C. 2007. Sustainability Science: A room of its own. PNAS, 104 (6): 1737-1738.

[19] ICSU-UNESCO-UNU. 2008. Ecosystem Change and Humans Well Being: Research and Monitoring Priorities Based on the Millennium Ecosystem Assessment. International Council of Science.

[20] Carpenter, S.R. *et al*. 2009. Science for managing ecosystem services: Beyond the Millennium Ecosystem Assessment. *Proceedings of the National Academy of Sciences* 106(5): 1305-1312.

[21] See also UN/JIU/REP/2008/3; Najam, A. 2005. Developing Countries and Global Environmental Governance: From Contestation to Participation to Engagement. *International Environmental Agreements* 5: 303-21; UNEP/CBD/WG-RI/2/2/Add.1; see Annex S

[22] Karlsson, S., *et al*. 2007. Understanding the North-South knowledge divide and its implication for policy: a quantitative analysis of the generation of scientific knowledge in the environmental sciences. *Environmental Science and Policy* 10(7): 668-684.

of the world's population. And much of that science […] neglects the problems that afflict most of the world's people." [23]

93. Lack of such knowledge in developing countries is not only accounted for as one of the greater challenges to policy implementation in these countries, it is also impeding the development of effective global environmental assessments that rely predominantly (or almost exclusively in the case of the IPCC) on published research results in peer-reviewed journals. Given the North-South bias in the published literature it can be argued that the resulting global assessments may currently be less 'global' than they set out to be, and that global negotiations and policy that are informed by these assessments may be inadequately addressing the perspectives of developing countries in particular.[24]

Guidance on research strategies

Finding #3.2. Although a range of institutions support the development of research strategies to meet policy needs, there is currently no process providing common and regularly reviewed guidance on a strategic approach to research to ensure that the most important needs in terms of knowledge to support more effective governance at all levels are being identified and responded to in a coordinated manner.

94. Helping to guide and/or influence the development and implementation of research strategies is of clear interest to the science-policy interface so as to help ensure future access to relevant research results and information based on them. To reach this aim, a science-policy interface would have to ensure coordination and a continuous dialogue about future research needs and strategies between those policy mechanisms and decision makers that are in need of further information, those responsible for developing research strategy, and the organization, networks, programmes and knowledge holders that would provide this information.

95. With both supply of and demand for scientific knowledge emerging from complex networks of individuals and institutions with diverse incentives, capabilities, roles, and cultures, it can be argued that more appropriate and more effective decisions about resource allocation, institutional design, programme organisation, and information dissemination science would be achieved if they were informed by knowledge about the supply of science, the demand for science, and the relationship between the two.[25]

96. Several organisations, programmes or initiatives support development of research strategies to meet policy needs in one way or the other, for example the following:

a) The International Council for Science (ICSU), with global and regional representations representing both national scientific bodies and international scientific unions, provides a forum for discussion of issues relevant to policy for international science and the importance of international science for policy issues, and undertakes, *inter alia*, planning and coordination of inter-disciplinary research to address major issues relevant to both science and society.

b) DIVERSITAS is an international programme of biodiversity science with a mission to promote an integrative biodiversity science, linking biological, ecological and social disciplines in an effort to produce socially relevant new knowledge to provide the scientific basis for the conservation and sustainable use of biodiversity. It also aims to establish national committees and collaboration with other organisations to enlarge and strengthen scientific networks to easier identify global research priorities, allocate resources, facilitate knowledge transfer, and support capacity building.

c) The International Social Science Council (ISSC), is an international non-profit-making scientific organisation with headquarters at UNESCO in Paris . It is the primary international body representing the social and behavioural sciences at a global level. The Council's role is to advance the practice and use of the social and behavioral sciences in all parts of the world, and to ensure their global representation. This involves among other things work to ensure their utilization and relevance to the problems of humankind. Such promotion includes, wherever possible, the assistance of policy development at international and national levels, and the use of high quality social science research to further economic well-being and quality of life in all parts of our globe.

d) The Academy of Sciences for the developing world (TWAS), an autonomous international organization, based in Trieste, Italy, that promotes scientific excellence for sustainable development in the

[23] Annan, K. 2003. A challenge to the world's scientists. *Science* 299: 1485.

[24] Karlsson, S., *et al*. 2007. quoted above; Biermann, F., 2000. Science as Power in International Environmental Negotiations: Global Environmental Assessments Between North and South. Environment and Natural Resources Program, Discussion Paper no. 2000-17. Belfer Center for Science and International Affairs, Harvard University

[25] Sarewitz, D., Pielke, R. 2007. The neglected heart of science-policy: reconciling supply of and demand for science. *Environmental Science and Policy*. 10(1): 5-16.

South. Originally named "Third World Academy of Sciences", it was founded in 1983 by a distinguished group of scientists from the South to promote scientific excellence and capacity in the South for science-based sustainable development.

e) The European Platform for Biodiversity Research Strategy (EPBRS) is an example of a regional forum at which natural and social scientists, policy-makers and other stakeholders identify structure and focus the strategically important research that is essential to conservation and sustainable use of biodiversity from a European perspective.

f) The Scientific, Technical and Research Commission of the African Union (AU/STRC), established to coordinate and promote scientific and technological research and findings and to serve as a clearing house for all scientific and technical activities of the continent through a sharpening of the overall national and regional development plans, strategies and policies in order to ensure full exploitation of national and natural resources for durable long term growth and development.

97. While each of these, and many more institutions not mentioned here, contribute significantly to building a common knowledge base in one way or the other, it can be argued that gaps in understanding that exist today are evidence of the fact that those fundamental challenges cannot be adequately addressed through uncoordinated studies of individual components of isolated traditional disciplines in an *ad hoc* set of research sites scattered across the globe.[26, 27] It is suggested that what is lacking or insufficient are:

a) Processes that systematically assess and reconcile the supply and demand for science information on biodiversity and ecosystem services in order to ensure that research agendas are more relevant to science-policy needs, that research agendas and user needs are more closely matched, and that institutional constraints, and other obstacles do not prevent effective use of results.

b) Guidance on and coordination of place-based long-term social–ecological research, based on a conceptual framework that can be applied at multiple scales and accounts for interactions across scales, so as to allow for opportunities for unique place-specific research, comparisons across a network of places, and to address the connections of ecosystem processes and institutions across local, regional, and global scales.

c) Opportunities to learn from ongoing management programmes and policies to better understand the factors that influence the outcomes of programmes intended to improve ecosystem services and human well-being. Only rarely is the success of these projects evaluated by using appropriate data and indicators. There is a lack of a framework for assessing changes in social–ecological systems, by using metrics and indicators that can be collected consistently and compared across the range of cases.

98. It is also suggested that a further constraint is the lack of information tools delivering systematic reviews providing an evidence-based framework to evaluate effectiveness and support decision-making in biodiversity and ecosystem services management.[28]

E.1.2 Processes for the incorporation of different types of knowledge

Finding #3.3. While awareness of the need to draw more systematically on a broad range of knowledge types is growing, there remains a lack of processes for ensuring the effective incorporation of types of knowledge into the knowledge base, including the incorporation of knowledge from other sectors and disciplines, non-formal knowledge and mutual learning.

99. The modern world is characterized by an unprecedented fragmentation and specialization of knowledge, including scientific knowledge.[29] Yet, the knowledge needs identified in the previous sections clearly suggest the importance of drawing on a wide range of different types of knowledge and mutual learning when building the common knowledge base for sound decision-making. In this context in particular, two important issues come to fore as regards important aspects for the effectiveness of science-policy interfaces on biodiversity and ecosystem services:

a) the need to address the challenges of interdisciplinarity; and

b) the need to include other, non-formal types of knowledge.

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[26] ICSU-UNESCO-UNU. 2008. Ecosystem Change and Humans Well Being: Research and Monitoring Priorities Based on the Millennium Ecosystem Assessment. International Council of Science.

[27] Carpenter, S.R. *et al*. 2009. Science for managing ecosystem services : Beyond the Millennium Ecosystem Assessment. Proceedings of the National Academy of Sciences. 106(5): 1305-1312.

[28] Pullin, A.S., Knight, T.M. 2009. Doing more good than harm – building an evidence-base for conservation and environmental management. *Biological Conservation* 142(5).

[29] Norgaard, R.B., Baer, P. 2005. Collectively Seeing Complex Systems: The Nature of the Problem. *Bioscience* 55(11).

Interdisciplinary challenges

100. It has long been agreed that interdisciplinary approaches are essential to building the knowledge base necessary for enhancing the governance of the environment and sustainable development, and there have been significant advances in number and quality.[30] However, true and meaningful interdisciplinary research necessary for an effective science-policy interface still remains a challenge for at least the following reasons:[31]

a) Scientists in different disciplines have different perspectives and approaches. For example, it has been said that "*Most of the social scientists are discussing the means of interdisciplinarity without an end in sight whereas many natural scientists are ardently promoting an end without deeper consideration of the means involved*." [32]

b) Science is often inaccurately or incompletely homogenized, neglecting the diversity of approaches to research and the types of resulting knowledge, and at the same time it is not fully appreciated that knowledge can have different power and implications associated with it within the sciences, between natural and social sciences, and between science and societal knowledge.

c) The prevalence of earlier more disciplinary and reductionist concepts of science in the organization of society and its institutions can constrain efforts to facilitate and coordinate interdisciplinary knowledge production.

101. An analysis of interdisciplinary scientific assessment for environmental governance has emphasized the mismatch between the emerging understandings of the complexity of reality, the ways scientists have come to understand this complexity, and the way science connects to politics, policy, and management.[33] In this context, scientific advisory bodies and processes, and other components of the science-policy interface, can all play an important role in promoting interdisciplinarity.

102. The experience of the MA demonstrated that the complexity and critical importance of systemic interactions with the environment can best be understood through a collective, discursive process of scientists learning together. It is argued that such collective learning processes need to be increased, and most importantly, that these methods need to be institutionalised in a way that they are ongoing and able to inform new, more integrated governance.[34]

Local ecological knowledge

103. Even more challenging is the incorporation of local ecological knowledge.[35] It is now widely accepted that the knowledge and practices of local communities make important contributions to the maintenance of biological diversity and ecosystem services (see Annex K for a more detailed review). The key challenge now is to move beyond merely accepting in principle the importance of traditional knowledge in policy-making to ensuring these knowledges and practices are fully considered and implemented in policy decisions in a more systematic way.

104. A wide range of innovative and sophisticated approaches and examples of tools have already been developed by Indigenous organisations, Indigenous communities and those working in collaboration with Indigenous peoples to facilitate the application of local ecological knowledge and expertise in biodiversity and ecosystem services management.[36, 37]

105. However, such initiatives remain a small fraction of the practice in the formal world of research, planning, education, and decision-making. Most of the time, local ecological knowledge still remains ignored by the science-policy interface relating to biodiversity and ecosystem services management, and if it is taken into

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30 Clark, W.C. 2007. Sustainability Science: A room of its own. PNAS, 104 (6): 1737-1738.

31 MacMynowski, D. P. 2007. Pausing at the brink of interdisciplinarity: power and knowledge at the meeting of social and biophysical science. *Ecology and Society* 12(1): 20; Norgaard, R.B., Baer, P. 2005. Quoted above.

32 MacMynowski, D. P., 2007. Quoted above.

33 Norgaard, R.B. 2008. The Implications of Interdisciplinary Scientific Assessments for Environmental Governance. In Ranganathan, J., Munasinghe, M., (Eds). *Policies For Sustainable Governance of Global Ecosystem Services*. World Resources Institute.

34 Norgaard, R.B. 2008. Quoted above

35 Also variously referred to as traditional, indigenous, community, customary, or practical knowledge

36 As shown by studies of tools that have been developed by Indigenous organisations, Indigenous communities and those working in collaboration with Indigenous peoples to facilitate the simultaneous protection and application of traditional knowledge and expertise in biodiversity conservation and management.

37 At the initiative of the UN Permanent Forum of Indigenous Peoples, and working with Tebtebba, a series of regional workshops were organized in 2006-07 around the question of how to integrate traditional knowledge into relevant processes of the science-policy interface, resulting in substantial guidance relevant to the policy-making process.

account, this has largely been accomplished through the work of western-trained academics and other intermediaries, following the largely linear, extractive academic convention of documenting and publishing traditional knowledge related to biodiversity.[38]

106. However, the primary goal in incorporating traditional knowledge into biodiversity decision-making cannot be premised on a straightforward "integration" of western scientific and traditional knowledge systems and methods. Incorporating traditional knowledge and expertise into dominant western scientific and legal paradigms, without due consideration and understanding of cultural diversity as inextricably linked to biological diversity, is not only inadequate, but potentially detrimental to both biological diversity and local communities whose existences and well-being are interdependent with biological and ecological systems.[39]

107. Among the main reasons for the current lack of incorporation of local ecological knowledge into science-policy interface processes is:

a) The complexity of the issue and the fact that no one-size-fits-all solution will or can emerge for how traditional knowledge and western science can be brought together in a synergism founded on complementarity.

b) The serious levels of erosion local ecological knowledge is facing, as the peoples and communities holding local ecological knowledge themselves face a range of threats from outright annihilation to 'assimilation' into 'mainstream' society, the knowledge they hold also slips away.

c) The continuing view that local ecological knowledge is inferior to scientific knowledge and the inherent inequity in distribution of power that stands in the way of governments, academic scientists, policy makers and others seeking meaningful collaborations with Indigenous organisations and communities.

108. Instead, a meaningful incorporation of local ecological knowledge into the science-policy interface requires at least the following:

a) Recognition, tolerance and facilitation of the expression of divergent styles of reasoning, acknowledging the strengths and weaknesses of each knowledge type, providing for access to and exchanges of information and for capacity building, allowing for mutual learning, exploring ways to build synergies to fill gaps and enhance comparative advantages of different knowledge types.

b) Tested models, templates and guidance on how to engage and disengage in ethical and equitable relationships (both within and outside of communities), and storage and management of vast amounts of information in various forms and with built-in mechanisms for multilevel or tiered access and degrees of stringency in control of information flow.

c) Acknowledgement of and support to ensuring the continuation of the social, cultural, economic, political and spiritual contexts within which such knowledge arises and is meaningful. This means the full recognition of the territorial, cultural, and political rights and responsibilities of indigenous peoples and local communities,[40] and the need to avoid generalizations or extrapolations that may overlook significant regional differences or diversity and lead to erroneous outcomes.

d) A balance between the need to document and make more widely available traditional knowledge related to maintenance of biodiversity on the one hand, and the need to ensure protections against unfair or harmful exploitation of the knowledge and interrelated bio-cultural resources.

E.1.3 Long-term observation and monitoring systems

Finding #3.4. Notwithstanding continuing efforts, there remain significant gaps in long-term observation and monitoring programmes, in particular as regards data and information on interactions between drivers of change, ecosystems and human well-being, and on particular geographic regions.

109. To ensure that the common knowledge base is able to provide relevant, credible and legitimate support to decision makers, now and in the future, it is important to ensure data capture oriented to addressing the current needs of decision makers, and their anticipated future needs. Observations made over long periods of time, including remote sensing, and programmes and process that bring observations together can have particular relevance for decision making processes because of their ability to illustrate change and trends, and to be able in some cases to link these changes and trends to pressures on biodiversity and ecosystem services, and on human

[38] Bannister, K., Hardison, P. 2006. Mobilizing Traditional knowledge and Expertise for Decision-Making on Biodiversity. IMoSEB Case Study.

[39] Bannister, K., Hardison, P. 2006. Quoted above.

[40] The UN Declaration on the Rights of Indigenous Peoples provides a good basis for such recognition.

intervention to address those pressures and changes. These can be considered by looking at three inter-related groups of activities: Earth observation; long term research activities; and monitoring programmes.[41]

110. Recognizing that increased international collaboration was essential for exploiting the growing potential of Earth observations to support decision making, the Group on Earth Observations was launched in 2005 as a voluntary partnership of governments and international organizations to coordinate efforts to build a Global Earth Observation System of Systems (GEOSS). Much progress has been made in implementation of the 10-Year Implementation Plan[42], but in reporting to the Earth Observation Summit in 2007 the GEO Secretariat admitted that considerable work still needed to be done to fully incorporate GEOSS projects into decision-making processes, despite the existence of an ever widening group of user communities.

111. The GEO Biodiversity Observation Network was established in 2007 with the intention of providing a coordinating framework working across many of the existing efforts to observe biodiversity. The intention is that such a coordinated biodiversity observation network would enable new and synthetic understanding of biodiversity and its role in maintaining the Earth system and humanity's place in it, facilitating the efforts of governments and the global community to address biodiversity loss by improving the ability to accurately monitor trends in biodiversity and to develop and test response scenarios, including addressing important gaps in observations. GEO-BON aims to address a number of known shortcomings and gaps in long-term observation and monitoring programmes, but it is still new and actively evolving.

112. Long term research at the national level, and international collaboration in long term research, is promoted by a range of international initiatives including in particular the International Long Term Ecological Research programme and the UNESCO Man and Biosphere programme. In both cases the global network comprises a range of national and regional initiatives that have associated themselves with the programmes concerned. While both programmes (ILTER and MAB) identify priorities for various aspects of research, implementation at the national level is essentially dependent on national or site-level priorities and available resources. The evaluation of MAB carried out in 2002 reported favourably on a wide range of issues, but notable was the observation that socio-economic research needed further attention, something that has also been identified as a weakness in the ILTER network.

113. Since the 2010 target was adopted in 2002 there has been a significant amount of discussion in the scientific literature on monitoring programmes,[43] particularly with respect to ensuring the availability of data for development and delivery of indicators. The essential message is that monitoring programmes need to be established and/or substantially improved so as to ensure the availability of the data necessary for tracking change in individual species and ecosystems, focusing on specific taxa and ecosystems, and ensuring geographic coverage which is currently particularly biased. Within its own area of interest, the Ramsar Convention has developed a handbook on inventory, assessment and monitoring intending to help address part of this need for wetlands, and others are taking similar steps.

114. However of particular concern is that there are few monitoring programmes currently that directly or indirectly address the delivery of ecosystem services that depend on biodiversity, or the value of biodiversity to local people. When the MA was carried out it made extensive use of the long-term data that was available on social–ecological variables, but the relative scarcity of such data made it difficult to evaluate trends and draw conclusions about relationships of social–ecological variables.[44]

115. Review of the information needs of the MA, and consideration of the gaps that needed to be addressed in the future by monitoring programmes included the following, building on what is already provided by other

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[41] While the term monitoring is used, this is intended to cover both monitoring and surveillance. *Monitoring* can be defined as the collection of specific information for management purposes in response to hypotheses derived from assessment activities, and the use of these monitoring results for implementing management, while the collection of time-series information that is not hypothesis-driven can be termed *surveillance* rather than monitoring (Ramsar Resolution VI.1).

[42] The 'societal benefits that the implementation plan addresses are identified in Annex J).

[43] See for example: Green, R.E. *et al*. 2005. A framework for improved monitoring of biodiversity: responses to the World Summit on Sustainable Development. *Conservation Biology* 19: 56–65.; Pereira, H.M., Cooper, H.D. 2006, Towards the global monitoring of biodiversity change. *Trends in Ecology and Evolution* 21(3): 123-129; Dobson, A. 2005. Monitoring global rates of biodiversity change: challenges that arise in meeting the CBD 2010 goals. *Phil. Trans. R. Soc. B. 360*; Reyers, B., McGeoch, M.A.2008. A biodiversity monitoring framework for South Africa: progress and directions. *South African Journal of Science.* 103:295–300; Lengyel, S., *et al.* 2008. Habitat monitoring in Europe: a description of current practices, *Biodiversity Conservation* 17: 3327-3339.

[44] Carpenter, S.R., *et al.* 2009. Science for managing ecosystem services : Beyond the Millennium Ecosystem Assessment. Proceedings of the National Academy of Sciences 106(5). 1305-1312.

programmes that already exist. It is noteworthy that most of these relate closely to the needs for indicators identified by other processes, which is discussed further in a later section. The identified needs[45, 46] are:

a) comprehensive time series information on changes in land cover and land use, biotic systems, and changes in use and ecological characteristics of oceans;

b) locations and rates of desertification;

c) spatial patterns and changes in freshwater quantity and quality, for ground and surface waters;

d) stocks, flows, and economic values of ecosystem services;

e) trends in human use of ecosystem services;

f) changes in institutions and governance arrangements; and

g) trends in components of human well-being.

116. With respect to long term observation and monitoring systems, coordination is essential in steps to harmonize data collection and management, including the adoption and promotion of standards and standard terminologies, and in building data sharing networks as is discussed below.

E.1.4 Availability of and accessibility to data and information

Finding #3.5. While progress has been made, there remain significant barriers to the effective use of existing data and knowledge resulting from institutional and technical impacts on both the availability of data and information and on the ability of users to gain access to such data and information in meaningful ways.

117. Data and information is fundamental to understanding status and trends in biodiversity, and the results of human interaction with biodiversity, and they are therefore essential components of biodiversity assessments, indicators and models, and provide the basis for monitoring impacts of decisions made at all levels. The spread of the Internet has been enormously helpful in improving opportunities for sharing data, information and knowledge, however, despite the Internet, despite the many programmes, networks and institutions collecting and managing data at all levels, and despite a far more clearly understood need for data and information, there remain a number of barriers to more effective use of biodiversity information, even where it already exists.

118. These barriers include: cultural barriers, which lead to an unwillingness to share data; lack of standardization, which makes it more difficult to combine data from multiple sources; insufficient incentive for those collecting and managing data to make it available to others; cost of digitization where the data concerned is still only available in hard copy; lack of information on datasets, on how data was collected and subsequently handled; and insufficient tools for providing meaningful access to data.

119. These barriers result in data availability and data access varying significantly from one part of the world to another. This is further compounded by the fact that species diversity is not fully described, that there is no broadly accepted classification of ecosystems, and that knowledge at the genetic level is even patchier than at the species or ecosystem level.

120. Having said this, many programmes, networks and institutions working at all levels are collecting and managing data for a variety of purposes, developing and promoting the use of standards, identifying ways to bring a variety of data from multiple sources together, developing increasingly sophisticated online access to data, and so on. All of this increases the data and information potentially available for supporting decision making, while recognising that significant taxonomic, thematic and geographical gaps remain.

121. However perhaps the most difficult barriers to address are the cultural barriers to sharing data and information, and to publishing it,[47,48] which range from financial issues to inter-institutional trust, and from concerns about releasing data before research is complete to publishing models which restrict access to those who have paid. There is now an increasing pressure to place data and information in the public domain, and momentum on this is increasing.

122. In the context of improving the use of data and information in decision making the following actions are key. Some are already under way to a greater or lesser extent, and some have strong champions, but there are

[45] ICSU-UNESCO-UNU. 2008. Ecosystem Change and Humans Well Being: Research and Monitoring Priorities Based on the Millennium Ecosystem Assessment. International Council of Science.

[46] Carpenter, S.R. *et al*. 2009. Quoted above.

[47] Costello M.J. 2009. Motivating Online Publication of Data. *BioScience*, 59:418-427

[48] Smith V.S. 2009. Data publication: towards a database of everything. *BMC Research Notes* 2:113

advantages to be gained if there were increased coordination, clearer political support and more secure financing, and if more attention was being paid to those knowledge gaps of particular importance for decision making processes:

a) Promoting and facilitating the use of internationally adopted standards, terminology and nomenclature so that data and information can be more easily shared and combined.

b) Ensuring that datasets and information repositories have associated metadata describing for potential users their provenance, and the methodologies used for data capture, management and manipulation.

c) Advertising the existence of datasets and information repositories more widely so as to increase their use by interested parties.

d) Promoting and facilitating increased online access to data and information (including publications) so that others are able to use them.

e) Developing and testing methods for combining data captured at different scales and using different methods so that they can be meaningfully and effectively used - so called data harmonization.

f) Developing tools that locate and/or combine data from multiple sources, and present these in ways that aim to directly support the decision making process.

g) Promoting a culture that reduces restrictions on access to data and information, encouraging organizations and individuals alike to work towards open access to data, information, expertise and knowledge.

h) Building the capacity of those managing data and information to carry out many of the tasks identified above for their own databases and information repositories.

i) Increasing coordination in improving access to data and information will substantially improve the knowledge base, particularly when combined with better understanding of the needs of policy makers.

123. Particularly important for increasing access to information are the development of national and regional information networks, the latter also facilitating and promoting the development of the former. The Inter-American Biodiversity Information Network (IABIN), for example, is beginning to play a valuable role in building capacity for data management and sharing at national and regional levels, initiated at least in part with the intention of supporting decision making. At the national level organizations such as the South African Environmental Observation Network (SAEON) and the Comision Nacional el Conocimiento y Uso de la Bioversidad (CONABIO) in Mexico are examples of networks which provide some of the same functions at the national level, helping to ensure access to data and information relevant for decision making. Both regional and national networks are actively supported by international programmes and networks which facilitate and promote increased access to data.

124. One other specific case of barriers to use of existing knowledge which it is worth emphasising further concerns access to publications, including in particular the scientific literature. The current publishing model and the costs of purchasing publications, and in many cases even of access to them over the internet, is essentially reducing access to and use of published knowledge. This particularly affects those in developing countries. There are programmes and activities addressing this, such as the increase in public access journals on the internet, online publishing, the OARE project, and specific national efforts in a range of countries, but these need further promotion and extension.

E.2. Effectively informing policy

Finding #4. Various mechanisms synthesize, present and communicate knowledge to inform policy. There is, however, a lack of regular processes providing periodic, timely and policy-relevant information covering the full range of biodiversity and ecosystem service issues to the broader development community. This information and knowledge is not always translated and communicated in the most efficient way or the most useful format.

125. Adequate synthesis, presentation and communication of the knowledge base is just as important as the creation of it, given that different rationalities, discourses and norms need to be bridged to effectively inform policy. Benefits that accrue from ensuring that policy makers have access to information from science and scientists in a form that best helps them to use it. For example, information provided is far more likely to be used if it is:

a) Context specific: the implications of scientific research are expressed in such a manner that their relevance to policy issues and decision making is readily apparent to a non-scientist;

b) Clearly expressed: the implications of scientific research are expressed succinctly, and in such a manner that the conclusions and implications are readily understood by a non-scientist;

c) Credible: arising from recognised, independent and unbiased sources, backed up by necessary research and supplementary evidence (and where appropriate caveats), and peer reviewed;

d) Appropriately communicated: delivered in the most appropriate formats and through the most appropriate channels to ensure that it is taken account of;

e) Responsive: directly responding to the identified needs of or requests from policy making bodies and decision-makers (whether by direct request or responding to know agendas); and

f) Timely: the information is delivered not only in appropriate formats, but to timetables appropriate for consideration by those developing policy and making decisions.

126. There is a long history in environmental governance of trying to ensure that policy is informed by the best knowledge available, and a variety of mechanisms of synthesizing, presenting and communicating knowledge to inform policy have emerged over time, and across scales and different regimes. However, despite the increasing role of science advice in governance, questions continue as to whether scientific advice is being delivered in the most effective way. Based on a review of previous discussion on the science-policy interface, the following elements are considered essential for synthesizing, presenting and communicating knowledge to inform policy on biodiversity and ecosystem services, and are analyzed in more detail below:

a) nature and scope of synthesis, presentation and communication of knowledge to inform policy;

b) models, scenarios and indicators;

c) assessments; and

d) early warning of emerging issue of concern.

E.2.1 Nature and scope of synthesis, presentation and communication of knowledge to inform policy

Clear and authoritative synthesis and communication of knowledge to inform policy

Finding #4.1. As a result of the vast quantity and varying quality of differing, fragmented and sometimes even contradictory knowledge currently available, together with the lack of clear authoritative synthesis and a clear and targeted communication thereof, decisions taken are not necessarily informed by the best available knowledge.

127. For essentially historic reasons "western" society is characterized by a fragmentation and specialization of knowledge, including, in particular, scientific knowledge. Dividing, reducing, or structuring the world into distinct separate realms of learning and research was key to early processes of science. This has also had an influence on governance. As scientists began to play an increasing role in calling for policy change, the structure of science became mirrored to some extent as new governance arrangements evolved, resulting in an similarly divided and fragmented institutional landscape of governance.[49] This fragmentation is particularly evident in environmental governance. In biodiversity and ecosystem services governance, institutions have been created case by case over a long period of time, resulting in an array of conventions, institutions, networks and programmes with overlapping remits and often poorly defined boundaries between them.

128. This fragmentation is also reflected in the system of institutional arrangements established to interface science and policy on matters regarding biodiversity and ecosystem services governance, and provide advice to it.[50] Not only is there a vast quantity and varying quality of differing, fragmented and sometimes even contradicting knowledge on biodiversity and ecosystem services, there is also a wide range of differing, fragmented and sometimes potentially incompatible processes established to bridge this knowledge with policy. While this range of different knowledge and institutions and their fragmentation are to some extent necessary to ensure some degree of efficiency and effectiveness in the face of the complexity of inherently interlinked global

[49] Norgaard, R.B., Baer, P. 2005. Collectively Seeing Complex Systems: The Nature of the Problem. *Bioscience* 55(11);. Norgaard, R.B. 2008. The implications of interdisciplinary scientific assessments for environmental governance. In: Ranganathan, J., Munasinghe, M. (Eds). *Policies for sustainable governance of global ecosystem services*. Edward Elgar.

[50] van den Hove, S., Chabason, L. 2009, The debate on an Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES). IDDRI Discussion Papers N° 01/2009 Governance.

environmental change, it is more and more difficult to reach a shared understanding and hence to take corrective steps.[51]

129. In the absence of institutional arrangements that would ensure the provision of relevant, credible and legitimate information and advice on the issue of biodiversity and ecosystem services on which all relevant users could draw, information and advice can potentially be contested. As a result there is debate on the science in most scientific advisory bodies and processes, and the potential for States, large NGOs and other knowledge holders with vested interests to use science as a tool for politics, instead of supporting decision-making processes by providing an authoritative overview of the best available knowledge.

130. A direct outcome of this are expressed concerns that range from the workings of SBSTTA and the politicisation of debate on scientific issues,[52, 53] to the wide application of prioritization approaches used by some NGOs which are influencing conservation and development investments.[54] This is not to say that either are necessary wrong or inappropriate, but that concerns are being expressed, and that this is in part a result of not having a clear and authoritative synthesis and communication of knowledge to inform policy.

131. This is rather different to the situation in climate change governance, which relies to large extent on the Intergovernmental Panel on Climate Change (IPCC) for much of the scientific validation of concepts and information. This has considerably reduced debates over scientific credibility in processes such as the UNFCC SBSTA, because as a result of the existence of the IPCC – which predates the adoption of the UNFCCC – there is little debate on many of the scientific issues as government has already accepted the results in another forum. This is not to say that this covers all scientific issues and there is not debate, but that for many issues this is not necessary.

132. In effect, the fragmented nature of science and scientific organizations is also contributing to this for the very reason that they do not speak with one voice, and have often not found themselves able to do so. The MA is an example where they have done so, and this has substantially contributed to the very significant shift in thinking so that the world is far more concerned with ecosystem services, and links between biodiversity and human wellbeing. It therefore seems true to say that the more science and scientists can speak with one voice, and the more credible, relevant and legitimate the process or processes that enable them to do so, then the more effective the results are likely to be in informing policy development and implementation.

Issue advocacy versus brokering knowledge in form of policy options

Finding #4.2. Knowledge is often not presented in the form of clear policy alternatives that systematically outline the implications of policy options under detailed framing assumptions and provide better guidance in policy implications.

133. There is tendency to think[55] that within the science-policy interface there should be an unproblematic, linear relationship between scientists and decision makers, in which the output from one process - the production of knowledge - becomes the raw material for another - the making of policies and decisions - and in which achieving agreement on scientific knowledge will lead to political consensus and clear courses of action. The underlying assumptions of this conception, although subject to a robust and well-developed critique,[56] are implicit in much policy discourse and often supported by natural scientists and policy makers alike.

134. In this context, important efforts which aim to interfacing science and policy, such as global environmental assessments, are predominantly aimed at reaching consensus on the scientific knowledge with respect to the status, trends and predictions of the most important drivers of environmental change in order to further environmental governance efforts.

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51 Norgaard, R.B. 2007. Deliberative Economics. *Ecological Economics* 375-382; van den Hove, S., Chabason. L., 2009. Quoted above.

52 Koetz, T. e*t al*. 2008. The role of Subsidiary Body on Scientific Technical and Technological Advice to the Convention on Biological Diversity as science–policy interface. *Environmental Science & Policy* 11(6): 505-516

53 Le Prestre, P.G. (Ed) 2002. Governing global biodiversity: The evolution and implementation of the Convention on Biological Diversity. Ashgate, Aldershot

54 Miller, C.A. 2003. Knowledge and accountability in global governance: Justice on the biofrontier. In Tetreault, M., Teske, R. (Eds) *Partial Truths: Feminist Approaches to Social Movements, Community, and Power*. University of South Carolina Press.

55 Owens, S. 2005. Making a difference? Some perspectives on environmental research and policy. *Transactions of the Institute of British Geographers* 30(3): 287-292; Pielke, R.A. 2007. *The honest broker: Making sense of science in policy and politics*. Cambridge University Press.

56 See for example Jasanoff, S. 1990. *The fifth branch: science advisors as policy makers*. Harvard University Press; or Pielke, R.A. 2007. Quoted above.

135. However, there are no unambiguous answers in science that would resolve political conflicts over complex problems of global environmental change. Processes achieving legitimate outcomes over environmental conflicts involve bargaining, negotiation and compromise. Thus in situations of political gridlock, policy-makers frequently need new options, and not more science to advance in environmental governance.[57]

136. Therefore there is a need for the scientific community to differentiate scientific results from the policy significance of those results, and to go beyond the presentation of scientifically unambiguous statements of status and trends, and engage more actively in policy analysis facilitating the creation of new and innovative policy alternatives along with expression of the implications of those alternatives where that is possible.

137. However, concerns have been raised that most scientists, even those asked to inform policy as for example in the cases of the IPCC and MA, typically eschew explicit discussions of the significance of their scientific findings for policy.[58] Seeking to be 'policy relevant but not policy prescriptive', scientists rarely go beyond a description of their scientific results as concerns trends, conditions and projections, do not take the next step further explaining how these findings translate into different policy alternatives, and leave the analysis of what these findings imply for policy actions to decision makers.

138. As a result, decision makers often find themselves dependent on in-house capacity within their secretariats to translate science into policy actions, or, if there is a lack of such capacity, on the interpretations provided by consultants or interest groups. Otherwise they might be unable to follow scientific information or advice with the implementation of meaningful policy. For example, not having gone the further step and translating the MA findings into a more relevant context for national governments has been seen as one of the reasons why it did not have the expected results in shaping policies, in particular as regards developing countries.

139. What is lacking are institutional arrangements within science-policy interfaces that systematically assess and communicate the significance of science for policy. Such analysis of policy, the essence of policy advice, implies the presentation of information and knowledge in terms of an honest broker of a range of policy alternatives systematically revealing how alternative policy options would appear preferable under different detailed framing assumptions and showing how these dependencies relate to the real world.[59]

140. Returning to the example of fisheries management in the European Union referred to in a previous section and discussed in more detail in Annex W, it is noted that as a result of frustration that their advice was not being followed scientists were increasingly moving away from simply being objective experts providing facts to working more closely with policymakers in approaches involving scenario-based modelling so that potential implications of decisions can be more easily understood.

Focus of policy information

Finding #4.3. In discussions on science-policy interfaces there is far more focus on identifying issues and formulating policies with regard to multilateral environmental agreements at the global level than on supporting policy implementation and policy evaluation, particularly at the national and regional levels of governance, and on the extent to which effective information and advice pertains to and is used by the development community at the lower governance levels.

141. As stated earlier, there are essentially four different areas or phases of policy to which science can contribute and which science-policy interfaces should take into account - issue identification, policy formulation, policy implementation, and policy evaluation. There is a strong tendency for scientific advisory bodies and processes at the international level to focus on issue identification and policy formulation, which takes place at the global level of governance, to the detriment of providing knowledge support to policy implementation and evaluation, which is mostly an issue to national and regional levels of governance.

142. This lesser focus on policy implementation and evaluation has the potential to considerably impede biodiversity and ecosystem service governance. For example:

a) Lack of knowledge and practice on ecosystem-based management, lack of economic incentive measures, and lack of support in mainstreaming biodiversity into other sectors were mentioned among the key challenges impeding on the implementation of the National Biodiversity Strategies and Action Plans (NBSAPs),

[57] Pielke, R.A. 2007. Quoted above.
[58] Pielke , R.A. 2007 The honest broker: Making sense of science in policy and politics. Cambridge University Press.
[59] Pielke, R.A. 2007. Quoted above

the CBD's most important means to allow for national self-expression and key instrument for implementation (see Annex U).[60]

b) The fact that the MA did not go beyond the presentation of general findings relevant to global governance and take the next step in terms of helping countries with taking and using these findings, and to design policies at their respective scale and context, has been identified as one of the reasons for why the MA has been limited in impact.

143. In the case of biodiversity and ecosystem services, most actions will have to be taken at the local level and are not dependent upon coordinated global action,[61] a predominant focus on issue identification and policy formulation, and the relative neglect of focus on policy implementation and evaluation at national level inherent in much of the international science-policy interface, constitutes a critical gap of the current science-policy interface.

144. In trying to make a difference, certain initiatives interfacing science and policy, such as the MA follow-up strategy, have prioritized the focus on sub-global levels of governance, for example with the development of tools and mechanisms that facilitate the interpretation of scientific findings in terms of their significance for policy. Others, like the TEEB, are making a considerable effort to provide knowledge and advice on how best to mainstream biodiversity issues into other sectors. However, these efforts are only limited in scope and time, and no institutional arrangements exist that would ensure more continuous support to policy implementation and evaluation and to mainstreaming biodiversity.

145. Having said this it is not the case that there should be a total change of focus to these issues, but that it is necessary to ensure that efforts of issue identification, policy formulation, implementation and evaluation are well orchestrated within an integrative processes that reaches across all relevant scales and sectors.

E.2.2 Models, scenarios and indicators

Finding #4.4. There is a need for more integrated quantitative models, scenarios and indicators that will aid understanding of not only biodiversity and ecosystem services, but also the relevance of biodiversity and ecosystem services to human well-being.

146. Models, scenarios and indicators are increasingly being used as means of bringing data and information together from a range of different sources, and presenting them meaningfully in such a way as to inform policy processes. For example scenarios are extensively used in assessments such as the MA or GEO to present the implications of different policy approaches, and indicators are increasingly used for tracking progress in achieving targets adopted by policy processes.

Integrated models of conservation and sustainable use of biodiversity and ecosystem services

147. A model is essentially a simplified representation of how a system works, developed so as to improve understanding of the system itself, and to aid understanding of how different factors affect the behaviour of the system. Models of coupled social-ecological ecosystems are essential for research, synthesis and projection of management actions. Models can be useful tools to help provide decision makers with an understanding of likely impacts the implementation of policies might have, and can provide the basis for reviewing different options and scenarios.

148. A wide range of processes, actors, organisations, networks and products are currently involved in assessing biodiversity impacts using models and scenarios. These range from response to the *ad hoc* requests of specific assessment processes, to models developed by groups of organizations (e.g. InVEST by the University of Stanford and others; GLOBIO developed by the Netherlands Environmental Assessment Agency working in collaboration with UNEP-WCMC and GRID Arendal). Currently the most widely used model of biodiversity at the science-policy interface is GLOBIO, which is based on response relationships between species abundance and five anthropogenic pressures.

149. In a recent report on biodiversity scenarios commissioned by the CBD Secretariat for input to the Global Biodiversity Outlook 3 and prepared under the leadership of DIVERSITAS[62], the authors reviewed the projections of a range of models and associated scenarios. The report drew on the experience of six lead authors

[60] CBD, 2007a. Synthesis and analysis of obstacles to implementation of National Biodiversity Strategies and Action Plans. UNEP/CBD/WG-RI/2/2/Add.1.

[61] Watson, R. 2005, Turning science into policy: challenges and experiences from the science–policy interface. *Phil. Trans. R. Soc.* B 360, 471–477

[62] Biodiversity Scenarios Synthesis for the Global Biodiversity Outlook 3, prepared for the CBD Secretariat under the leadership of DIVERSITAS

and 33 contributing authors from 17 countries across the world. As part of the report the authors addressed the future needs for biodiversity and ecosystem service modelling, identifying in particular that:

a) currently separate models for terrestrial, freshwater and marine biomes need to be fully integrated to take account of interactions and feedbacks among biomes;

b) models need to include feedbacks and interactions among the complex chains linking biodiversity, ecosystem functioning, and ecosystem services to socio-economic processes, and aid in understanding of "tipping points";

c) a framework for linking biodiversity and ecosystem services to human well-being needs to be developed and incorporated in models;

d) there is the need to develop models that can map the flow of a range of ecosystem services so that the spatial disconnect between where services are produced and where people benefit is better addressed;

e) a new conceptual basis, based on risk or probability approaches, might be needed to model regulating and supporting ecosystem services;

f) models need to realistically incorporate multiple drivers to better represent global change impacts on biodiversity and ecosystem services;

g) models need to incorporate dynamics and be process-based instead of the currently available statistical, deterministic models;

h) models should be evaluated to assess their capabilities and limitations, not least because they are complex systems with many components;

i) models need further testing through systematic comparison of outputs generated by different models and by multiple simulations with the same model for past, present and future conditions; and

j) the ability of models to simulate past and present situations needs to be tested against data on past and current biodiversity and ecosystem services.

150. Meanwhile, in a report on scenarios and models for exploring future trends of biodiversity and ecosystem services changes commissioned by the European Commission, the authors[63] reviewed in detail 41 models identified through literature and internet search, and personal knowledge. Comparative information on these models is included in the project report, and information on the models was further analysed and summarised with respect to a number of characteristics. Preliminary conclusions include the following with respect to ecosystem services and human well being in particular:

a) there is no single model covering socio-economic development, policy input, environmental and land use change, and biodiversity and ecosystem services for terrestrial and aquatic systems together;

b) multi-model combinations are needed to generate comprehensive and consistent results, with economic as well as biophysical modelling of water and plant growth, and natural and agricultural systems. the availability of data for different ecosystems is a significant constraint on ecosystem service modelling, as they are generally scarce and on a very coarse scale;

c) little is known about critical thresholds/ time lags between biophysical effects and ecosystem service impacts and recovery potential, and consequently these issues/processes are not addressed in models;

d) there is a challenge in incorporating human managed lands, including various management options, as compared to natural systems;

e) models often omit feedback between environmental condition and socio-economic development, making it impossible to estimate the benefits of measures to maintain ecosystem services; and

f) none of the models cover biodiversity risks and likely associated losses of ecosystem services resulting from invasive alien species with the exception of climate change induced biome changes.

151. In addition they concluded that global models cannot practically include the small-scale heterogeneity of a landscape that is necessary for drawing conclusions on pollination and pest-control effects, and regional models have the advantage that they can account for relevant aspects of global economics and policies, and developments like climate change while they also relate to local processes and conditions. Also models with a

[63] IEEP, Alterra, Ecologic, PBL and UNEP-WCMC (2009) Scenarios and models for exploring future trends of biodiversity and ecosystem services changes. Final report to European Commission, Contract ENV.G.1/ETU/2008/0090r

smaller geographic coverage offer the possibility of including much more meaningful management and policy options. Sufficient detail is not available at the global scale and effects of options and policies can only be estimated by crude proxies and general parameter estimates.

152. These findings are highly consistent with those that arose from experience with the MA[64] where it was observed that "*explicit models of coupled social–ecological systems were essential for research, synthesis, and projection of the consequences of management actions*". The authors went on to recommend that a key research need was to improve quantitative modelling across a range of social–ecological topics, noting in particular that:

a) integrated, quantitative models of social–ecological systems do not match the scope of existing conceptual and qualitative models;

b) existing ecosystem service models were developed to address particular sectors (e.g. water supply, agriculture, fisheries) or particular intersections of issues (e.g., biodiversity and land use change);

c) models for sectors must be coupled with projections from other models of climate, demography, macroeconomic development, and other drivers to assess or project ecosystem services;

d) it would be far better to have models that correspond in scope and content to the conceptual frameworks used by the MA or future assessments; and

e) this model development should be done in a research setting, not under the stringent time constraints of an assessment.

Other reviews have come to similar conclusions.[65] Between them these reviews provide a comprehensive assessment of areas in which models need to be improved in order to increase their value in supporting decision-making processes. Comparative information on the models is provided in the referenced reports, which will all be publicly available by the last quarter of 2009.

The role of scenarios in demonstrating possible futures

153. Scenarios are plausible and often simplified descriptions of how the future may develop, based on a coherent and internally consistent set of assumptions about key driving forces and relationships, typically developed through the joint involvement of decision-makers and scientific experts[66] (). Scenarios are used as a means of presenting anticipated outcomes of different types of policy action so as to assist policy-makers in making choices, or at least helping them to understanding the potential implications of different decisions. Scenarios are informed by scientific research and opinion, and are increasingly used as a means of presenting the outcomes of research meaningfully. They do not attempt to predict the future but instead are designed to indicate what science can and cannot say about the future consequences of alternative plausible choices that might be taken in the coming years (MA 2005 as above). They help to address uncertainty in complex systems.

154. Scenarios may be classified into three different types[67], which can be characterised as:

a) baseline trend scenarios (predictive scenarios), which assume that current trends will continue in the future, and may include policy variants based on near-future decision alternatives;

b) normative scenarios (pathway or vision scenarios), which describe a desirable future or set a specific goal for the future and explore possible ways to reach that goal; and

c) explorative scenarios (forecasting or descriptive scenarios), which work the other way around, and are created to forecast the effect of specified measures (policies) on future development and conditions.

155. In an ongoing review of scenarios and models for exploring future trends of biodiversity and ecosystem services changes commissioned by the European Commission, due to be published shortly, the authors[68] reviewed a wide range of scenarios. Comparative information on these scenarios is included in the project report, and information on the scenarios was further analysed and summarised with respect to a number of characteristics. Preliminary conclusions include the following:

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64 Carpenter, S.R. *et al*. 2009. Science for managing ecosystem services: beyond the Millennium Ecosystem Assessment. *Proc Natl Acad Sci USA* 106: 1305–1312.

65 Jaeger, A., Henrichs, T. 2008. Modelling environmental change in Europe: towards a model inventory (SEIS/Forward). EEA Technical Report No 11/2008. European Environment Agency, Copenhagen.

66 Millennium Ecosystem Assessment 2005 Ecosystems and human well-being : scenarios : findings of the Scenarios Working Group, edited by Steve R.Carpenter, et al.

67 Börjeson, L. *et al*. 2006. Scenario types and techniques – towards a user's guide. *Futures 34*, 723-739.

68 IEEP, Alterra, Ecologic, PBL and UNEP-WCMC (2009) Scenarios and models for exploring future trends of biodiversity and ecosystem services changes. Final report to European Commission, Contract ENV.G.1/ETU/2008/0090r

a) the most appropriate or useful scenario approach depends on the questions to be addressed, and therefore these need to be carefully thought through and documented before trying to use a scenario approach;

b) current scenario approaches do not adequately distinguish between different types of land management, although management types are expected to have important consequences for the delivery of ecosystem services within human-managed land;

c) while for most models climate change and land use change were found to be the key input variables, the description of scenarios focuses on drivers such as technological development, human population development, economics including trade and policies, therefore there is at present a potential disconnect; and

d) socio-economic models are necessary to translate the scenario drivers to the pressures, however, deriving quantitative input variables from primarily narrative scenarios is a crucial task and the process is often not well documented.

156. These preliminary conclusions, together with those for models identified in the previous section, suggest the need for further elaboration of a range of the relationships between biodiversity and ecosystem services on one hand and socio-economic issues on the other, built on a more robust understanding of the interrelationships. This will potentially increase the value of scenarios in helping to use science in a manner that better supports the decision making processes through illustration of the implications of policy alternatives.

157. Comparative information on currently used scenarios is provided in the referenced report, which will all be publicly available by the last quarter of 2009.

Indicators of conservation and sustainable use of biodiversity and ecosystem services

158. Indicators are increasingly being used to inform policy processes, whether as part of assessment processes, or independently. This is closely related to the increased use of quantitative targets in setting policy, and the use of indicators to assess progress in meeting those targets, as well as more widely in communicating biodiversity concerns through the media (for example on threatened species).

159. Many of the international policy processes have established strategic plans and work programmes with targets relating to biodiversity, and these require appropriate indicators to track progress in their achievement. For example the table in Annex L identifies the indicator processes being used for each of the global biodiversity-related treaties, and the action under way, as well as for a number of other global and regional processes.

160. Particularly noteworthy are the efforts made in the context of assessing progress in achieving the CBD target of significant reduction in the rate of biodiversity loss by 2010. Following adoption of the target in 2002 (decision VI/26), the CBD Secretariat worked with a number of organizations to discuss the need for indicators, and these were further elaborated by SBSTTA working with an *Ad hoc* Technical Expert Group. CBD COP called on UNEP-WCMC to support the CBD Secretariat in reporting on progress, and this led to the formation of the 2010 Biodiversity Indicators Partnership (2010BIP).[69]

161. The 2010BIP is a collaboration between the many organizations and agencies developing global biodiversity indicators. Funded in part by the GEF and in part by the organizations and agencies themselves, the objectives of the partnership are to facilitate and promote: generation of information on biodiversity trends which is useful to decision makers; improved global biodiversity indicators; better links with biodiversity initiatives at the regional and national levels to enable capacity building and improve the delivery of the biodiversity indicators.

162. As is apparent from Annex L most of the global biodiversity-related agreements are now developing indicators of some form so as to better demonstrate progress in achieving their objectives. Several of the secretariats participate in the 2010BIP, and conscious efforts are being made to collaborate wherever possible and appropriate both in development of indicators, and delivery of messages based on the indicators. The table in Annex P illustrates, for example, how the Ramsar Convention's proposed indicators relate to the CBD framework, and to some of the other indicators.

163. One region has made a concerted effort to develop indicators that are consistent with the CBD framework, and are relevant and useful at both national and regional levels The project on Streamlining European 2010 Biodiversity Indicators (SEBI2010) involves a wide range of organizations and individuals across Europe in reviewing potential indicators, and in developing guidance on using them (see Annex M) for a

[69] See www.twentyten.net

brief description of the project and associated reports). Recently, as is reported in Annex M, a working group has been reviewing use of the indicators and made a number of recommendations on their use, and on future development of an improved indicator package.

164. The use of indicators is also increasing at the national level as countries appreciate their value in assessing and managing progress in meeting their own biodiversity targets. There are two sets of observations on this in Annex N, part based on observations from experiences in carrying out regional workshops on indicators in a range of developing countries, the other based on a review of comments in the CBD National Reports. From both is clear the urgent need to improve the use of indicators at the national level, and to improve the data on which both national and internationally used indicators are based.

165. In July 2009, UNEP-WCMC convened an international expert workshop with the CBD Secretariat and the support of the UK Government to review the use and effectiveness of the 2010 biodiversity indicators, and to consider implications for development of the post-2010 targets and indicators. Results of this workshop, including identification of lessons learnt and key recommendations, are included in Annex O. Discussion at the workshop focused on four key areas: sufficiency of the current 2010 biodiversity indicator set; its scientific rigour; the policy relevance of the indicators; and their effective communication.

166. It is clear from these discussions, and from the observations and recommendations arising, that indicators are seen as a valuable means of presenting data in formats that are meaningful to policy. Ideally, the set of indicators would be broad enough to address the range of biodiversity issues, small enough to be manageable, and simple enough to be applied consistently and affordably in different regions over long periods of time. At the same time countries need indicators that meet their own needs, while contributing to the global picture. In summary the key messages from the Reading meeting were that the following were needed:

a) a few head-line indicators clearly linked to the targets being addressed, based on a set of sub-indicators which can also be used in communicating meaningful storylines and clear, policy relevant messages;

b) a clearly expressed conceptual framework for the indicators which aids understanding of the links between threats to biodiversity, its state of biodiversity, ecosystem services, human well-being, and policy responses;

c) further indicators on threats to biodiversity, status of species diversity, ecosystem extent and condition, ecosystem services and policy responses, more clearly relating biodiversity to benefits for people;

d) improved national capacity for framework application, indicator development, data collection and information management, so as to improve national use of indicators and support international needs;

e) a clear strategy for using indicators in informing policy discussions, delivering multiple messages into all sectors, and demonstrating relevance of biodiversity to human wellbeing.[70]

167. The recommendations of the Reading meeting help to identify some of the key issues, but it is essential that the research and policy communities work together to continue to design a set of appropriate indicators, to implement the sustained monitoring programmes that are needed to ensure the availability of data and indicators for the long run, to develop appropriate communications strategies to ensure the indicators are used well, and to facilitate improved use of indicators at the national level.

168. A particular challenge will be in developing those indicators that aid understanding of the essential links between biodiversity and human livelihoods and wellbeing. With an increase in consideration of ecosystem services in public and private decision-making at different scales, it is apparent that indicator frameworks, as used in the Millennium Ecosystem Assessment (MA), the CBD and elsewhere, are under-developed with regard to ecosystem services. Tracking conventional biodiversity indicators alone is insufficient, and indicators will also need to be found which can demonstrate how the benefits from biodiversity and naturally functioning ecosystems are changing over time so that the policy relevance of biodiversity can be more clearly understood. Challenges that will need to be addressed include the fact that:

a) for most ecosystem services there are currently few if any suitable indicators for monitoring the actual delivery of services;

b) the indicators required will need to communicate policy relevant information readily about a complex issue of not only the status and trends of ecosystem services, but also flows;

c) there is limited or no data available for ecosystem service indicators; and

[70] These are described in more detail in Annex O, along with lessons learnt.

d) not all ecosystem services are quantifiable (for example the aesthetic benefits people receive from ecosystems differ greatly between people and are dependent on a number of different factors, for which a value or number cannot easily be assigned).

E.2.3 Assessments

Finding #4.5. Notwithstanding the range of assessments relating to biodiversity and ecosystem services, no regular periodic multi-level assessment process exists that provides the conceptual and institutional framework coherently to gather, review, synthesize, communicate and monitor information and track changes in biodiversity and ecosystem services and their consequences for human well-being at the global, regional and national levels and on the interrelation across these levels.

169. Assessments are formal efforts to gather, review and synthesize selected knowledge with a view toward making it publicly available in a form useful for decision making. In the recent years, scientific environmental assessments have grown in number, have become more comprehensive and systematic and have become the science-policy element most attention has been given to.

170. During the last decade, there has been a proliferation of assessments relating to biodiversity and ecosystem services, at global and sub-global scales. Key amongst recent global assessments of biodiversity and ecosystem services have been the Millennium Ecosystem Assessment (MA), the 4th Global Environment Outlook (GEO4), the IPCC 4th assessment report (AR4), the International Assessment of Agricultural Science and Technology for Development (IAASTD), the Comprehensive Assessment of Water Management in Agriculture (CAWMA), the 2nd Global Biodiversity Outlook (GBO2), the 2005 Forest Resources Assessment (FRA), the Global International Waters Assessment (GIWA), and the global Assessment of Peatlands, Biodiversity and Climate Change. Each of these is described briefly in Annex Q.

171. Over time the global assessments have increasingly aimed to be more integrated in the manner in which biodiversity and ecosystems services issues are assessed, and they have increasingly been designed to be relevant, credible and legitimate. However, they vary considerably in thematic focus and scope, in their design and processes, and in the ways in which biodiversity and ecosystem services are integrated. For example:

a) The thematic focus of recent global assessments varies between those focusing strictly on biodiversity assessment, such as the GBO or IUCN Red List assessments, those encompassing a broad ecosystem service assessment, such as the MA and GEO, and those focusing on a narrower range of specific ecosystem services, such as FRA, GIWA, IAASTD, LADA.

b) There have also been an increasing number of sub-global assessments conducted and planned in the last decade, at scales from continental to local communities. The MA, GIWA, GEO4 and IAASTD explicitly included sub-global (in most cases regional, and in the case of the MA some multi-scale) assessment elements.

c) Most recent and ongoing assessments evaluate both environmental and socio-economic factors. Only one of the ongoing global assessments, the GBO, additionally evaluates the implementation of a specific corresponding policy mechanism (the CBD) for its impact on biodiversity and ecosystem services.

d) Some, such as the MA, GIWA and TEEB, were designed as one-off assessments that could be repeated in the future should the demand and resources exist. Others, such as GEO, GBO, IPCC, and FRA, are part of ongoing assessment initiatives (see Annex Q).

e) Some, such as the MA, the IPCC and GEO, involve a broad spectrum of the scientific community, whilst others, such as the GBO, FRA and TEEB, are based on contributions from a more selective group of experts (see Annex Q). Also the breadth of stated target audiences varies considerably between assessments.

f) A number of recent global assessments, such as GEO4, and the IPCC 4th assessment, have been overseen by intergovernmental governance bodies, providing significant legitimacy for their findings amongst national governments. In the case of the MA and IAASTD, the assessments were overseen by a multi-stakeholder board, including governmental, non-governmental and private sector stakeholders.

172. However, despite all these advances in assessment efforts related to biodiversity and ecosystem services, there remain a range of gaps and obstacles significantly impeding the science-policy interface's ability to coherently gather, review, synthesize and communicate information on biodiversity and ecosystem services at global, regional and national level:

a) Many assessment initiatives have been limited by data and information availability. This is the case at all geographic scales for a range of ecosystem services and for biodiversity. Gaps in data for biodiversity

and non-provisioning ecosystem services are particularly widespread, and in many cases prevent more comprehensive assessment being completed at global, regional, national or local scales.

b) In terms of scope and coverage of ecosystems considered by biodiversity and ecosystem services assessments, there has been relatively less assessment focussed in some key biomes and system types, including islands, mountains, wetlands and urban systems. Relatively less attention has also been given to regulating and supporting services (such as prevention of flooding or nutrient cycling), and there remain key gaps in assessing the interlinkages between biodiversity and climate change (such as the link between biodiversity and carbon sequestration).

c) There remains relatively little coherence or coordination between approaches to assessment within and between scales and thematic approaches and there is a lack of core set of common, scaleable variables for better linking assessments at different geographic scales, and with different but related thematic foci. Even those assessments that are well networked within the MA follow-up process make use of a wide variety of data and indicators within a diversity of thematic scope and geographical coverage, which complicates the synthesis of lessons across assessment initiatives, and hampers the process of drawing conclusions relating to multi-scale aspects of biodiversity and ecosystem services.

d) There is a wide variety of and little coherence within conceptual frameworks used for assessment design and implementation, although at a global scale for recent integrated assessments, and in many regional and national assessments, there has been an increasing convergence on variations of the framework developed in the MA global and sub-global assessments (an ecosystem services and human well-being focused variation of the DPSIR framework).

e) Only very few recent assessments, including the MA, IPCC, LADA and GBO, have been explicitly endorsed by those MEAs that they seek to inform. Of the assessments explicitly endorsed or otherwise officially recognized by MEAs, only the IPCC and GBO are anticipated to be repeated in the future - the remainder were conceived as one-off initiatives. Other assessments, such as GEO and GIWA have been endorsed by other decision-making, or intergovernmental fora such as the UNEP Governing Council.

173. Ongoing initiatives, such as the MA follow-up process in general (see Annex B) and the forthcoming publication of the MA methodology manual in particular, are likely to help considerably in bringing coherence to assessment process and design in the future. However, there remains the need for a common conceptual and institutional framework to coherently assess information on biodiversity and ecosystem services across all relevant sectors and at global, regional and national levels.

174. Over the recent years there has been an extensive process to review assessments in marine environments, in anticipation of a Regular Process for Global Reporting and Assessment of the state of the Marine Environment (See Annex C. Drawing from a this broad analysis of assessments, those elements that are said to most successfully lead to an effective assessment include:

a) a holistic conceptual framework that considers the multiple and interacting pressures on biodiversity and ecosystems at and across all scales;

b) regular review of assessment product to support adaptive management;

c) use of rigorous science and the promotion of scientific excellence;

d) regular and proactive analysis to ensure that emerging issues, significant changes and knowledge gaps are detected at an early stage;

e) continuous improvement in scientific and assessment capacity;

f) effective links with policy makers and other users, reflected in communication, products and formal recognition and endorsement by official policy processes;

g) inclusiveness with respect to communication and engagement with all stakeholders through appropriate means for their participation; and

h) transparency and accountability for the process and products.

E.2.4 Early warning of emerging issues of concern

Finding #4.6. There are continuing difficulties in ensuring timely scientific advice on emerging issues of concern at and across all levels, whether in response to policymakers' requests or resulting from concerns arising from the scientific community.

175. New issues for biodiversity can arise from a diversity of sources including as a result of scientific research or monitoring (e.g. the discovery of the impact of a new invasive species) or an emerging issue in the policy arena. New issues can also arise from developments in other sectors that might be important for biodiversity, such as the potential impacts of economic trends, and emerging markets.

176. It is widely known that the global community has responded too late to many environmental problems and hazards. A key feature in this has been the length of gap between problems being identified in science and a response being taken. Though adequate information may be available, information might not have been brought to the attention of appropriate decision-makers early enough, or has been discounted for one reason or another. Sometimes 'loud and late' warnings (e.g. on asbestos, the Great Lakes, sulphur dioxide and acidification) have been effectively ignored by decision-makers because of short-term economic and political interactions.[71] Costs of such inaction have been most recently highlighted by the Stern report on climate change.[72]

177. There is a growing number of initiatives that help to prioritise issues and to explore the likely significance and relevance of emerging issues relating to biodiversity and ecosystem services. Providing they are firmly based on the common knowledge base and adequately linked to decision-making processes, such initiatives provide a valuable tool in informing development of policy in identifying issues that need to be addressed, in helping assess the likely significant of emerging issues and in helping to prioritize both research priorities and policy actions. Important tools of science-policy interfaces for dealing with emerging issues of concern are: [73] horizon scanning processes, which involve the systematic examination of potential threats, opportunities and likely future developments which are at the margins of current thinking and planning (potentially including the use of scenarios), and futures techniques, by which the results of horizon scanning exercises are further explored.

178. Examples of such processes widely range in scope and in the extent to which they have specific links to policy processes, and are described further in Annex R). At the same time a number of MEAs have taken steps to improve the effectiveness of their assessment of and response to emerging policy issues (e.g. by Ramsar's STRP and the CBD SBSTTA), so that their scientific advisory bodies and processes can more effectively deal with new issues not previously on their agendas.

179. However, there remain significant challenges for processes interfacing science and policy in addressing emerging issues, which are often of complex, contentious or controversial nature:

a) Whilst some initiatives offer an independent and highly creative exploration of futures, the usefulness of such initiatives can be limited if they do not adequately communicate and link with decision making processes, if they present mixed messages, or do not answer the more urgent questions that policy makers may have – potentially reducing impact and therefore the attention the results receive.

b) Where such horizon scanning and futures processes are introduced into scientific advisory bodies and processes, care must be taken to ensure that they are not only relevant to the process, but that they are also the result of legitimate and transparent processes so that they are seen as being credible in the sense defined earlier (including issues such as independence and peer review).

c) Only very few ongoing mandated assessment processes provide flexible mechanisms to respond to demands from MEAs for targeted or rapid integrated assessments on emerging issues relating to biodiversity and the full spectrum of ecosystem services; on the contrary, the long time-scale periodicity of global assessments can preclude responding to many emerging issues in a timely manner to guide decision-making, even for those selected issues which are covered by such assessments.

180. Among the key gaps apparent from a review of current horizon scanning processes and futures techniques are the following. The implication of not addressing such gaps is a reduced preparedness for issues that might arise in the future. The key gaps are:

a) Conceptual approach: The lack of widely applicable and broadly accepted conceptual and institutional frameworks for horizon scanning and futures techniques that are responsive to the needs of decision makers and concerns of knowledge holders, are credible as regards their implementation, and are legitimately linked to policy processes.

b) Sharing of experience and results: The need for wider sharing of knowledge and experience on horizon scanning and futures techniques, by those countries and organizations that have fairly well-established

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[71] EEA 2001. Late Lessons from early warnings: the precautionary principle 1896-2000. See reports.eea.europa.eu/environmental_issue_report_2001_22/en

[72] See www.hm-treasury.gov.uk/sternreview_index.htm

[73] Defra, UK definition of horizon scanning 2002. See horizonscanning.defra.gov.uk

mechanisms for identifying and assessing new issues for biodiversity and are producing useful outputs that international mechanisms could draw on.

c) Capacity: The lack of capacity at national level, in particular in developing countries, to conduct horizon scanning processes and apply futures techniques to assist in their own planning processes.

181. It is also important to ensure that when new issues emerge the scientific community is able to respond rapidly to information of scientific advisory bodies and processes rising from these emerging issues, so that they are better able to inform policy development and decision making.

182. There may also be value in exploring the potential for increased coordination between existing horizon scanning and futures initiatives supporting biodiversity science-policy processes, and for coordination in use of the outcomes of these processes. This is true across the range of scales and sectors.

183. In addition to improving the use of horizon scanning and futures techniques in identifying potential future issues, it is important to also ensure that scientific advisory bodies and processes are able to effectively use this information in their deliberations. This may involve changing their terms of reference, as happened for CBD SBSTTA in 2006 (decision VIII/10).

E.3. Increasing Synergies and Effectiveness Through Coordination

Finding #5. Notwithstanding the existence of several mechanisms to improve the coordination of the wide range of science-policy interfaces for the many multilateral environmental agreements and other bodies related to biodiversity and ecosystem services, there is significant room for building on the existing experiences that would lead to better coordination between and across global and national mechanisms.

184. It is apparent from earlier sections in this analysis that there is a wide range of institutions, processes, networks and programmes at all levels and within different sectors that address, or are relevant to, one or other part of the science-policy interface for biodiversity and ecosystem services.

185. This fragmentation is in part structural and to a certain degree unavoidable, as the issues are far reaching, cross-cutting and multi-scale, while institutions have to focus on specific missions to ensure some degree of effectiveness and efficiency.[74] Indeed, studies have shown that it is often collaborative networks of a range of science-policy interfaces of different institutional types, functions and focus with complex, partly redundant, and layered institutional arrangements that constitute the most effective way in managing complex interrelations between science and politics.[75]

186. But the fragmentation is also historical, as institutions have been created step by step to address problems as they have emerged. Particularly in the case of the issues of biodiversity and ecosystem services this has resulted in an array of conventions, institutions, networks and programmes with overlapping remits, differing objectives, interests and *modus operandi*, and often poorly defined boundaries between them. This in turn results in the potential for uncoordinated action, gaps, unnecessary duplication, and for a multitude of different messages and solutions, unless there is good coordination.

187. Coordination[76] - or promoting and facilitating improved coordination - is a crucial cross-cutting and inherent aspect of the science-policy interface. There exists a wide range of mechanisms established to improve coordination of different parts of this fragmented institutional landscape, and a range of examples are included in the following text and associated annexes. However, while in part advances have been made, lack of coherence remains in many areas, with the resulting potential for gaps, mismatches, duplications and missed opportunities.

188. One potential solution is to attempt to establish improved coordination across all aspects of biodiversity and ecosystem services, thereby ensuring significantly support for decision making. While such a solution may be desirable, a more pragmatic solution, at least in the first instance, will be to gradually improve and build on existing coordination approaches, examples of which are described in the following sections.

189. While the following text primarily uses examples from the international level, the messages are relevant at all levels.

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[74] van den Hove, S., Chabason, L. 2009. The debate on an Intergovernmantal Science-Policy Platform on Biodiveristy and Ecosystem Services (IPBES). IDDRI Discussion Papers N° 01/2009 Governance.

[75] Dietz, T. *et al*. 2003. The Struggle to Govern the Commons. *Science* 302:1907-1912; Ostrum, E. 2005. *Understanding institutional diversity*. Princeton University Press

[76] While the term coordination is used throughout, it is recognised that there are aspects of collaboration and integrated approaches that do the job just as well in many circumstances.

E.3.1 Coordination within and across functional elements of a science-policy interface

Finding #5.1. There is significant potential to improve the effectiveness of science-policy interfaces through more coherent coordination within and across their various functions, integrating such aspects as research strategies, models and scenarios, assessments, knowledge-brokering and capacity-building.

190. Given the inextricable interrelations between research, monitoring, models and scenarios, assessments capacity building and policy development on the one hand, and the partly inherent functional fragmentation of the institutional landscape on the other, coordination is not only fundamental within but also across each of the functional categories (or areas of work) of the science-policy interface.[77]

191. In each of the sections on the knowledge base, on communication of science into policy making, and on capacity building, and on the specific subsections within them, a range of organizations and/or programmes has been referred to. It is axiomatic that improved coordination between them will improve efficiency:

a) Coordination amongst those responsible for building the common knowledge base, and between them and those wanting to use the knowledge base, helps to ensure a more relevant, more credible and more legitimate knowledge base, more efficiently produced with fewer gaps and duplications.

b) Coordination amongst those drawing on the knowledge base and informing policy helps to ensure that a more consistent use is made of science in informing policy (including speaking with one voice), and a more coordinated approach to identifying the implications of different options.

c) Coordination amongst those helping to build capacity, whether by developing tools and standards, or by facilitation and training, inevitably leads to a more efficient use of resources in building capacity, and hopefully also to a more consistent and integrated approach to using science in development and implementation of policy.

192. There are good examples of ongoing efforts that address the coordination of a range of the different functional aspects of the science-policy interface, among the most relevant of which are the MA and the MA follow-up process (Annex B), and the proposals for the Regular Process in the marine environment (Annex C). These addressed and continue to address all the aspects of a science-policy interface in that within a specified policy area they provided a knowledge base, policy oriented products based on that knowledge base, and capacity building to help others augment the knowledge base and derive further products.

193. There are other examples of organizations, programmes or networks that *de facto* coordinate activities that contribute to the science-policy interface, therefore contributing to improving its effectiveness.

a) Indicators: The 2010 Biodiversity Indicators Partnership is providing a degree of coordination across those organizations working on biodiversity indicators, bringing together UN initiatives, MEAs, IGOs, international active NGOs and university scientists.

b) Long term research: The International Long Term Ecological Research network is promoting and facilitating site-based research and monitoring programmes, drawing on the experience of research sites and networks in a wide range of member countries, and the scientists that work there.

c) Access to data: The GEO Biodiversity Observation Network and the Global Biodiversity Information Facility are both working with a wide range of organizations to facilitate increased access to biodiversity data so that it can be more easily used.

d) Research policy: Policy research platforms such as the European Platform for Biodiversity Research Strategy provide fora at which natural and social scientists, policy-makers and other stakeholders identify structure and focus the strategically important research for the conservation and sustainable use of biodiversity.

194. These are not the only examples, and not necessarily the best examples, but in each case there is an organization or a group organizations that is working together through a network, partnership or collaborative effort to improve the current situation, to reduce gaps, and to reduce duplication of effort. This is experience that can be built upon in fostering and creating opportunities for increased coordination.

195. At a higher level within the biodiversity-related MEAs, there are ongoing efforts to increase coordination and sharing of experience that address in part the coordination of the different functional aspects of the science-policy interface (although the science-policy interface is not necessarily their primary focus). Among the most relevant are the following, which are described in more detail in Annex I):

[77] See also Watson, R., Gitay, H. 2007. Science-policy interface: The role of scientific assessments. IMoSEB Case study.

a) Biodiversity Liaison Group (BLG): The purpose of the BLG, which consists of the heads of the secretariats of the global biodiversity-related agreements, is to enhance coherence and cooperation in the implementation of those conventions in general. In summary, the BLG has addressed a small number of items related to the conventions' use of science, such as the 2010 biodiversity target and the related 2010 biodiversity indicators, and the use of standardized species nomenclature and taxonomy. It has also discussed possible ways for all participating MEAs to contribute to related activities, such as the *Global Biodiversity Outlook*. It has therefore provided some of the impetus for ensuring a more coordinated approach to issues where there are strong scientific interests, and could potentially so more in the future.

b) Meetings of the Chairs of the Scientific Advisory Bodies of Biodiversity-related Conventions: These can be seen as complementary to those of the BLG, from which they have been mandated. The first meeting in 2007 and was attended by representatives of the Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention), IUCN, UNFCCC, UNEP, the GEF Scientific and Technical Advisory Panel, and WWF International in addition to representatives of CBD, CITES, CMS, Ramsar Convention and World Heritage Convention. These meetings provide a forum for initiating discussion on areas of cooperation and collaboration on the scientific issues of the various convention processes and their translation into policy. The meetings so far have identified a small number of issues where the biodiversity-related conventions could cooperate in improving the scientific advice to their bodies and to Parties, including mapping the guidance developed by the individual conventions and coordination in the requests for scientific advice on various topics.

196. Most of the initiatives described demonstrate the potential of increased coordination, and examples of approaches and structures that can be built upon.

E.3.2 Coordination within thematic areas

Finding #5.2. Examples exist of thematic mechanisms such as expert groups or other collaborative arrangements that are providing valuable support to policy formulation and implementation on specific issues. Lessons can be learned from this.

197. Steps to improve coordination can be particularly effective when focussed on specific topics, themes or issues, and this is usually the case where a strong network or consortium already exists that can take the issue forward, or is formed specifically to do so.

198. Invasive alien species are widely seen as one of the key threats to biodiversity, and have been discussed on several occasions by the scientific advisory bodies of a number of conventions including all of the global biodiversity-related agreements. As is described in more detail in Annex T, the Global Invasive Species Programme was established to gather the best minds and organizations working on issue of invasive alien species, to consolidate available scientific and management information, to raise awareness of the issue and to present best management practices. Through the use of thematic working groups GISP focused on key issues such as pathways, management, socioeconomics, while simultaneously engaging national agencies and experts through a series of regional workshops. This model helped to funnel information developed by the international working groups down to the national level, while raising national level priorities and capacity needs to the global level. Information from both efforts was also channelled into the CBD. GISP has not been the only contributor (the IUCN Invasive Alien Species Group has also been significantly involved), but having a group coordinating inputs has played a significant role in helping to shape discussions and decisions within the CBD in particular. GISP have also been involved in discussions under other conventions, also bringing a degree of synergy.

199. There is a range of other examples where specific initiatives provide coordination across a range of organizations, networks and programmes working on a particular theme, and deliver information or analysis relevant to policy development and implementation. Examples include the following.

a) Synthesis and review: The Scientific Committee on Problems of the Environment (SCOPE) is an interdisciplinary worldwide network of natural and social scientists and scientific institutions focused on environmental issues, using workshops and consultations to provide synthesis and review on current and potential environmental issues intended to help inform policy and decision making.

b) Research: The International Council for the Exploration of the Sea (ICES) is a network of more than 1600 scientists from 200 institutions which coordinates and promotes marine research on the marine environment in the North Atlantic. Their advice supports, amongst other things, policy development on fisheries (discussed in more detail in Annex W) and implementation of the OSPAR Convention.

c) Access to data: ReefBase, which is a project of the WorldFish Centre, works with a wide range of coral reef scientists and institutions to improve the sharing and use of data, information and knowledge in

support of research and management of coral reefs. In doing so it works actively with both the Global Coral Reef Monitoring Network and the International Coral Reef Action Network.

200. The point is not what each of these organizations or processes does, but the fact that there are many examples of coordination that can be built upon. Meanwhile organizations and programmes such as ICSU, DIVERSITAS and IUCN have a range of thematic working groups, networks and committees. Some of these are established for short periods of time to address particular issues, others, such as the IUCN Commissions, are long standing and well known.

201. Given the nature of biodiversity, the complex governance landscape and the relatively independent nature of the different governance bodies, it is inevitable that the needs of one policy making body are not completely different from the needs of other governance bodies, yet no obvious mechanism exists to review the needs of a range of governance bodies and their advisory bodies and advise on research priorities based on an integrated review. However there are the following examples of where such cooperation and collaboration has occurred and is beneficial, and where the experience can be built upon.

a) Inland waters: There is agreement between the CBD and the Ramsar Convention regarding how they cooperate on the issue of inland waters, leading to coordinated programming and decision making, and to a certain extent collaboration on how science is used to support these processes.

b) Species taxonomies: There is agreement between CITES and CMS to work towards standardization in species taxonomies so as to move away from the current situation where the taxonomies used differ. This will include jointly approaching relevant scientists for advice, and drawing on the same literature.

c) Wildlife diseases: The Ramsar Convention, CMS and the African-Eurasian Waterbird Agreement (AEWA) all support and participate in the work of the Scientific Task Force on Avian Influenza and Wild Birds, with the strong endorsement of their governing bodies.

202. At a higher level there are processes which improve inter-institutional cooperation of key thematic issues, and these can also have implications for improving the science-policy interface. For example, the Collaborative Partnership on Forests (CPF), which is a voluntary arrangement among 14 international organizations and secretariats with substantial programmes on forests (see Annex I), has a range of initiatives which are concerned with increasing collaboration in order to deliver improved management, conservation and sustainable management of forests.

203. Again, most of the initiatives described demonstrate the potential of increased coordination, and examples of approaches and structures that can be built upon. Perhaps an analysis of the overlaps between different mandates of, for example, the biodiversity-related MEAs could provide the basis for identifying those areas where increased coordination would provide most effective?

E.3.3 Coordination across different sectors

Finding #5.3. There is a lack of coordination across sectors to allow for the constant exchange and joint creation of knowledge, leading to mismatches and duplications of information and policies relevant to the broader development community.

204. The conservation and sustainable use of biodiversity is relevant to a wide range of different sectors from forestry to fisheries, and provides services ranging from carbon storage to protection of water supplies. Meanwhile many other sectors have a potential impact on biodiversity, whether transport, energy or mining. Data and information on biodiversity can therefore be of as great an importance to decision making in these sectors as is it in the biodiversity sector. The difference this time is that the case for taking account of impacts on biodiversity is rather less well understood, and the need for effective communication is rather higher.

205. There are some well established and successful examples of cross-sectoral coordination relevant for the science-policy interface on biodiversity and ecosystem services, some fixed term with time-bound mandates, and others ongoing. These include, for example, between the MEAs the following (all except the first being described further in Annex I):

a) An *Ad hoc* Technical Expert Groups on Biodiversity and Climate Change established under the CBD to provide biodiversity related information to the 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, in particularly as regards the mechanism for reducing emissions from deforestation and degradation in developing countries (REDD) currently being discussed in the context of the successor agreement to the Kyoto Protocol (see also Annex Von REDD).

b) The Joint Liaison Group (JLG), a joint body of the CBD, UNFCCC and UNCCD, established in 2001 as an informal forum for exchanging information, exploring opportunities for synergistic activities and increasing coordination. The JLG comprises the officers of the conventions' scientific subsidiary bodies, the Executive Secretaries, and members of the secretariats.[78] In summary, the JLG of the Rio Conventions has addressed a wide range of issues of relevance to the three conventions, including several relating to the coordination of scientific advice, such as collaboration among the scientific advisory bodies to the conventions, and cooperation in the development of advice, methodologies and tools (see Annex I).

206. Meanwhile there are other examples of coordinatory bodies within the UN system, again not usually specifically focus on the science-policy interface, but certainly relevant to if appropriate issues are brought to their attention:

a) The Environmental Management Group (EMG), a UN System-wide coordination body[79] established under the auspices of UNEP to serve as a platform (i) to identify, address and resolve collectively specific problems, issues and tasks on the environmental and human settlements agenda and (ii) to provide a forum for an early discussion and sharing of information on emerging problems and issues in the field of environment and human settlements geared at finding collectively the most effective coordinated approach to the solution of new tasks (see Annex I).

b) The UN Chief Executives Board (CEB), which furthers coordination and cooperation on a whole range of substantive and management issues facing UN system organizations. CEB has established three High Level Committees, including the High Level Committee on Programme (HLCP) promoting global policy coherence and the UN Development Group (UNDG) promotes coherent and effective oversight, provision of guidance and capacity building with country level partners, coordination of UN development operations at country level (see Annex I).

c) The Common County Assessment/UN Development Assistance Framework processes, which aims to bring about a more coordinated UN approach to supporting achievement of national objectives within each country. Under which UNEP and UNDP have started to assist developing countries in preparing national reports on the implementation of MEAs; establishing thematic committees and coordinating; and sharing best practices among bodies using GEF funding such as the National Capacity Self-Assessments (NCSA), the National Dialogue Initiative and UNDP Country Support Programme.

207. In a way the Millennium Development Goals (MDGs), aimed at reducing poverty, improving the quality people's lives and ensuring environmental sustainability, draw attention to cross-sectoral needs in achievement of targets on which partnerships are formed and policy responses formulated for progress towards sustainable development, especially in developing countries, and which involve cooperation across intergovernmental organisations (WHO, UNDP, UNEP, the World Bank), MEA secretariats, international NGOs, and global and regional business groupings. Substantial constraints similar to those faced by MEA implementation in developing countries apply to meeting MDGs at national level. They include poor integration of environment and development policies, lack of horizontal structures for inter-ministerial consultation and cooperation, and the lack of regional framework to coordinate sharing of experience from implementation and new policy responses.

208. There also exist a range of specific and *ad hoc* cross-sectoral institutional arrangements between various different UN bodies and agencies. For example, the joint work of WHO and UNEP regarding the interrelations between ecosystems and human health. Following the MA findings highlighting the link between the quality of ecosystems and human health, WHO and UNEP jointly agreed to use these recommendations as basis to inform policy in a cross-sectoral spirit. Since then, regional policy fora at ministerial level have discussed the issue involving ministers responsible for both health and environment.[80] The initiation and consolidation of such coordination mechanisms within the UN that bring science together to inform policy have the potential to foster synergetic national policies both on health and the environment.

209. The Committee on Trade and Environment (CTE), was established under the World Trade Organization (WTO), with a twofold broad mandate: to identify the relationship between trade and environmental measures, and to make appropriate recommendations in harmonising WTO rules with the principle of sustainable development. The CTE has greatly contributed to the identification and understanding of the complex relationships between trade, environmental and development measures such as seen in the Doha Round. The

[78] Some of the meetings were attended by the Ramsar Convention Secretariat.

[79] Its membership consists of UN specialized agencies, programmes, economic commissions, funds and other UN bodies as well as UN/UNEP-administered and non-UN/UNEP-administered Secretariats of MEAs.

[80] First Inter-Ministerial Conference on Health and Environment in Africa, Libreville, Gabon, 26-29 August 2008

Committee co-operates with international organisations and leading international NGOs in building capacity of developing countries to manage WTO negotiations on environmental services. However, it would appear that the CTE still has a relatively low profile with WTO, and this may explain why current limited progress towards environmental policy and action remains.

210. The Organization for Economic Co-operation and Development (OECD) aims to provide a setting where governments compare policy experiences, seek answers to common problems, identify good practice and coordinate domestic and international policies, with a particular focus on democracy and the market economy. The OECD Working Group on Economic Aspects of Biodiversity (WGEAB) has been actively working with the CBD on issues such as incentive measures and access and benefit sharing of genetic resources, and also on valuation. Working together the CBD and OECD can approach an issue from different perspectives, and communicate support on addressing issues at the national level through different channels, increasing cross-sectoral reach

211. However, despite these and many other coordination and networking efforts there are still considerable gaps in cross-sectoral coordination relevant to interfacing science and policy at the global level, and these are almost certainly reflected at the national level in many parts of the world. Key concerns that lack of coordination can bring about are:

a) the sometimes *ad hoc* and late in time nature of such interrelationships, as in the case of cross-sectoral collaboration related to REDD;

b) the lack of sufficient reference to socio-economic perspectives in discussion on biodiversity and ecosystem services on a regular basis, and the lack of reference to the relevance of biodiversity and ecosystem services in other sectors even when biodiversity is directly relevant;

c) the lack of full understanding of the value of biodiversity, a gap that is partly addressed by, for example, ongoing follow-up to the MA at the sub-global level and The Economics of Ecosystems and Biodiversity (TEEB) project; and

d) the small scope and relatively low priority of environmental issues as compared to development and trade related issues in discussions at all levels.

212. In fact the currently ongoing discussions on REDD provide an interesting example of the need for cross-sectoral collaboration and coordination, because of the opportunities for synergies it brings. As is described further in Annex V in improving conservation and management of tropical forests there is potential to simultaneously address not only the carbon agenda of the UNFCCC, but also biodiversity conservation and sustainable use, poverty and human livelihoods, water conservation and quality management, and so on. Annex V describes some of this evolving collaboration, in particular as it relates to the science-policy interface.

E.3.4 Coordination at and across levels of governance

Finding #5.4. There is a lack of coordination across levels of governance to allow for the effective exchange of knowledge and experience back and forth across relatively diverse science-policy interfaces from the national to the global level that is necessary to avoid mismatches and duplications and to increase synergies between them.

213. Although levels of governance overlap and interlink in many ways, they are essentially different. Institutional arrangements are considerably influenced by a range of scale-dependent features, including: differences in the broader socio-economic and political setting in which institutional arrangements operate; differences in the policy instruments and compliance systems available; and differences in the type of knowledge systems that actors use.[81] In other words, depending on the level at which particular aspects of biodiversity and ecosystem services are addressed, the types of problems that can be addressed, the actors involved, the modes of explanation that are needed, and the solutions that are likely to come about will change significantly.[82]

214. Given the multi-level nature of biodiversity and ecosystem services, effective governance has to accommodate different concepts and principles at each level, and at the same time provide a conceptual and institutional framework that allows for coherence across levels to reduce redundancies, gaps and mismatches on the one hand, and to increase synergies on the other.

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[81] Young, O. 2006. Vertical interplay among scale-dependent environmental and resource regimes. *Ecology and Society* 11(1): 27; Berkes, F. 2007. Community-based conservation in a globalized world. PNAS, 104(39): 15188–15193.

[82] Bulkeley, H. 2005 Reconfiguring environmental governance: Towards a politics of scales and networks. *Political Geography* 24: 875-902; Brenner, N. 2001. The limits to scale? Methodological reflections on scalar structuration. *Progress in Human Geography* 25(4): 591-614.

215. Scientific advisory bodies and processes at national, regional and global level are central elements in such a conceptual and institutional framework, fostering networking, coordination and orchestration across levels of governance, potentially providing the mechanisms not only for the coordination of the interface between science and policy at a given level and context, but also in terms of the nodes in a network of science-policy interfaces necessary for the constant dialogue and translation from national to global scale.

216. It is worth noting her that coordination between levels should be seen not only in terms of working together to apply processes (e.g. indicators, assessments, data capture) that are meaningful in a cross-scalar way, and the associated guidelines, tools, and so on, but also in terms of people interrelating so that lessons are learnt, and moves towards consistency are made. The positive benefit of people working together should not be under-estimated.

217. There is a range of different institutional arrangements engaged, at least in part, in interfacing science and policy at regional and national levels. Relevant institutions at the regional level include a set of regional intergovernmental bodies such as the ASEAN-ACB, AU/STRC, CCAD, CEC, EEA, the regional offices of ICSU, which assisting in strengthening science and capacity-building in developing countries and promoting their increased participation in ICSU programmes and activities, and regional information networks such IABIN and others. Relevant institutions at the national level include the various MEA focal points, relevant government agencies and other national non-state actors.

218. However, despite this range of different institutional arrangements at global, regional and national levels, arrangements that coordinate (or network) the range of institutions at a given level are still largely missing, especially in many parts of lesser developed areas of the world. This may in part be due to the lack of a widely accepted conceptual and institutional framework for systematically and coherently addressing the different levels of governance and the interrelations in between them in and adequate manner.

219. There are no globally concerted efforts to systematically address the coordination of the science-policy interface on biodiversity and ecosystem services across scales. Partial approaches that exist include:

a) thematic approaches, such as the MA and its follow-up, which are supporting and guiding processes which involve a range of sub-global activities, with the guidance provided helping moves towards the outputs and outcomes being cross-scalar in nature;

b) regional approaches, such as the EPBRS on development of research strategies, or SEBI2010 which is working toward indicators scalable from national to regional level, both of which are intended to increase collaboration and understanding across scales; and

c) functional approaches, such as moves to create distributed databases, and tools that draw on data and information from across a range of scales, as is the case with GBIF, for example, working with a wide range of data at national and institutional levels.

220. Each of these is an example that can be built upon and promoted further.

E.4. Providing Fundamental Capacity

Finding #6. Numerous institutions and processes are helping to build capacity to use science effectively in decision-making at all levels. Further efforts, however, are required to integrate multiple disciplines and knowledge systems to produce relevant knowledge effectively; to translate knowledge into policy action and to coordinate these processes; and to build the capacities of developing countries to use science more effectively in decision-making and to participate fully in the science-policy dialogue.

221. The capacity for enabling full, equitable and active participation of all relevant stakeholders and knowledge-holders is crucial for ensuring the effectiveness of the science-policy interface on biodiversity and ecosystem services and their governance. But capacity is constantly changing and evolving, and capacity-building, be it at individual, institutional or systemic levels, is inherently a continuous effort. Providing the capacity fundamental for an effective science-policy interface requires at least the following three aspects be addressed:

a) the capacity for the production of relevant knowledge to contribute to the common knowledge base, and for the effective communication of this knowledge to decision makers and larger public;

b) the capacity for effective use of this knowledge and other knowledge in the formulation of and critical reflection on policy choices and their implementation; and

c) the capacity for effectively brokering knowledge so that it is used appropriately in decision making, including through identification of implications of different policy options.

222. Two issues are addressed further in this section, the broad need for building capacity for interdisciplinary approaches to knowledge production and the more effective brokering of knowledge, and the critical concern of geographical differences in capacity.

Improved production and use of knowledge

Finding #6.1. Notwithstanding continuing efforts and improvements in capacity-building supporting the various processes of interfacing science and policy, there remains a significant and widespread lack of capacity in interdisciplinary approaches for knowledge production relevant to biodiversity and ecosystem services for human well-being and governance that draw upon a variety of knowledge systems.

Finding #6.2. There is a widespread lack of capacity for brokering knowledge effectively so that it is used appropriately in decision-making, including by identifying the implications of various policy options.

223. In an earlier section it was noted that an analysis of interdisciplinary scientific assessment for environmental governance emphasized the mismatch between the emerging understandings of the complexity of reality, the ways scientists were coming to understand this complexity, and the way science connects to politics, policy, and management.[83]

224. It would therefore appear that there are significant gaps in capacity for using interdisciplinary approaches for knowledge production relevant to biodiversity and ecosystem services for human well-being and governance. At individual, institutional or systemic level there is need to improve the capacity to approach the production of knowledge in more interdisciplinary terms, in particular as concerns:

a) capacity of individuals to address complex phenomena in an interdisciplinary manner, reflecting the need for more interdisciplinary understanding to be taught and practiced; and

b) institutional capacity to encourage and allow for scientists and other knowledge holders to collaborate, promoting collective and discursive learning and knowledge-producing processes.

225. Such efforts should build on and learn from the existing interdisciplinary approaches gradually being discussed and developed within a number of the organizations already referred to in this paper, and also adding to their capability and potential.

226. It was also identified earlier that there was a need for the scientific community to go beyond the presentation of scientifically unambiguous statements of status and trends, and engage more actively in policy analysis facilitating the creation of new and innovative policy alternatives along with expression of the implications of those alternatives where that is possible. There is therefore also a need for a more systematic approach to ensuring capacity at all levels to interpret and broker knowledge in the interface between science and policy.[84] This would suggest that:

a) training and practice is also needed to develop interpretation and knowledge brokering skills in researchers and relevant staff in government departments and agencies; and

b) tools and needed to which support and enable all relevant actors to broker knowledge and interface science and policy need to be developed.

227. To some extent such needs are being addressed by existing institutions such as ICSU (see Annex J) and the MA and its follow-up strategy (see Annex B). Interdisciplinarity and knowledge brokering are also key elements of the proposed GRAME and UNEP's proposed science strategy. However, many of these efforts have been *ad hoc* and one off, and are limited in scope or resources, and a more systematic approach to build capacity building on interdisciplinarity and knowledge brokering is needed.

E.4.1 The North-South capacity divide

Finding #6.3. There are geographical variations in capacity relevant to science-policy interfaces, with significantly reduced capacity in developing countries, and in particular the less developed countries and small island developing States, impeding these countries' full engagement in nearly all relevant processes.

228. There are many institutions, programmes and processes supporting capacity building in developing countries and countries with economies in transition, including UNDP, the World Bank, UNEP and FAO, GEF

[83] Norgaard, R.B. 2008. The Implications of Interdisciplinary Scientific Assessments for Environmental Governance. In Ranganathan, J., Munasinghe, M., (Eds). *Policies For Sustainable Governance of Global Ecosystem Services*. World Resources Institute.

[84] Holmes, J., Clark, R. 2008. Enhancing the use of science in environmental policy-making and regulation. *Environmental Science and Policy* 11: 702-711

and a wide range of other multilateral and bilateral development assistance agencies, most of the MEAs, as well as some assessment processes. For example:

a) The UN Development Assistance Framework (UNDAF),[85] which describes how UN agencies and programmes working at the national level can coherently respond to the priorities identified in national development frameworks supporting countries in achieving MDG-related national priorities;

b) The UNEP Bali Strategic Plan for Technology Support and Capacity-building,[86] providing for a framework and systematic measures for technological support and capacity building based on national or regional priorities and needs,

c) The UNDP/GEF National Capacity Self-Assessment (NCSA) programme for environmental management,[87] established to identify capacity needs of developing countries to effectively meet the challenges of national and global sustainable development and environmental governance, and to strategically enhance their capacity

229. Many of these and other capacity-building efforts relate to strengthening of abilities also relevant for the science-policy interface on biodiversity and ecosystem services. Other initiatives include the work of ICSU and the MA follow up strategy referred to in the previous section. However, despite these efforts, there remain significant gaps in capacity relevant for the science-policy interface on biodiversity and ecosystem services in developing countries, and the capacity divide continues to be a severe obstacle to equitable participation of developing countries and those with economies under transition in the processes relevant to the science-policy interface on biodiversity and ecosystem services.[88]

230. According to a review of a representative sample of completed National Capacity Self Assessments (NCSAs),[89] a significant number of developing countries continue to lack among other things the personal and institutional capacity:

a) for effective reconciliation of demand and supply of policy relevant scientific knowledge, as they often lack academies of sciences or scientific councils vital to provide guidance and coordination for the identification of knowledge needs, and research programmes;

b) for effective production of policy relevant scientific knowledge, as they often lack sufficient individual, institutional and financial capacity for conducting research, show gaps in inventory data collection and documentation, and have inadequate management and assessment of knowledge and information;

c) to effectively communicate knowledge to decision makers and larger public, including the lack of institutional capacity for assessing and contributing to policy-making effectively, and lack of institutional frameworks that incorporate all stakeholders; and

d) to effectively use knowledge in formulation policy choices and implementation, as they often lack sufficient individual, institutional and financial capacity to understand and effectively use provided knowledge.

231. The analysis of existing capacity-building efforts suggests that the gaps related to capacity for building and effectively using the science in policy setting and decision making rest at least in part on:

a) a lack of focus and priority providing clearer definition of the knowledge and research needed, clearer understanding of how this will support decision making, and increased priority afforded to capacity development in these areas;

b) insufficient long-term capacity building strategies established to support long-term processes of sustainably building capacity needed to fully engage in all relevant processed interfacing science and policy reaching from public education, to research programmes, to specific training of decision-makers; but above all

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85 http://www.undg.org/?P=232

86 UNEP/GC/23/6/Add.1

87 GEF/C.22/8, Strategic Approach to Enhancing Capacity Building

88 Karlsson, S. *et al*. 2007. Understanding the North-South knowledge divide and its implication for policy: a quantitative analysis of the generation of scientific knowledge in the environmental sciences. *Environmental Science and Policy* 10(7): 668-684; Najam, A. 2005. Developing Countries and Global Environmental Governance: From Contestation to Participation to Engagement. *International Environmental Agreements: Politics. Law and Economics* 5(3); UN/JIU/REP/2008/3

89 For this review a sample of 27 (out of 80) completed NCSAs was reviewed for common capacity building constraints identified as priority under biodiversity thematic assessment. See Annex S for further details.

c) a lack of coordination among existing capacity building efforts on the priorities and objectives identified to enhance the capacity needed to fully engage in all relevant processed interfacing science and policy.

232. The pronounced lack of capacity in developing countries has considerable implications for the effectiveness of the science-policy interface on biodiversity and ecosystem services. Not only does this affect the decision making processes at the national level, and ability to, for example, fully and effectively implement MEAs at the national level (see for example Annex U on CBD national biodiversity strategies and action plans), it also reduces national potential to contribute to the common knowledge base, and potentially also to fully participate in scientific advisory bodies and process at regional and global levels.

233. More profoundly, in an international governance system that aims to rely on scientific knowledge to make political claims through scientific advisory bodies and processes, developing country can be disadvantaged with respect to the expression and negotiation of their environmental perspectives and interests.[90] Given that the legitimacy of the global environmental processes seems to be a major concern of many developing countries,[91] this underlines the absolute importance of ensuring an equitable capacity of all relevant stakeholder and knowledge holders.

[90] Karlsson, S. *et al.* 2007, and Najam, A. 2005. quoted above; Biermann F. 2000. Science as Power in International Environmental Negotiations: Global Environmental Assessments Between North and South. Environment and Natural Resources Program, Discussion Paper 2000-17. Belfer Center for Science and International Affairs, Harvard University.

[91] UNEP/GC.25/INF/37; Najam, A. 2005. Quoted above.

Gap analysis for the purpose of facilitating the discussions on how to improve and strengthen the science-policy interface on biodiversity and ecosystem services[92]

Annexes

Contents

[92] This report was prepared with the support of the UNEP World Conservation Monitoring Centre (UNEP-WCMC) , with substantive input and comment from a wide range of governments, IGOs, NGOs and individuals.

A. International Mechanism of Scientific Expertise on Biodiversity consultative process

234. Following the International Conference *Biodiversity: Science and Governance* held January 2005, in Paris, France, an international consultation process was launched to assess the need, scope and possible forms of an International Mechanism of Scientific Expertise on Biodiversity (IMoSEB). An Executive Secretariat was established, and an Executive Committee and an International Steering Committee, including representatives of a range of key stakeholders, were appointed to guide and support the process.

235. Between February 2006 and November 2007, the consultative process included six regional meetings, case studies, briefings, presentations and discussions at numerous other scientific and policy meetings, written input from a wide range of other sources, and dialogue with a number of stakeholders.[93] The final statement that was delivered by the International Steering Committee in November 2007,[94] identifies the following needs:

a) The need for independent scientific expertise: independent, synthetic, comprehensive information to support the needs of MEAs, proactive scientific input on emerging threats and issues, increased ability at all levels to predict the consequences of current actions, and insights from the relevant sciences and other forms of knowledge to inform local/national decisions on topical issues;

b) The need for more capacity: mobilizing scientific expertise for local national and regional level capacity building, and improving understanding of the factors affecting biodiversity and ecosystem services; and

c) The need for improved communication: enhancing understanding of how to use science, improving access to science so that it can be more effectively used in decision-making, promoting increased dialogue among diverse knowledge systems, and identifying research priorities and gaps identified by decision-makers' concerns.

236. While recognising that a number of intergovernmental and non-governmental institutions are already addressing some of these needs, the International Steering Committee recommended further and urgent consideration of the establishment of a means of enhancing the use of science in decision making at all levels, and suggested a number of principles and characteristics that needed to be considered in carrying this out. They agreed, *inter alia*, that a science-policy interface should:

a) be scientifically credible, politically legitimate, and policy relevant without being policy prescriptive, responding to policy needs identified by decision making organs at multiple scales;

b) be supported by a network of scientific and national capacities and by capacity building integrated into the assessment process and/or networking efforts, and promote dialogue between international agencies and decision-makers; and

c) be flexible and pragmatic, building on what already exists, and involving all relevant stakeholders across multiple scales.

[93] Information on the IMoSEB consultative process, copies of all reports and submissions can be found at www.imoseb.net

[94] The report can be found at www.imoseb.net/international_steering_committee_2

B. Millennium Ecosystem Assessment follow-up process

1. Following completion of the Millennium Ecosystem Assessment (MA) in 2005, and taking account of the recommendations of two independent evaluations of the MA conducted in 2006 and 2007,[95] a global strategy for follow-up to the MA has been developed in 2007 by a group of interested partner organizations.[96]

2. Both evaluations reported that the MA's technical objective of assessing the capacity of ecosystems to support human well-being proved both innovative and far-reaching. The emphasis on ecosystem services and their significance for human well-being was widely recognized as having made a major contribution to linking biodiversity conservation with poverty alleviation. However, the evaluations also concluded that, at that time, there was little evidence that the MA had had a significant direct impact on policy formulation and decision-making, especially in developing countries. The main reasons were identified as being:

a) Limited awareness and understanding of the concept of ecosystem services: Ecosystem services are a new concept to most decision makers, and as a result, there is limited capacity to apply the ecosystem services framework and work proactively on incorporating ecosystem service considerations into development strategies.

b) Lack of operational tools and methodologies: There was limited availability of working models that could be used readily by policy-makers to analyze ecosystem services and their trade-offs with development policies and resource allocations.

c) Limited economic analysis: The MA fell short of providing convincing economic values of ecosystem services, and in particular of the regulating and cultural services which could be used to evaluate the trade-offs with conventional development strategies.

d) Insufficient attention to Sub-Global Assessments: Very few developing country sub-global assessments (SGAs) were adequately funded, resulting in the significantly varying quality of the SGA products and a lack of comparability across the sub-global assessments.

e) Gaps in ecosystem services knowledge base: More needs to be known about the interdependence of ecological and social systems for human well-being, including the way ecosystems function, their response to human pressure, and the relationship to biodiversity. Few ecosystem services, other than those traded in markets, are routinely monitored.

f) Lack of periodic assessments: No permanent body or process exists to conduct periodic assessments of the status of ecosystem services, nor to monitor and track changes in ecosystem services and the impacts of these changes on human well-being.

3. The Conference of the Parties (COP) of the Convention on Biological Diversity (CBD) considered the implications of the MA for the work of the Convention (decisions VIII/9 and IX/15), and, *inter alia*, requested the Executive Secretary, and invited Parties and other Governments, to contribute actively to the implementation of the global strategy for follow-up to the MA aimed at addressing knowledge gaps, promoting sub-global assessments, promoting application of the MA framework, methodologies and findings, and outreach.

4. Addressing the identified needs, this strategy provides a roadmap to operationalize the MA. The strategy offers a common framework for partner organizations to enhance their collaboration in the implementation of MA related activities thereby maximising their impact in a coordinated and coherent manner. Guided by the findings of the evaluations and the discussions at the CBD COP, the MA follow-up process has elaborated a detailed strategic approach pursuing a four objective 'global strategy for turning knowledge into action':

a) continuing to build and improve the knowledge base on the links between biodiversity, ecosystem functioning, ecosystem services, and human well-being, primarily by supporting and improving ongoing, and further establishing sub-global assessments;

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[95] The GEF review was completed in 2006 (www.unep.org/eou/Pdfs/Millennium Eco Assessment Report unedited.pdf). The review conducted by the United Kingdom's Environmental Audit Committee of the House of Commons was published in 2007 (www.publications.parliament.uk/pa/cm200607/cmselect/cmenvaud/77/77.pdf)

[96] Partner institutions involved in MA follow-up process include: UNDP, EEA, FAO, GEF, Sida, Stockholm Resilience Centre, SwedBio, The Cropper Foundation, The Dutch Ministry of Foreign Affairs (DGIS), IUCN, UNESCO, UNEP-WCMC, ISDR, UNU/IAS, and WRI. Since the start of the MA follow-up process a number of other organisations have joined the efforts.

[3] ICSU-UNESCO-UNU (2008) Ecosystem Change and Humans Well Being: Research and Monitoring Priorities Based on the Millennium Ecosystem Assessment (International Council of Science).

b) promoting the systematic application of ecosystem service considerations in public, civil society and private sector decision-making – primarily by developing tools for mainstreaming ecosystem services into development and economic decision-making;

c) disseminating the findings of the MA and its conceptual framework, tools and methodologies to relevant stakeholders through the development of action-based media strategies and educational tools; and

d) exploring the needs, options and modalities for a possible second global ecosystem assessment, complementing existing assessment processes and contributing to the development of a more coherent international environmental assessment landscape.

5. The institutional arrangements established to ensure the implementation of the strategy foresees:

a) a MA Follow-up Implementation Group that represents all partner organizations interested in the strategy and coordinates the implementation of the strategy and joint programming of related initiatives;

b) an Executive Committee, comprising a subset of the MA Follow-up Implementation Group, revising ongoing activities and promoting coordination;

c) a MA Follow-up Advisory Group that advises on strategic directions on the MA Follow-up activities, links and engages with a range of stakeholders and ensures the scientific, technical and policy leadership and credibility of the initiative;

d) thematic working Groups, formed as needed to facilitate the exchange of information and lessons learned, and ensure coordination at the working level; and

e) a MA Follow-up Global Secretariat, hosted by UNEP in collaboration with UNDP to support the various groups mentioned above.

6. So far the following has been achieved:

a) the MA Follow-up Global Secretariat is established and based at UNEP/DEPI;

b) a Working Group on Sub-Global Assessments, with a secretariat based at UNU/IAS, was established to coordinate and provide a clearing house for the network of 34 completed and ongoing Sub-Global Assessments (SGAs) and, other new emerging SGAs, with a total of 12 joining the network so far;

c) a multidisciplinary group of experts to identify key gaps in knowledge and data, to design a research agenda, and to influence the priorities of research funding agencies has been established and has delivered a report on Research and Monitoring Priorities Based on the Millennium Ecosystem Assessment;[97]

d) an ecosystem assessment manual has been developed to provide practical guidance for undertaking integrated ecosystem assessments and will be published towards the end of 2009;[98]

e) tools such as those that are able to map ecosystem services have been developed;

f) new assessment programmes have been initiated such as the Ecosystem Services for Poverty Alleviation Programme (ESPA) and Reefs at Risk + 10; and

g) a number of outreach activities have been carried out, such as workshops, media releases, documentaries and websites to support the uptake of the key findings from the MA into policy.

7. The COP of the CBD also viewed the use and impact of the SGAs in the MA.[99] Further lessons learned specific to SGAs were identified. Main lessons learned are:

a) Geographic coverage of the SGAs was uneven: The basic bottom-up approach taken in developing SGAs resulted in wide and varied assessments driven by user-demand, but did not provide a comprehensive global coverage of ecosystem types and geographical areas. Further more such an approach did not allow for effective comparisons across SGA.

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[97] ICSU-UNESCO-UNU (2008) Ecosystem Change and Humans Well Being: Research and Monitoring Priorities Based on the Millennium Ecosystem Assessment (International Council of Science).

[98] Ash, N., Blanco, H., Brown, C., Garcia, K., Henrichs, T., Lucas, N., Raudsepp-Hearne, C., Simpson, R.D., Scholes, B., Tomich, T., Vira, B., and Zurek, M. (in press) *Ecosystems and Human Well-being – A Manual for Assessment Practitioners*. Island Press

[99] UNEP/CBD/COP/9/INF/30

b) Lack of capacity: Many SGA practitioners lacked capacity in aspects in the assessment methods (e.g. responses and scenarios) and tools (economic valuation) to be able to carry out a comprehensive SGAs.

c) Engagement of policy makers: SGAs were catalyzed and led by individuals or organizations (research and NGOs) and policy makers were not fully engaged as stakeholders, resulting in many SGAs having little or no impact on policy-making at the relevant scales.

8. The following activities are underway to support the completed, ongoing and new SGAs and address the lessons learned from the original set of SGAs:

a) New SGAs are being encouraged in under represented regions such as West Africa through initiatives such as the Poverty and Environment Initiative;

b) A network of assessment practitioners has been established and is growing with the inclusion of new SGA members;

c) Annual SGA meetings are held to allow for the exchange of experiences and lessons learned between SGA practitioners; and

d) Capacity building workshops are planned for 2009, which will utilize the ecosystem assessment manual and build the capacity of practitioners already carrying out assessments and practitioners wishing to begin an assessment.

C. The Assessment of Assessments and the Regular Process for Global Reporting and Assessment of the state of the Marine Environment

1. In 2002, the World Summit on Sustainable Development in Johannesburg recommended the establishment of a Regular Process under the United Nations for the global reporting and assessment of the state of the marine environment, including socio-economic aspects. This was endorsed by the United Nations General Assembly (UNGA) later in 2002 (Resolution 57/141).

2. In 2005, the UN General Assembly launched the "Assessment of Assessments" (AoA) as a preparatory stage towards the establishment of the "Regular Process." Resolution 60/30 called for the establishment of an Ad Hoc Steering Group to oversee the execution of the AoA and a Group of Experts to undertake the actual work. It invited UNEP and the Intergovernmental Oceanographic Commission (IOC) of UNESCO to serve as lead agencies for the process, to provide secretariat services and to coordinate the work.

3. The AoA is a review of the global marine assessment landscape for the purposes of determining possible options and a framework for a Regular Process. Its final report provides, along with the Summary for Decision Makers, a thorough review of existing marine and coastal environmental assessments, at global and regional levels, includes a critical analysis of the assessments with a view to identify best practises, thematic and geographic gaps, capacity-building needs, and establishes a framework and options (with rough budgets) for the Regular Process.[100]

4. The AoA concluded that although assessment capacity is strong in many regions, there is a clear need for continued efforts to develop greater expertise and infrastructure around the globe in the technical aspects of marine assessment. In addition, five major areas that need immediate, concerted and ongoing attention are:

a) ensuring that assessment processes are well designed and clearly link assessment processes and policy-makers, conducted to the highest standards, and fully documented by the responsible institutions;

b) improving data accessibility and interoperability so that assessments can be extended and scaled up or down within and across regions;

c) increasing the consistency of selection and use of indicators and reference points to guide the interpretation of status and trends;

d) developing integrated ecosystem assessments that can inform on the state of systems rather than just individual sectors or ecosystem components and which include social and economic aspects,

e) strengthening the mandates of institutions to undertake fully integrated assessments; and

f) strengthening capacity for response assessments that are linked directly to the findings of state, pressure and impact assessments.

5. Accordingly, the fundamental building blocks of the first cycle of the proposed Global Reporting and Assessment of the Marine Environment (GRAME) (2010-2014) include:

a) build capacity at both individual and institutional levels based on identified priorities;

b) improve knowledge and methods of analysis;

c) enhance networking among assessment processes, international monitoring and research programs and associated institutions and individuals;

d) create communications tools and strategies for reaching different target audiences.

6. The AoA/GRAME process is currently in a very advanced and critical phase, with an *Ad Hoc Working Group of the Whole* 31 August - 4 September 2009. The ad hoc Working Group of the whole is to consider best practices and institutional options (see para 14 above) for the Regular Process and recommend a path forward to meet the commitment Resolution 54/141. The ad hoc Working Group plans to submit its proposals to the UN General Assembly in October 2009, for inclusion in the annual Oceans Resolution of UNGA.

[100] Available at: www.unga-regular-process.org

D. Increasing coherence within the UN and environmental governance

1. Recognising missed opportunities for synergy, and the potential for duplication of effort, a number of intergovernmental processes and reviews within the UN system have been addressing ways and means to increase coherence both within the UN and its activities, and within the governance landscape. Given that many of these activities need to be informed by science these discussions and related actions are relevant to this gap analysis.

2. In 2001 the UN Secretary-General established the *Environment Management Group* as a UN system-wide coordination body on environment and human settlement.[101] Its membership consists of the specialized agencies, programmes and organs of the United Nations including the MEA secretariats. While the EMG is neither a scientific body nor a decision making body it is in a position to facilitate and promote greater cooperation, including on science-policy issues.

3. The UN is also seeking greater coherence in its activities at the national level, through the development and implementation of *UN Development Assistance Frameworks* (UNDAF) which help to focus the activities of UN agencies, programmes and organs at the national level, and the *Delivering as One* pilot projects which are testing more coordinated approaches. While these plans and activities relate to nationally defined priorities, increased coherence in action inevitably requires increased coherence in the use of science in decision making.

4. In paragraph 169 of the 2005 World Summit Outcome, Governments agreed to explore the possibility of a more coherent institutional framework for environmental activities in the UN system by improving the key areas of concern including: enhanced coordination; improved policy advice and guidance; and strengthened scientific knowledge, assessment and cooperation. All these issues are directly relevant to steps to improve the science-policy interface.

5. The *Bali Strategic Plan for Technology Support and Capacity Building* adopted in 2004 aims to strengthen the capacity of Governments of developing countries and countries with economies in transition, at all levels, to *inter alia* develop national capacity for using science in decision-making with respect to environmental management.

6. Finally in order to support many of these activities there has been a recognition of the need to *strengthen the scientific base of UNEP* so that it is better placed to provide support at both national and international levels.

7. Discussion on increasing coherence in both the UN system and international environmental governance is likely to continue for some time, and its final outcome cannot be predicted. However it can be assumed that emphasis will remain on the need for greater coherence, that improvements in the ways in which science can be used to support decision making will continue to be recognised as a key issue, and that improvements in delivery and use of such information now will be important for whatever governance landscape exists in the future.

[101] More information on the EMG can be found at www.unemg.org

E. Summary table on the scientific advisory bodies and processes of the Rio conventions

Convention	CBD	UNCCD	UNFCCC
Scientific advisory bodies	Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA)	Committee on Science and Technology (CST)	Subsidiary Body for Scientific and Technological Advice (SBSTA)
Membership of scientific advisory bodies	• **Open to participation by all Parties**, it comprises government representatives competent in the relevant field of expertise, and to observers. • The **Chair** is elected at ordinary meetings of the COP; candidates should be recognized experts, qualified in the field of biodiversity and experienced in CBD and SBSTTA processes. S/he also chairs the Bureau. As a general rule, the chair rotates among regional groups. • The **SBSTTA Bureau** is composed of 10 members elected for fixed two-year terms by the Parties at SBSTTA meetings (2 from each of the 5 regional groups). They take office at the end of the meeting at which they are elected. In order to facilitate continuity only one of the regional representatives is replaced at each meeting.	• **Open to participation by all Parties**, it comprises government representatives competent in the fields of expertise relevant to combating desertification and mitigating the effects of drought, and to observers. • Participation in the new format of the CST ordinary sessions (i.e. scientific conference –style format) will be open to registered participants in their individual capacity, and participants accredited to the COP. • The **Chair** is elected by the COP at each of its sessions with due regard to ensure geographical distribution and adequate representation of affected Country Parties, particularly those in Africa. S/he serves for up to two consecutive years. • The **CST Bureau** is composed of the Chair and the four Vice-Chairs. It should hold two meetings per year.	• O**pen to participation by all Parties:** government representatives competent in the relevant field of expertise, and to observers. • **Chair** of the SBSTA is elected from the representatives of the Parties present at the COP session, and the SBSTA elects its own Vice-Chair and Rapporteur.
Mandate, terms of reference, *modus operandi*	Article 25 establishes SBSTTA as an open-ended scientific advisory body to COP and, as appropriate, its other subsidiary bodies. As per Annex III of Decision VIII/10 (**Consolidated *modus operandi* of the SBSTTA**), its specific functions include, *inter alia*, to: provide assessments of the status of biological diversity; prepare assessments of the effects of types of measures taken in implementing the Convention; identify innovative, efficient and state-of-the-art technologies and know-how relating to the conservation and sustainable use of biological diversity and advise on the ways and means of promoting their use; identify new and emerging issues relating to the conservation and sustainable use of biodiversity; provide advice on relevant scientific programmes and international cooperation; respond to scientific, technical, technological and methodological questions that the COP and its subsidiary bodies may put. Additional elements to its *modus operandi* are included in Decision IX.29. The meetings of the SBSTTA place as necessary and sufficiently in advance of each regular meeting of the COP.	Established under Article 24, the CST is a subsidiary body of the COP. Its mandate and **terms of reference** were defined and adopted during COP-1 (Decision 15/COP.1). The CST collects, analyses and reviews relevant data, and promotes cooperation in combating desertification and mitigating the effects of drought through sub-regional, regional and national institutions, and in particular by its activities in research and development, which contribute to increased knowledge of the processes leading to desertification and drought as well as their impact. It also contributes to distinguishing causal factors, with a view to combating desertification and achieving improved productivity. In Decision 13/COP.8, the COP called for reshaping operation of CST in line with the strategic plan and framework to enhance the implementation of the Convention. *Inter alia*, the COP decided that each future ordinary session of the CST should be organized in a predominantly scientific and technical conference-style format. It meets in conjunction with the ordinary sessions of the COP.	SBSTA, established under Article 9, is a subsidiary body to provide the COP and, as appropriate, its other subsidiary bodies with timely information and advice on scientific and technological matters. Under the guidance of COP, and drawing upon existing competent international bodies such as the IPCC, the SBSTA: provides assessments of the state of scientific knowledge relating to climate change and its effects; prepares scientific assessments on the effects of measures taken in the implementing the Convention; identifies innovative, efficient and state-of-the-art technologies and know-how and advise ways and means of promoting their use; provides advice on scientific programmes, international cooperation in research and development related to climate change, as well as on ways and means of supporting endogenous capacity-building in developing countries; and responds to scientific, technological and methodological questions that the COP and its subsidiary bodies may put to it. The SBSTA meets at least twice a year.

Convention	CBD	UNCCD	UNFCCC
Related scientific processes, rosters, working groups and tools	• Scientific processes include the review of **programmes of work** of the Convention (e.g. agricultural biodiversity) and other **initiatives** of the Convention (e.g. 2010 biodiversity target indicators) as well as CBD **publications**, such as the Global Biodiversity Outlook • SBSTTA establishes, under the guidance of the COP, **ad hoc technical expert groups (AHTEG)** on specific priority issues (e.g. on the Review of Implementation of the Programme of Work on Forest Biodiversity). • SBSTTA established a **Roster of experts:** however, its maintenance and use was discontinued (Decision VIII/10). • SBSTTA works closely with the CBD **Clearing-House Mechanism** (CHM) and the **Consortium of Scientific Partners on Biodiversity** as well as with other processes such as the **CMS/FAO jointly convened Task Force on Avian Influenza.**	• **Roster (by nominations from Parties) of Independent Experts** with expertise/experience in relevant fields. It is also used to establish **Ad hoc panels appointed by the COP** to provide it, through CST, with information/advice on specific issues regarding the state of the art in the fields of science and technology relevant to combating desertification and mitigating the effects of drought. • **Group of Experts (GoE),** under the authority of CST, established by COP with a specific work programme, to assist in improving the efficiency/effectiveness of CST. COP-8 has not appointed a GoE. • **CST-9 Special Segment: UNCCD 1st Scientific Conference: "Understanding Desertification and Land Degradation Trends"** organized by the Dryland Science for Development Consortium (DSD) with the assistance of the UNCCD Secretariat (Sept. 2009). • Other valuable inputs include an **institutions database,** based on upon survey by CST, the Land Degradation Assessment in Drylands (**LADA**) project, and the a **survey** on other bodies performing work similar to that envisaged for the CST requested by Decision 21/COP 1. • Additionally "**Friends of the CST**" provide informal assistance from scientific community during COP and CRIC, and there is an **UNCCD Fellowship Programme**.	• SBSTA cooperates closely with the **Intergovernmental Panel on Climate Change** (**IPCC**) and its, *inter alia*, Assessment Reports, Guidelines, Technical Papers. • The **Nairobi Work Programme (NWP)** on Impacts, Vulnerability and Adaptation to Climate Change. • **Research Dialogues** under SBSTA's agenda item "Research and systematic observations", (ref also to Decision 9/CP.11). • Groups of experts such as the **Expert Group on Technology Transfer (EGTT)** established by the Marrakesh Accords, is to provide scientific and technical advice to advance the development and transfer of environmentally friendly technologies under the Convention. It reports to the SBSTA. • The UNFCCC **Roster of Experts** (nominated by Party's National Focal Points) contains information on experts in the areas of greenhouse gas inventory issues, in-depth reviews of national communications from Annex I Parties and technology transfer. • SBSTA also cooperates with the following: **Global Climate Observing System** (GCOS)**; Global Terrestrial Observing System** (GTOS); and the **Committee on Earth Observations Satellites** (**CEOS**) and other organizations on a range of issues.
Linkages between scientific and other convention bodies	• The SBSTTA fulfils its mandate under the authority of, and in accordance with, guidance laid down by the COP, and upon its request. • As a subsidiary body of the COP, SBSTTA is to report regularly to the COP on all aspects of its work. • The SBSTTA, in carrying out its functions, supports the implementation of the multi-year programme of work of the COP and the Strategic Plan of the Convention, in a manner consistent with other internationally agreed goals relevant to the objectives of the Convention. • SBSTTA Chair to attend relevant meetings of the COP Bureau. • The AHTEGs are established under the guidance of the COP.	• CST advises COP on scientific and technological matters. • The Bureau of the CST is responsible for follow-up the relevant work of the Convention between COP sessions. • The CST serves as liaison between the COP and the scientific community by seeking the cooperation of, and utilizing the services and information provided by, competent bodies or agencies – national, international and non-governmental. • As per COP's request, the CST could also provide the Committee for the Review of the Implementation of the Convention (CRIC).	• SBSTA reports regularly to COP on all aspects of its work. • The SBSTA provides the link between the scientific information provided by expert sources such as the IPCC on the one hand, and the policy-oriented needs of the COP on the other. • The SBSTA and the Subsidiary Body on Implementation (SBI) have traditionally met in parallel, at least twice a year. When they are not meeting in conjunction with the COP, the subsidiary bodies usually convene at the seat of the secretariat. • The SBSTA and SBI work together on cross-cutting issues that touch on both their areas of expertise. These include capacity building, the vulnerability of developing countries to climate change and response measures, and the Kyoto Protocol.

F. Summary table on the scientific advisory bodies and processes of the global biodiversity-related conventions

Convention	Scientific advisory body	Membership of scientific advisory body	Mandate, terms of reference, *modus operandi*	Related scientific processes, rosters, working groups and tools	Linkages between scientific and governance bodies
Convention on Biological Diversity (CBD)[102]	**Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA)**	• **Open to participation by all Parties**, it comprises government representatives competent in the relevant field of expertise, and to observers. • The **Chair** is elected at ordinary meetings of the COP; candidates should be recognized experts, qualified in the field of biodiversity and experienced in CBD and SBSTTA processes. S/he also chairs the Bureau. As a general rule, the chair rotates among regional groups. • The **SBSTTA Bureau** is composed of 10 members elected for fixed two-year terms by the Parties at SBSTTA meetings (2 from each of the 5 regional groups). They take office at the end of the meeting at which they are elected. In order to facilitate continuity only one of the regional representatives is replaced at each meeting.	Article 25 establishes SBSTTA as an open-ended scientific advisory body to COP and, as appropriate, its other subsidiary bodies. As per Annex III of Decision VIII/10 (**Consolidated *modus operandi* of the SBSTTA**), its specific functions include, *inter alia*, to: provide assessments of the status of biological diversity; prepare assessments of the effects of types of measures taken in implementing the Convention; identify innovative, efficient and state-of-the-art technologies and know-how relating to the conservation and sustainable use of biological diversity and advise on the ways and means of promoting their use; identify new and emerging issues relating to the conservation and sustainable use of biodiversity; provide advice on relevant scientific programmes and international cooperation; respond to scientific, technical, technological and methodological questions that the COP and its subsidiary bodies may put. Additional elements to its *modus operandi* are included in Decision IX.29. The meetings of the SBSTTA place as necessary and sufficiently in advance of each regular meeting of the COP.	• Scientific processes include the review of **programmes of work** of the Convention (e.g. agricultural biodiversity) and other **initiatives** of the Convention (e.g. 2010 biodiversity target indicators) as well as CBD **publications**, such as the Global Biodiversity Outlook • SBSTTA establishes, under the guidance of the COP, **ad hoc technical expert groups (AHTEG)** on specific priority issues (e.g. on the Review of Implementation of the Programme of Work on Forest Biodiversity). • SBSTTA established a **Roster of experts:** however, its maintenance and use was discontinued (Decision VIII/10). • SBSTTA works closely with the CBD **Clearing-House Mechanism** (CHM) and the **Consortium of Scientific Partners on Biodiversity** as well as with other processes such as the **CMS/FAO jointly convened Task Force on Avian Influenza.**	• The SBSTTA fulfils its mandate under the authority of, and in accordance with, guidance laid down by the COP, and upon its request. • As a subsidiary body of the COP, SBSTTA is to report regularly to the COP on all aspects of its work. • The SBSTTA, in carrying out its functions, supports the implementation of the multi-year programme of work of the COP and the Strategic Plan of the Convention, in a manner consistent with other internationally agreed goals relevant to the objectives of the Convention. • SBSTTA Chair to attend relevant meetings of the COP Bureau. • The AHTEGs are established under the guidance of the COP.

[102] Note that the Cartagena Protocol and its bodies have not been considered in this comparative exercise

Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)	**Animals Committee** **Plants Committee** Initially there was only one Technical Committee, and for some time there was a Nomenclature Committee. A proposal was made to merge the Committees, but this was rejected.	For each of the 2 Committees: • **Government-designated experts,** serving in their personal capacity, elected at COP meetings as representative of six geographical regions. Ideally candidates should be, associated with a Scientific Authority and have appropriate experience. • **One nomenclature expert**, appointed by the CoP who would be ex-officio and non-voting; • **Observers:** any Party as well as any person/organization invited by the Chair. • A **Chair** and **Vice-Chair** are elected by the Committee. • Membership is reviewed at every regular COP meeting. Terms of office of members commence at the close of the meeting at which they are elected and expire at the close of the second regular meeting.	Established at COP-6, the role of the Committees is to provide technical support to decision-making. They have similar **terms of reference**, detailed in Resolution Conf. 11.1 (Rev. CoP14), Annex 2, which include *inter alia*: providing scientific advice and guidance to the COP, the other committees, working groups and the Secretariat; dealing with nomenclatural issues; undertaking periodic reviews of species, in order to ensure appropriate listing; advising when certain species are subject to unsustainable trade and recommending remedial action (through a process known as the 'Review of Significant Trade'); and drafting resolutions on animal and plant matters for consideration by the COP. Doc SC54 Inf.4 describes the evolution of the ToRs of the Committees. The Committees meet twice between CoP meetings.	• **Regional directories** prepared by the Committees, listing the zoologists and botanists who are experts in CITES-listed species in each Party. • **Working Groups** established under the Standing Committee or one of the scientific committees to assist it in implementing certain Decisions. • **CITES trade database** (maintained by UNEP-WCMC for the Secretariat). • **Review of Significant Trade** • CITES **partners with other organizations** in order to obtain the population status and distribution information that it does not regularly collect through its annual, biennial or special report.	• The two Committees report to the CoP at its meetings and, if so requested, provide advice to the Standing Committee between such meetings. • The two Committees are invited on a regular basis to the meetings of the Standing Committee.
Convention on the Conservation of Migratory Species of Wild Animals (CMS)	- **Scientific Council (ScC)**	• **Open to participation by all Parties** which are entitled to nominate a qualified expert who will be serving in individual capacity as scientists. • No more than eight **additional experts**, selected and appointed by COP, to specific topics related to taxa, threats, and geographic regions. • **Observers:** the Chairperson may invite any person or representative of any Party, non-Party State or organization to participate in meetings of the Council as an observer without the right to vote, and shall inform the Secretariat accordingly. • A **Chair** and a **Vice-Chair** elected by the members of the Council among the Party-appointed Councillors, for intervals corresponding to those of meetings of the COP. • Other than the experts appointed directly by the Parties, specialists appointed to the Council are reviewed at each ordinary meeting of the COP.	Established in accordance with Article VIII of the Convention, the ScC provides scientific and technical advice to, *inter alia*, the Conference of the Parties, the Secretariat, and to any Party to the Convention. In particular, it advises, between the meetings of the Conference of the Parties, on the development and implementation of the Convention's work programme from a scientific and technical standpoint, and advises on the priorities for sponsorship of conservation activities. Current Rules of Procedure were adopted by the Scientific Council on 8 April 1997 and approved by the Conference of the Parties on 15 April 1997 (e.g. UNEP/CMS/ScC15/Inf.2). The ScC should meet at least once between ordinary meetings of the COP. Meeting of the Council shall be convened at the request of the Chairperson or, in exceptional cases, of at least $^1/_3$ of the members, in both cases in consultation with the Secretariat.	• **Working groups** of the ScC may be established in order to further the Council's work programme intersessionally, taking into account provisions of any relevant resolutions of the COP. • CMS/FAO jointly convened the **Task Force on Avian Influenza** and recently the CMS/FAO co-convened the **Scientific Task Force on Wildlife Disease**; • CMS Information Management System (**IMS**) and Global Register of Migratory Species (**GROMS**). • The ScC shall liaise, through its Chairperson or a member or members nominated for this purpose, with other comparable bodies established under the Convention. • A "Survey of the Expertise of Scientific Council Members" has been undertaken at the CMS ScC Activity Planning Meeting (13 June 2009).	• The Chair shall submit to each ordinary meeting of the COP a written report on the Council's work since the previous ordinary meeting. • The COP shall determine the functions of the ScC, and frequently directs the ScC to provide specific advice. • The ScC shall meet at the request of the Secretariat as required by the Conference of the Parties. • The Chair of the ScC shall liaise with other committees and with the Standing Committee between meetings of the Council. • The Chair of the Standing Committee shall have the right to participate in meetings of the Council as an observer without the right to vote. • The ScC has adopted a Strategic Implementation Plan that mirrors the Conventions' Strategic Plan and guides the Convention's Work.

Ramsar Convention on Wetlands of International Importance	- **Scientific and Technical Review Panel (STRP)**	• **Regional representatives** appointed for each of the six Ramsar regions. • **Thematic experts** relevant to the STRP priority thematic work areas (approved by COP). For these members, gender and regional balance is sought, with appointed members based in different Ramsar countries or regions and/or from northern and southern parts of the world. One additional member appointed with expertise in **Communications, Education, Participation & Awareness**. These experts are appointed by the STRP Oversight Committee. • Each of the Convention's International **Organization Partners (IOPs)** is a member of the Panel. • **Observers**: a list of invited observer organizations, as per COP Resolutions. • The **Chairperson** is appointed by the STRP Oversight Committee as supernumerary post, while the **Vice Chairperson** is appointed by the same Committee from amongst the appointed STRP members. • **The Panel shall seek additional expertise** as and when required through various means, including through collaboration with the scientific advisory bodies of other international conventions and agencies, and through IOPs, STRP invited observers and STRP invited experts. • A minimum of $^1/_3$ of the appointed members of the STRP should be reappointed for a second terme.	Established by Resolution 5.5 to provide scientific and technical guidance to the Conference of the Parties, the Standing Committee, and the Ramsar secretariat. Current *modus operandi* for 2009-2012 based on Resolution IX.11 with refinements in Resolution X.9. As per Resolution X.10, ongoing functions of the STRP include, *inter alia*, (i) strategic scientific and technical advice; (ii) ongoing advisory functions; (iii) STRP National Focal Points – support and network development; (iv) CEPA advice on guidance preparation; and (v) review of draft COP Resolutions. Two meetings of the STRP as well as midterm workshops are held in the period intersessional to the COP.	• **Thematic Work Area (TWA) Working Groups** within the STRP, to be led or co-led by appointed STRP members. Membership may include *inter alia* other appointed STRP members, representatives of STRP observer organizations, STRP National Focal Points with relevant expertise, and other invited experts. • A **small task force** for the delivery of a *particular* high priority task in the STRP's programme for the period can be established by a Working Group or the Chairperson. • **Affiliated centres and committees** (e.g. MedWet *Committee*, Ramsar Regional Center for Central and Western Asia, Ramsar, Iran**).** • **STRP Support Service,** operated by Wetlands International. • **Indicators of Effectiveness of the Ramsar Convention on Wetlands.** • **Member** of the **CMS/FAO jointly convened Task Force on Avian Influenza** • **Review of scientific and technical support amongst partners** to improve core science foundation support to the STRP and the Ramsar Convention, as agreed at the 26th meeting of the Standing Committee.	• The Chair of the STRP will report to each Standing Committee meeting on the STRP progress. • **STRP will report to the Standing Committee** on any adjustments to its programme it considers necessary and on new tasks proposed during the intersessional period in relation to emerging issues. • **STRP Oversight Committee** composed of the Chair and Vice-Chair of the Standing Committee, the Chair and Vice-Chair of the STRP, and the Secretary General and the Deputy Secretary General ex officio. Among its responsibilities: (i) appoint the members, Chair and Vice Chair of STRP and (ii) provide intersessional advice, guidance and support to the operations of the Panel under the revised modus operandi. • **The Standing Committee** will continue to have overall responsibility for the work of the STRP. • Participation of StC Chair in STRP meetings, and participation of STRP Chair in StC meetings. • The value of participation by STRP members in meetings of the COP and Standing Committee has been emphasised by the COP (Resolution X.9).

World Heritage Convention (WHC)	Three organizations are named in the Convention as advisory bodies, IUCN, ICOMOS and ICCROM	• **IUCN** is an international organization which brings together national governments, NGOs, and scientists in a worldwide partnership. • **ICOMOS** is an international non-governmental organization. • **ICCROM** is an international intergovernmental organization established by UNESCO.	The bodies' roles are to: a) advise on the implementation of the Convention in the field of their expertise; b) assist the Secretariat, in the preparation of the Committee's documentation, the agenda of its meetings and the implementation of the Committee's decisions; c) assist with the development and implementation of the Global Strategy for a Representative, Balanced and Credible World Heritage List, the Global Training Strategy, Periodic Reporting, and the strengthening of the effective use of the World Heritage Fund; d) monitor the state of conservation of World Heritage properties and review requests for International Assistance; e) in the case of ICOMOS and IUCN evaluate properties nominated for inscription on the World Heritage List and present evaluation reports to the Committee; and (f) attend meetings of the World Heritage Committee and the Bureau in an advisory capacity. Specific roles for IUCN, ICOMOS, ICCROM are contained in the **Operational Guidelines for the Implementation of the WHC (Section I.G)**.	• **Thematic initiatives**, e.g. "Central Africa World Heritage Forest Initiative"; and "Climate Change and World Heritage". • **World Database on Protected Areas (WDPA)**; and its utilization by IUCN for its thematic studies. • **Reactive monitoring**, i.e. the reporting by the World Heritage Centre, other sectors of UNESCO and the advisory bodies to the Committee on the state of conservation of specific World Heritage properties that are under threat. • Additionally support from the IUCN World Commission on Protected Areas (**WCPA**).	• IUCN and ICOMOS report to the World Heritage Committee. • IUCN, ICOMOS, and ICCROM attend the meetings of the Committee and of the Bureau.
International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA)	The second session of the Governing Body agreed that establishment of a permanent subsidiary body was premature, and that *ad hoc* technical bodies with focused, specialised and outcome-oriented ToRs offered the best approach for the time being.			• **Panel of experts** for project appraisal. • FAO Commission on Genetic Resources for Food and Agriculture (**CGRFA**). • The **FAO State of the World on Plant Genetic Resources** for Food and Agriculture, which also contributes to the development and implementation of the Global Plan of Action. • Ongoing collaboration with **FAO** on the development of the **global information system on PGRFA**. • **Global Crop Diversity Trust**.	

G. Summary descriptions of the scientific advisory bodies and processes for the global biodiversity-related conventions and Rio conventions

Convention on Biological Diversity (CBD) and its Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA)

1. Article 25 of the Convention establishes SBSTTA "*to provide the Conference of the Parties and, as appropriate, its other subsidiary bodies with timely advice relating to the implementation of the Convention*" and anticipates that the body will be multidisciplinary, and "*shall comprise government representatives competent in the relevant field of expertise*". The following tasks: *(a) Provide scientific and technical assessments of the status of biological diversity; (b) Prepare scientific and technical assessments of the effects of types of measures taken in accordance with the provisions of this Convention; c) Identify innovative, efficient and state-of-the-art technologies and know-how relating to the conservation and sustainable use of biological diversity and advise on the ways and means of promoting development and/or transferring such technologies; (d) Provide advice on scientific programmes and international cooperation in research and development related to conservation and sustainable use of biological diversity; and (e) Respond to scientific, technical, technological and methodological questions that the Conference of the Parties and its subsidiary bodies may put to the body.*

2. COP 5 recognized the need to improve the quality of scientific, technical and technological advice provided to the COP[103] and to undertake sound scientific and technical assessments on issues critical for the implementation of the Convention. The COP requested SBSTTA to continue to improve the way it conducts its work, and asked SBSTTA to identify and develop methods for undertaking or participating in scientific assessments, to undertake a limited number of pilot scientific assessment projects, and to identify and regularly update assessment priorities and information needs (decision V/20). In response, SBSTTA 6 and SBSTTA 9 addressed assessments, and SBSTTA 8 considered a draft strategic plan for the subsidiary body.

3. COP 7 tasked the Ad Hoc Open-ended Working Group on Review of Implementation of the Convention (WGRI) with a review of the impacts and effectiveness of existing processes under the Convention, including SBSTTA (decision VII/30). Following the 1st meeting of WGRI, COP 8 endorsed a consolidated *modus operandi* for SBSTTA. The consolidated *modus operandi* identifies strategic ways and means of improving the quality of scientific, technical and technological advice of SBSTTA as follows (decision VIII/10):

"Improving the scientific, technical and technological inputs into SBSTTA meetings by, inter alia: (a) Strengthening relationships with the scientific and technical community through: (i) providing material about the work of the Subsidiary Body in a format that is accessible and relevant to the scientific and technical community; (ii) Actively disseminating the results of the work of the Subsidiary Body through scientific literature, both as reporting items and scientific papers, as reviewed and approved by the Conference of the Parties; (iii) Participating in, and contributing to, the scientific and technical components of other biodiversity-related processes; (iv) Using other bodies as a bridge between the Subsidiary Body and the scientific and technical community in relation to work programmes; (v) Engaging the scientific community in scientific assessments.

"Improving the scientific, technical and technological debate during SBSTTA meetings by, inter alia: (a) Raising delegates' awareness about, and encouraging informal debate on, key issues through the provision of scientific and technical publications, keynote speakers, poster sessions, round-table debates and other side events during meetings of the Subsidiary Body; (b) Identifying other opportunities to prepare delegates, particularly those with limited experience, for the discussions on scientific and technical matters; (c) Dedicating sufficient time to the consideration of results of scientific and technical assessments.

4. COP 8 also discussed the handling of new and emerging issues, and in decision VIII/10 added to the list of functions that SBSTTA carries out "*identify new and emerging issues relating to the conservation and sustainable use of biodiversity*".

5. The *modus operandi* of SBSTTA allows for the establishment of a relatively limited number of Ad Hoc Expert Groups (AHTEGs) on specific issues identified by the COP to '*provide scientific and technical advice and assessments.* The establishment of AHTEGs is guided by the following[104]:

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[103] An overview of the challenges to SBSTTA is provided in the report of the Brainstorming Meeting of SBSTTA Chairs on Ways and Means to Improve the Effectiveness of the Subsidiary Body (UNEP/CBD/SBSTTA/brainstorming/1/4).

[104] Taken from decision VIII/10, although earlier guidance is provided by decision IV/16

a) AHTEGs should "*draw on the existing knowledge and competence available within, and liaise with as appropriate, international, regional and national organizations, including non-governmental organizations and the scientific community, as well as indigenous and local community organizations and the private sector*";

b) SBSTTA is requested, whenever it convenes AHTEGs "*to provide oversight to ensure that terms of reference clearly indicate their mandate, duration of operation, expected outcomes and reporting requirements, and that their mandates are limited to the provision of scientific and technical advice and assessments*";

c) Parties are asked to nominate experts for AHTEG meetings, and in doing so are requested "*to give priority to the nomination of appropriate scientific and technical experts*", from these nominations, the Executive Secretary, in consultation with the SBSTTA Bureau, selects up to fifteen "*scientific and technical experts from the nominations submitted by Parties*" for each AHTEG and can also invite a limited number of experts; and

d) The reports produced by the AHTEG should, as a general rule, "*be submitted for peer review*" (which is particularly important as the number of participants is capped).

6. To date AHTEGs have reviewed and reported on a wide range of issues based on terms of reference usually prepared by SBSTTA and agreed by COP. These issues are as follows: inland water biodiversity, marine and coastal protected areas; mariculture; forest biodiversity; biodiversity of dry and sub-humid lands; genetic use restriction technologies; biological diversity and climate change; in-depth review of the implementation of the programme of work on forest biodiversity; mountain biodiversity; integrated marine and coastal area management; protected areas; technology transfer and scientific and technical cooperation; gaps and inconsistencies in the international regulatory frameworks in relation to invasive alien species; indicators for assessing progress towards the 2010 target; and island biodiversity. Based on SBSTTA recommendations, the COP has frequently welcomed and made extensive use of AHTEG reports.

7. Each in depth review of an issue by SBSTTA is informed by a document prepared by the Secretariat summarising the status and trends in biodiversity, and providing an overview of the drivers and the impact of measures taken. Even when no AHTEG has taken place, these documents are based on consultations, and undergo review by key experts.

8. The original *modus operandi* of SBSTTA included the compilation of rosters of experts in the relevant fields of the Convention, with the following purpose: "*The experts on the rosters are invited to make available, upon request of the Executive Secretary, Parties or other countries and relevant bodies, their specific expertise in order to contribute to the further development of the scientific, technical and technological issues of the work programme of the Convention on Biological Diversity. Such requests could entail, inter alia, peer reviews, questionnaires, clarifications or examinations of scientific, technological and technical issues, specific contributions to the compilation of documents, participation in global and regional workshops and assisting in connecting the Convention-process to international, regional and national scientific, technical and technological processes*" (decision IV/16). However, through decision VIII/10, the COP decided to discontinue the use of the roster of experts.

9. In summary, the Convention has taken up the challenge of improving the quality of scientific, technical and technological advice provided to the COP, and of undertaking sound scientific and technical assessments on issues critical for the implementation of the Convention. There have been several suggestions for improving the workings and operations of SBSTTA, including the endorsement of a consolidated *modus operandi*. SBSTTA and COP have drawn extensively on the reports of AHTEGs, which comprise experts nominated by Parties and selected by the Executive Secretary in cooperation with the SBSTTA Bureau. The use of a roster of experts in relevant fields of the Convention was discontinued in favour of the more flexible mechanism of Party nominations of experts for AHTEG meetings and other purposes.

10. However, despite all efforts, in the closing session of SBSTTA 13 in 2008, concerns were expressed at the failure to make significant progress, and one Party expressed "*disappointment that despite the scientific and technical advice mandate of SBSTTA, there had been very little focus on scientific and technical issues during the thirteenth meeting"* and that *"SBSTTA must refocus its work to deal with scientific, technical and technological issues in order to fulfil its mandate"* (report of SBSTTA 13, document UNEP/CBD/COP/9/3).

Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) and its Plants and Animals Committees

11. CITES has two scientific committees, the Animals Committee and the Plants Committee. The membership of the Animals and Plants Committees consist of: i) a person chosen by each of the North American and Ocean geographic regions; ii) two persons chosen by each of the African, Asian, Central and South American and the Caribbean, and Europen regions; and iii) a specialist on zoological nomenclature (Animals Committee) and a specialist on botanical nomenclature (Plants Committee) appointed by the Conference of the Parties who would be ex-officio and non-voting;

12. The Plants and the Animals Committee were established through resolution Conf. 6.1. Both committees were subsequently re-established; the latest resolution in this regard is resolution Conf. 11.1 (Rev. CoP14), which agreed the terms of reference for both committees that they should carry out the following with respect to wildlife trade:

a) provide scientific advice and guidance to the COP and other Convention bodies and processes;

b) deal with nomenclatural issues;

c) assist the Secretariat with respect to identification issues;

d) cooperate with the Secretariat in assisting Scientific Authorities;

e) develop regional directories of experts in CITES-listed species;

f) identify and assess taxa included in Appendix II which may be significantly affected by trade

g) assess information on species where there is evidence of a change in the volume of trade;

h) undertake a periodic review of animal or plant species included in the CITES Appendices;

i) make available advice on management techniques and procedures for States requesting it;

j) draft resolutions on scientific matters for consideration by COP;

k) perform any other functions at the request of the COP or Standing Committee; and

l) report to the COP and, if so requested, the Standing Committee, on the activities undertaken.

13. Document SC54 Inf. 4 and SC54 Inf.5, describe the evolution of the terms of reference of the committees and of the duties and responsibilities of the committee members, together with the results achieved, resources and support available to the committees and a comparison with practices in other biodiversity-related multilateral environmental agreements (MEAs).

14. There have been several moves to merge the two Committees (CoP12, CoP14), but Parties have always been strongly opposed to this. CoP13 adopted a process to review the Scientific Committees. COP 13 directed the Standing Committee to determine a process for the review of the scientific committees and to proceed with the review. The Standing Committee established an External Evaluation Working Group to undertake the review. The External Evaluation Working Group recognised that the scientific committees were achieving a generally high level of performance in the high-priority tasks assigned to them and often with very limited resources or a reliance on voluntary effort. They made the following recommendations to the Standing Committee for the Review of the Scientific Committees (CoP14 Doc 12):

8. On the gap analysis of duties performed and factors that could be compromising their performance, ways to improve or modify relevant procedures, the evaluation recommended that:

a) Increased performance, particularly in lower-priority tasks, would require increased budgetary funds and other resources in relation to those tasks, especially for translation and intersessional work.

b) Performance would further improve if greater consideration were given by the COP and the Standing Committee to whether these tasks are within their mandates and the forthcoming Strategic Plan, and whether the tasks were adequately resourced.

c) The scientific committees should be able to organize their working methods within the priorities allocated to them by the COP.

d) The COP should take into account the workload of the committees in assigning tasks to them, but the frequency of the committee meetings should remain unchanged unless otherwise determined by the COP.

e) Performance would improve if funds were made available for the chairmen to operate and participate and represent their committees at meetings of the Standing Committee and at other key meetings.

f) Their terms of reference in Resolution Conf. 11.1 (Rev. CoP13) could be revised with a view to clarifying their mandate.

9. On opportunities for efficiencies in the functioning of the scientific committees, the evaluation recommended that:

a) To promote and facilitate coordination and contact between the taxonomic expertise in regions, the former Nomenclature Committee could function as a working group of the Animals and Plants Committees, but should retain its ability to take decisions intersessionally in accordance with COP Resolutions and Decisions.

b) The members of the Nomenclature Committee should be elected for a fixed term lasting two intersessional COP periods.

c) The requirement of a Party/region to provide the time and resources for a regional representative to carry out his/her duties needs to be strengthened, and Parties should aim to commit to this at time of nominating.

d) The costs and benefits of the COP nominating independent chairmen of the scientific committees or extra regional representatives fulfilling this role should be explored.

e) The Secretariat should seek assistance from the scientific committees in the assignment of consultants and the definition of terms of reference for specific projects.

10. Responding to the recommendations, of the external valuation, COP 14 decided to conclude the review, Resolution 11.1 was modified, and a decision directed the Animals and Plants Committees to '*evaluate the need to further review and revise the terms of reference* [for the establishment of the Animals and Plants Committees] *in Resolution Conf. 11.1 (Rev. CoP14) and as necessary revise the terms of reference for presentation at the 15th meeting of the Conference of the Parties*'.

11. In summary, CITES is unusual in having two (and for a long time having had three) scientific committees, which were established in the 1980s and remained largely unchanged (although they had been charged with additional tasks). The review process that has been initiated has addressed a number of areas in which the work of those committees, and the support for them, can be improved, and these are being addressed as resources allow.

The Convention on Migratory Species (CMS), its Scientific Council, and the scientific advisory bodies of CMS Daughter Agreements

12. The Scientific Council was established by the first COPmeeting in 1985 as foreseen in Article VIII of the Convention text. Over almost 30 years the Scientific Council has provided advice on scientific matters through identifying research and species conservation priorities to the Convention. All Parties are entitled to nominate a qualified expert, as a member of the Scientific Council, and an alternate entitled to participate in meetings of the Council when the regular Councillor cannot attend. Country members are appointed in their individual capacity as scientists and do not represent their Governments – a feature which aims to ensure the autonomy of the Scientific Council. In addition eight experts are appointed by the COP to contribute through offering specific expertise on taxa, geographic regions and threats. At present, the Council includes 93 members of whom 85 are Party-appointed, and eight appointed to cover the following areas: marine turtles; birds; aquatic mammals; fish; neo-tropical fauna; Asiatic fauna; African fauna; by-catch.

13. The functions of the Scientific Council are defined as: providing scientific advice to the COP, the Secretariat, and, if approved by the COP, to any body set up under the Convention or an Agreement or to any Party; recommending research and the coordination of research on migratory species, evaluating the results of such research in order to ascertain the conservation status of migratory species and reporting to the COP on such status and measures for its improvement; making recommendations to the COP as to the migratory species to be included in Appendices I and II, together with an indication of the range of such migratory species; making recommendations to the COP as to specific conservation and management measures to be included in Agreements on migratory species; and recommending to the COP solutions to problems relating to the scientific aspects of the implementation of the Convention, in particular with regard to the habitats of migratory species. The Council's work programme is maintained intersessionally by nine working groups, five on taxonomic groups and four on threats, notably climate change, by-catch and wildlife diseases and sustainable use.

14. The COP frequently directs the Scientific Council to provide specific advice. For example, COP 3 requested the Council to provide recommendations and advice on a range of issues related to the conservation of Appendix I and II species, species to be added to the Appendices, and other issues (resolution 3.4). Through resolution 4.5, COP 4 directed the Scientific Council to provide further advice on Appendix species, existing Agreements and potential new ones and on small-scale pilot projects promoting the Convention's implementation. Resolution 7.12 of the COP, on the background of the growing number of Parties and hence members to the Scientific Council, acknowledged the need for a review of the Scientific Council's working practice '*to optimise its productivity and capability to deal with the scientific and technical aspects of numerous issues relevant to the conservation and sustainable use of migratory species*' and instructed the Scientific Council to produce a strategy on its scientific and conservation work. The 12th meeting of the Scientific Council elaborated on a Strategic Implementation Plan of the Council in light of the emerging Strategic Plan for the Convention. It also considered the *modus operandi* of the Council, with a focus on how to better involve the councillors in the work of the Convention, in particular during intersessional periods. The 13th meeting of the Scientific Council adopted its Strategic Implementation Plan. The Plan outlines the contributions of the Scientific Council to the CMS Strategic Plan 2006-2011. The 13th meeting also discussed the resources and working practices of the Council and agreed to retain its current format.

15. The Scientific Council normally meets twice between COP sessions to offer scientific advice and identify research and conservation priorities; however, COP 9 decided that an extraordinary meeting of the Scientific Council would be convened in 2009. The meeting has been convened as "Planning Meeting of the Scientific Council of the Convention on Migratory Species of Wild Animals" (Bonn, Germany, 13 June 2009). There, the Council addressed its own expertise through discussing a proposed questionnaire/survey ("Survey of the Expertise of Scientific Council Members", the Small Grants Programmes, and the intersessional work of taxonomic and thematic working groups.

16. Within the framework of the work undertaken concerning the future shape of the CMS, the COP has instructed the ad hoc working group on the future shape of the CMS and the CMS family to take into account inter alia, " possibilities and options for ensuring a sound science base of a growing CMS family and the resultant growing responsibilities for a higher number of species" (UNEP/CMS/Resolution 9.13).

17. Some of the Daughter Agreements under the CMS also have scientific advisory bodies, including the: Scientific Committee of Agreement on the Conservation of Cetaceans in the Black Sea, Mediterranean Sea and contiguous Atlantic area (ACCOBAMS); the Advisory Committee of EUROBATS; the Advisory Committee of Memorandum of Understanding on the Conservation and Management of Marine Turtles and their Habitats of the Indian Ocean and South-East Asia (IOSEA); and the Technical Committee of the Agreement on the Conservation of African-Eurasian Migratory Waterbirds (AEWA). Furthermore, within these processes additional ad hoc working groups can be established, as in the case of EUROBATS' Intersesssional Working Group on "Producing Guidelines on Bat Monitoring Methods to Assess Population Trends at Different Levels". However, it would seem that no formal linkages have been established between the processes of these advisory bodies and the CMS Scientific Council.

18. In summary, the Scientific Council has provided advice on issues as outlined by Article VIII of the Convention. The challenges that have been recognised do not relate to the provision of advice on scientific matters *per se* but to the operations of the Council. With the growing number of countries acceding to the Convention, the membership of the Scientific Council is growing accordingly, which creates financial and logistical challenges to its functioning. The Council, as requested by the COP, has responded to this challenge with the adoption of a Strategic Implementation Plan that mirrors the Convention's Strategic Plan and guides the work of the Council.

Ramsar Convention on Wetlands and its Scientific and Technical Review Panel (STRP)

19. The Ramsar STRP was established by Resolution 5.5 as a subsidiary body of the Convention to provide scientific and technical guidance to the COP, the Standing Committee, and the Ramsar secretariat. Its individual members are elected by the Standing Committee, based upon nominations from the Parties, on the same regionally proportionate basis that is used for electing the Standing Committee itself, but they serve in their own capacities as experts in the scientific areas required by the STRP's Work Plan and not as representatives of their countries. In addition to the 12 individual STRP members, delegates from the five International Organization Partners -- BirdLife International, International Water Management Institute (IWMI), the International Union for the Conservation of Nature (IUCN), Wetlands International, and WWF International -- represent their organizations as full members of the Panel. In addition, representatives of the 18 subsidiary bodies of other Multilateral Environment Agreements and non-governmental organizations and associations specified in Resolution X.9 are also invited to participate as permanent observers during each triennium, and representatives

of other organizations are invited to participate in the work of the STRP as required by the nature of the tasks under study.

20. The Standing Committee originally requested the STRP to concentrate on three specific items: review of the criteria for identifying Wetlands of International Importance; definition of ecological character and change in ecological character in relation to Ramsar sites; and review of the application of the Montreux record (relating to listed wetlands under threat). COP resolution VI.7 requested the Standing Committee to define the principal tasks for the STRP in the coming year. Through resolution VII.2, the COP emphasized the need for establishing a close link between the STRP and the network of scientists and experts in each Contracting Party. The COP invited Contracting Parties to nominate STRP focal points, invited a number of organizations, including the International Organization Partners of the Convention, and bodies as observers to the STRP, and decided that the STRP membership should have the same regional structure as the Standing Committee.

21. COP resolution VIII.28 approved a revised *modus operandi* for the STRP. The *modus operandi* states that the COP shall establish the priorities for STRP work in the coming triennium and that the Standing Committee shall adopt the definitive list of STRP assignments for the triennium on the basis of the Convention work plan and resolutions adopted by the COP, and will provide additional guidance on priority tasks. The modus operandi identifies the Terms of Reference of the STRP and its members as follows:

a) review the tasks and nature of the products requested of it by COP Resolutions and the Convention's Work Plan;

b) undertake strategic review of the current tools and guidance available to Parties and new and emerging issues for the Convention;

c) determine and agree a mechanism for the delivery of each of these tasks, including the establishment of Expert Working Groups as appropriate, advise on which tasks it does not have the expertise or capacity to progress, and receive the advice of the Standing Committee for this work plan;

d) identify, for each task the Panel proposes to undertake, and with the advice of any Working Group on the topic, the best global expert(s) either from within or outside the Panel to undertake drafting work, taking into account geographical and gender balance and language ability;

e) identify, for each product in the work plan, and with the advice of any Working Group and the STRP Support Service, additional experts to undertake review by correspondence of draft materials, as necessary;

f) make expert review of the draft products in its work plan, taking into account the views expressed by additional experts in (d) above, agree any amendments needed, and transmit these revised products for consideration by the Standing Committee;

g) ensure, with the assistance of the Ramsar Bureau, that the work of the STRP contributes to and benefits from the work undertaken by similar subsidiary bodies of other MEAs.

22. Through resolution IX.11, the COP recognised the concern expressed by STRP about aspects of its operations, and its capacity and resourcing to deliver all of its required tasks. The COP consequently approved a revised modus operandi and established an STRP Oversight Committee, reporting to the Standing Committee, to deliver the responsibilities as defined by the revised modus operandi. The revised modus operandi identifies its key objective as “to establish ways and means of ensuring that the STRP mechanism delivers the best available scientific and technical advice to the Convention, in the most efficient and cost-effective manner, through the work of widely recognized wetland conservation and wise use experts and networks”.

23. In 2008, COP 10 adopted resolution X.9, which confirms the modus operandi of the STRP with some refinements. Resolution X.10 outlines the tasks and priorities of the STRP for 2009-2012 under the following headings: ongoing functions of the STRP; strategic scientific and technical implementation; general wise use of wetlands; wetland inventory, assessment, monitoring and reporting; wetlands and human health; wetlands and climate change; wetlands and water resources management; Wetlands of International Importance; wetland management – restoration, mitigation and compensation; communication, education, participation and awareness. Resolution X.10 also addresses how STRP members are selected, the directions allowing the STRP Oversight Committee valuable flexibility in identifying as members those best able to support work on the tasks set by COP.

24. The COP notes that “it has not been possible to progress some elements of STRP’s priority work in the 2006-2008 triennium and that full delivery of the Panel’s programme remains subject to resources” (resolution X.10).

25. In summary, the STRP has been confronted with issues of lack of capacity and resourcing. In response, the COP has established a modus operandi for the scientific body and detailed outlines of the tasks to be undertaken by the STRP. While the mechanisms of producing scientific and technical guidance for the COP as well the Standing Committee and the Secretariat work well, the workload of the STRP remains substantial and is likely to continue to provide enormous challenges, including financial ones.

World Heritage Conventions and its advisory institutions (IUCN, ICOMOS, ICCROM)

26. The World Heritage Convention does not have a scientific advisory body *per se*, but the Convention recognises and calls upon the competence and expertise of three advisory institutions, namely the International Centre for the Study of the Preservation and Restoration of Cultural Property (ICCROM), the International Council of Monuments and Sites (ICOMOS) and IUCN, the International Union for the Conservation of Nature. These organizations have been providing advice to the World Heritage Committee for more than 30 years.

27. The Operational Guidelines for the implementation of the Convention define the roles of these three organisations as advisory bodies to the Convention as being: to advise on the implementation of the Convention in the field of their expertise; to assist the Secretariat, in the preparation of the World Heritage Committee's documentation, the agenda of its meetings and the implementation of the Committee's decisions; to assist with the development and implementation of the Global Strategy for a Representative, Balanced and Credible World Heritage List, the Global Training Strategy, Periodic Reporting, and the strengthening of the effective use of the World Heritage Fund; to monitor the state of conservation of World Heritage properties and review requests for International Assistance; and to, in the case of ICOMOS and IUCN, evaluate properties nominated for inscription on the World Heritage List and present evaluation reports to the Committee; and to attend meetings of the World Heritage Committee and the Bureau in an advisory capacity. In addition, the Operational Guidelines also highlights that the Committee may call on other international and non-governmental organizations to assist in the implementation of programmes and projects, and expert groups on specific issues related to the Convention are also established from time to time.

28. In summary, the World Heritage Convention does not have an established subsidiary advisory body, but calls upon the expertise of three organizations, namely the International Centre for the Study of the Preservation and Restoration of Cultural Property (ICCROM), the International Council of Monuments and Sites (ICOMOS) and IUCN, the International Union for the Conservation of Nature.

The International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA)

29. In 2007, the 2nd session of the Governing Body of the International Treaty on Plant Genetic Resources for Food and Agriculture agreed that the establishment of a permanent subsidiary body was premature. It was decided that ad hoc technical bodies with focused, specialized and outcome-oriented terms of reference offered the best approach for the time being. Furthermore, each Contracting Party's delegate may be accompanied by experts and advisers (however with no voting rights) at the session of the Governing Body.

30. However it is worth also noting here the link between the Treaty and the FAO assessment on *The State of the World's Plant Genetic Resources for Food and Agriculture* which is explicitly referenced in Article 17.3 of the Treaty, and which contributes to development and implementation of the *Global Plan of Action* that is referenced in Article 14. Also, to be noted the ongoing collaboration between the Treaty and the FAO on the development of the global information system on PGRFA.

31. In summary, even if the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA) does not have a scientific body at present, it has direct access to assessments and information systems, it has direct access to assessments and information systems developed by FAO and the Commission on Genetic Resources for Food and Agriculture.

United Nations Framework Convention on Climate Change (UNFCCC)

32. Article 9 of the Convention establishes the Subsidiary Body on Scientific and Technological Advice (SBSTA) "*to provide the Conference of the Parties and, as appropriate, its other subsidiary bodies with timely information and advice on scientific and technological matters relating to the Convention…Under the guidance of the Conference of the Parties, and drawing upon existing competent international bodies, this body shall:*

(a) Provide assessments of the state of scientific knowledge relating to climate change and its effects;

(b) Prepare scientific assessments on the effects of measures taken in the implementation of the Convention;

(c) Identify innovative, efficient and state-of-the-art technologies and know-how and advise on the ways and means of promoting development and/or transferring such technologies;

(d) Provide advice on scientific programmes, international cooperation in research and development related to climate change, as well as on ways and means of supporting endogenous capacity-building in developing countries; and

(e) Respond to scientific, technological and methodological questions that the Conference of the Parties and its subsidiary bodies may put to the body."

33. Relating to this, Article 5 of the Convention on research and systematic observations, says that Parties shall:

(a) Support and further develop, as appropriate, international and intergovernmental programmes and networks or organizations aimed at defining, conducting, assessing and financing research, data collection and systematic observation, taking into account the need to minimize duplication of effort;

(b) Support international and intergovernmental efforts to strengthen systematic observation and national scientific and technical research capacities and capabilities, particularly in developing countries, and to promote access to, and the exchange of, data and analyses thereof obtained from areas beyond national jurisdiction; and

(c) Take into account the particular concerns and needs of developing countries and cooperate in improving their endogenous capacities and capabilities to participate in the efforts referred to in subparagraphs (a) and (b) above.

34. The COP, through decision 6/CP.1, noted that SBSTA "*will be the link between the scientific, technical and technological assessments and the information provided by competent international bodies, and the policy oriented needs of the Conference of the Parties*." In annex I to the same decision, SBSTA was tasked with, *inter alia*, the provision of assessments of the state of scientific knowledge relating to climate change and its effects; summarizing scientific and other information provided by bodies such as the IPCC; preparing scientific assessments on the effects of measures taken in the implementation of the Convention; and providing advice on scientific programmes and on international cooperation in research and development related to climate change.

35. SBSTA plays an important role as the link between the scientific information provided by the Intergovernmental Panel on Climate Change (IPPC) and other expert sources on the one hand, and the policy-oriented needs of the COP on the other. The IPPC is a very significant input to the work of UNFCCC, being relevant not only to the international process, but also in helping Parties formulate their national policies. The fact that an intergovernmental body is providing regular assessments and other support based on work of a substantial number of scientists is very helpful to the work of the UNFCCC, and in particular as the key reports are already endorsed by governments. In addition to receiving and drawing on the work of the IPCC, SBSTA also sometimes requesting specific information or reports from it. In addition to the IPCC, SBSTA can call on the work of other scientists and experts, and convene expert groups to address specific issues (such as has been done for REDD).

36. Research and systematic observation is a regular and separate item on the SBSTA agenda. For example at SBSTA 30 in 2009 the following issues were considered[105]: emerging scientific findings; research planning activities, including those undertaken in response to key uncertainties and research needs identified by the IPCC or raised by Parties; research priorities, and gaps in the implementation of these priorities; research capacity-building activities, particularly in developing countries; regional climate change research networks; and relevant communication issues. This discussion was informed by information provided by a range of regional and international climate change research programmes and organizations provided in advance of the meeting. As a consequence of the discussion, SBSTA requested the secretariat to prepare a list of international and regional programmes and organizations active in areas of research relevant to climate change, and to post this list on the UNFCCC website.

37. COP 10 requested SBSTA "*to develop a structured five-year programme of work on the scientific, technical and socio-economic aspects of impacts, vulnerability and adaptation to climate change, which would address the following issues: methodologies, data and modelling; vulnerability assessments; adaptation planning, measures and actions; and integration into sustainable development*" in the context of its terms of reference (decision 1/CP.10). Through decision 2/CP.11 the COP 11 adopted this programme of work for SBSTA, the objective of which is to "*assist all Parties, in particular developing countries, including the least*

[105] FCCC/SBSTA/2007/4

developed countries and small island developing States, to improve their understanding and assessment of impacts, vulnerability and adaptation, and to make informed decisions on practical adaptation actions and measures to respond to climate change on a sound, scientific, technical and socioeconomic basis, taking into account current and future climate change and variability" (Annex to decision 2/CP.10).

38. In summary, SBSTA plays an essential role in providing scientific and technical advice to the COP and, essentially, to the Parties to the Convention, as stressed in various COP decisions and SBSTA reports. To fulfil this role, SBSTA addresses major issues of the Convention as tasked by the COP, and makes use of workshops and expert groups. SBSTA also provides the essential link between the IPCC – a body independent of the UNFCCC – and the COP, by making it available to the COP (and to other Convention bodies) and assessing the relevance and value to the Convention of the information.

UN Convention to Combat Desertification (UNCCD) and its Committee on Science and Technology (CST)

39. The Committee on Science and Technology (CST) was established by article 24 of the Convention as a subsidiary body of the COP to provide it "*with information and advice on scientific and technological matters relating to combating desertification and mitigating the effects of drought*". The same article requested COP to establish a roster of independent experts with expertise and experience in the relevant fields and, as necessary, appoint *ad hoc* panels to provide it, through the CST, with information and advice on specific issues regarding the state of the art in fields of science and technology relevant to combating desertification and mitigating the effects of drought.

40. The terms of reference for the CST were adopted by COP 1 through decision 15/COP.1. They specify the mandate provided by Article 24 of the Convention in terms of advisory functions, data and information functions, research and review functions, functions related to technology, and evaluation functions. Decision 16/COP.1 decided that at each session the CST will address in depth a priority issue relating to the implementation of the Convention.

41. The following issues have been addressed in depth by CST: traditional knowledge (CST2); early-warning systems (CST3); the application of traditional knowledge, benchmarks and indicators and early warning systems to the monitoring and assessment of sustainable soil and water management in dryland areas (CST4); strategies for the communication of information and its use to generate best practices for combating desertification and mitigating the effects of drought (CST5); land degradation, vulnerability and rehabilitation: an integrated approach (CST6/7); and the effects of climatic variations and human activities on land degradation (CST8). CST 9 will address biophysical and socio-economic monitoring and assessment of desertification and land degradation, to support decision-making in land and water management.

42. Following considerations at CST4, COP 4 encouraged Parties to hold extensive consultations on ways of improving the efficiency and effectiveness of the CST (decision 17/COP.4). Parties' submissions, as well as consultations between regional groups, were introduced to COP 5 through document ICCD/COP(5)/3/Add.2. The document summarises Parties' main concerns as: the competence of participants in the CST; the political nature of discussions, rather than a focus on scientific and technological issues; the lack of continuity of representatives to the CST; and inadequate time within the agenda of the CST to allow for in-depth analysis and debate of the issues. Through decision 17/COP.5, the COP adopted ways and means to improve the effectiveness and efficiency of CST including through, among others, giving the CST a role in the review of national reports, better integrate of the work of the CST into national and regional activities, and establishing a Group of Experts on combating desertification and mitigating the effects of droughts.

43. The Group of Experts (GoE) met for the first time in 2003 and reported to the CST. COP 6 adopted a framework of the two-year work plan for the GoE, requested the GoE to focus on issues emerging from the review of national subregional and regional programmes and provide advice, through the CST, to the Committee for the Review of Implementation of the Convention (CRIC) (decision 15/COP.6). With decision 15/COP.7, the COP requested the GoE to continue its priority activities, including developing a communication and information strategy, and a land degradation and poverty strategy, and requested the CST Bureau to review the functions and the work of the GoE. The COP, through decision 17/COP.8, took note of the final report of the GoE. COP-8 has not appointed a GoE.

44. COP 3 invited Parties to report to the Secretariat on the use that they have made of the roster of experts (decision 15/COP.3). COP 4 noted that little response had been received from Parties on the use they had made of the roster and repeated the call on Parties to submit such information (decision 15/COP.4). COP again repeated the call on Parties to submit information on the use of the roster (decision 15/COP.5). Cop 6 not only repeated the same call, but also asked the CST to utilize the roster through its Group of Experts (decision 14/COP.6).

45. With decision 3/COP.8, COP adopted the 10-year Strategic Plan and Framework to enhance the implementation of the Convention (2008-2018) ("The Strategy"). Operational objective 3 of the 10-year Strategic Plan anticipates CST becoming "*a global authority on scientific and technical knowledge pertaining to desertification/land degradation and mitigation of the effects of drought*". Decision 3/COP.8 requests the Executive Secretary, in consultation with the COP Bureau and CST, to prepare a costed draft two-year work programme for the CST in line with The Strategy, taking a results-based management approach.

46. Decision 13/COP.8 decided that future ordinary sessions of the CST should be organized in a predominantly scientific and technical conference-style format in consultation with a lead institution/consortium, which is qualified in and has expertise in the relevant thematic topic selected by the COP, and should focus on one specific thematic topic determined by the COP. In this context, the UNCCD 1st Scientific Conference "Understanding Desertification and Land Degradation Trends" is organized by the Dryland Science for Development Consortium (DSD) with the assistance of the UNCCCD Secretariat and is convened, in support of UNCCD under the auspices of the CST, and will take place in Buenos-Aires, Argentina during the CST session of COP-9 (22-24 September 2009). The Conference's main purpose will be to analyze and summarize leading scientific knowledge on the Conference topic, in ways that generate practical, actionable recommendations for deliberations by the UNCCD COP to more effectively combat desertification in affected States, regions and globally. The format of the Conference includes a pre-Conference consultation phase organized through three globally-constituted Working Groups which will develop analyses that reflect prevailing scientific consensus on three facets of the Conference's topic, namely: (i) WG I. Integrated method for monitoring and assessment of land degradation processes and drivers (Land Quality Assessment); WG II. Monitoring and assessing land rehabilitation and sustainable land management (Sustainable Land Management Assessment); and WG III Monitoring and Assessment of Desertification and Land Degradation: Economic and Social Drivers and Knowledge Management.

47. In summary, the UNCCD Committee on Science and Technology has provided advice to the Convention's bodies on scientific and technological matters, in particular through the in-depth consideration of priority issues chosen by the COP. It was assisted by the roster of experts and in particular the Group of Experts. The adoption of the 10-year Strategic Plan at COP 8 offered the opportunity to reshape the operations of the CST, by introducing new ways and means of working, including conference-style sessions held in consultation with an institution or consortium qualified in the field of the specific session topic, as it is the case of the upcoming Scientific Conference "Understanding Desertification and Land Degradation Trends" (Buenos Aires, Argentina, 22-24 September 2009).

H. Examples of the involvement of selected intergovernmental organizations in the science-policy interface

1. The following paragraphs are not meant to be an exhaustive review of the activities of these organizations and programmes with respect to the science-policy interface, but to give a number of examples of the roles that they play so as to provide context for the gap analysis.

Food and Agriculture Organization of the United Nations (FAO)

2. Article 1 of the FAO constitution states that the Organization shall promote and, where appropriate, recommend national and international action with respect to, *inter alia*, the conservation of natural resource and the adoption of improved methods of agriculture production. In carrying out this part of its mandate, the FAO concentrates its competence on living resources known to be of use to humanity, especially for food and agriculture. In this context, FAO considers biodiversity and ecosystem services as the *sine qua non* for food security and rural development, and addresses it through nutrition-associated biodiversity and the ecosystem approach at the technical and policy level.

3. FAO's commitment to the fight against biodiversity loss has seen a steep increase in the last ten years as shown, for example, through the establishment of the Priority Areas for Inter-disciplinary Action (PAIA) on Integrated Management of Biological Diversity for Food and Agriculture. This is implemented by the Interdepartmental Working Group on Biological Diversity for Food and Agriculture (IDWG/BIOD), the main interdisciplinary analysis and coordination mechanism for issues related to biological diversity within the FAO. In addition, the FAO re-emphasised its commitment to fighting biodiversity loss in 2007 by creating the new Natural Resources Management and Environment Department (NRD); which leads on, among other issues, biodiversity for food and agriculture. NRD hosts the Secretariats of the Global Terrestrial Observing System (GTOS) and the Commission on Genetic Resources for Food and Agriculture (CGRFA).

4. FAO's intergovernmental Commission on Genetic Resources for Food and Agriculture has overseen the preparation by FAO of two global assessments on biodiversity for food and agriculture106. Based on these assessments, the Commission developed policies, action plans, codes of conduct and the International Treaty on Plant Genetic Resources for Food and Agriculture, all of which confirm the relevance and credibility of the scientific analysis and information for the development of effective policies for the conservation and sustainable use of biodiversity for food and agriculture at various levels. Currently the Commission's Multi-year Programme of Work is overseeing global assessments of the state of the world's plant, animal, forest and aquatic genetic resources which shall ultimately lead to the first integrated global assessment of The State of the World's Biodiversity for Food and Agriculture.

5. FAO biodiversity-related initiatives are carried out in partnership with a wide variety of institutions (e.g. CGIAR), Governments, biodiversity-related conventions, as well as other MEA processes. There is great and increasing cooperation and joint activities between FAO and the CBD, especially through the Programmes of Work on Agricultural Biodiversity and Forest Biodiversity. FAO is in a unique position to address the issue of biodiversity loss given its ability to make the link between biodiversity (genetic resources and their use in agriculture, fisheries and forestry) and trade facilitation. In addition, FAO has under its responsibility many biodiversity-related legally binding and non-binding instruments and initiatives, such as the International Plant Protection Convention (IPPC), the Forest Resources Assessment (FRA) and the Code of Conduct on Responsible Fisheries. The importance of FAO's work on biodiversity and ecosystem services is finally reflected in its outstanding knowledge-management on biodiversity and related issues through a variety of widely used tools such as its Webpage on "Biological Diversity in Food and Agriculture" and the Web-based "FAO Knowledge Forum" as well as its flagship regular assessments including the State of the World of Food and Agriculture (SOFA) and the Global Forest Resources Assessment.

UNESCO – MAB Programme

6. The Man and the Biosphere (MAB) Programme was launched in the early 1970s with the aim of promoting interdisciplinary research and building capacity so as to improve the relationship of people with their environment globally. The MAB Programme, which actively promotes collaboration and cooperation between scientists, particularly at the regional level, grew from a knowledge and research project network into one that

[106] *The State of the World's Plant Genetic Resources for Food and Agriculture* (1996) and *The State of the World's Animal Genetic Resources for Food and Agriculture* (2007)

also encompasses field sites used for interdisciplinary research, observation and assessment. Meanwhile much of the focus of MAB activity remains with MAB National Committees and MAB Regional Networks.

7. The biosphere reserve concept was devised in 1974 and further revised in 1995 with the creation of the World Network of Biosphere Reserves (WNBR). The WNBR provides opportunities to combine scientific knowledge and governance modalities to: (i) reduce biodiversity loss, (ii) improve livelihoods, and (iii) enhance social, economic and cultural conditions for environmental sustainability. The MAB Programme promotes sustainable development through the establishment of interdisciplinary learning laboratories using sites of the World Network of Biosphere Reserves for research on biodiversity and sustainability; improvement of ecological, biodiversity and biological resources management knowledge, and enhancement of capacities for socio-ecological research including eco-hydrology, to attain the MDGs and other internationally agreed development goals.

8. MAB's current strategy is centred on fostering policies, technical capacity-building, research, networking, education and international cooperation in the fields of water, ecological and earth sciences for enhancing societal responses. WNBR serves as its vehicles for knowledge-sharing, research and monitoring, education and training, and participatory decision-making. The MAB Programme, including the WNBR, relies on related action plans for its implementation. The governing body of the MAB Programme adopted the latest plan – the Madrid Action Plan (MAP) – in Madrid in February 2008. The MAP is organized around three main areas: climate change; provision of ecosystem services; and globalization as main driver of change.

9. Much of the work of the MAB programme is focused on research that is of relevance for management, and on the sharing of that knowledge and experience.

United Nations Development Programme (UNDP) – Biodiversity Programme

10. The UNDP has made Biodiversity for Development a prime focus of its Energy and Environment Practice. Through capacity development, knowledge management, policy advice and advocacy, UNDP helps more than 140 countries maintain and sustainably use biodiversity and ecosystem services. Closely integrated activities, including its Biodiversity Global Programme, the Equator Initiative, the Global Environment Facility (GEF), and the GEF Small Grants Programme, which enable UNDP to leverage change at the local, national, regional and global levels. The UNDP works to ensure that biodiversity considerations are integrated in processes designed to achieve the MDGs. At the same time, UNDP works to help the CBD, multilateral and bilateral organizations, NGOs, other civil society organizations, and the private sector incorporate the MDGs in their efforts.

11. UNDP's Biodiversity Global Programme assists developing countries and communities to influence national and global policies, benefit from knowledge on biodiversity, and advance their sustainable development and poverty reduction goals. Through this programme, the UNDP works to help integrate biodiversity, ecosystem services, protected areas and other CBD commitments into national policies and programmes, including in such key sectors as agriculture, forestry, fisheries and energy. These efforts address social, economic and policy frameworks such as the MDGs, *Human Development Reports*, Poverty Reduction Strategy Papers, and National Sustainable Development Strategies. Specific activities include: empowering local communities and indigenous peoples to protect their traditional knowledge and ensure equitable access and sharing of benefits from biodiversity; and achieving synergies with other multilateral environmental agreements related to biodiversity and ecosystem services. The Programme works through strategic partnerships to provide cutting-edge knowledge on policies that work for people and biodiversity.

12. UNDP's Drylands Development Centre works with people to fight poverty in the dry areas of the world through the practice of sustainable land management. It focuses attention on the unique and valuable biodiversity in dryland ecosystems worldwide and promotes the sustainable use of this biodiversity through: policy action and advocacy, programming for biodiversity-friendly development at the country level, and knowledge sharing and outreach.

13. The Equator Initiative is a partnership that promotes greater recognition of the critical role of local communities in reducing poverty and conserving biodiversity. Launched in January 2002, the work undertaken by Equator Initiative partners champions and supports sustainable communities in the Earth's equatorial region. The Equator Initiative is a partnership of UNDP with BrasilConnects, Conservation International, the government of Canada, the government of Germany, the International Development Research Centre, IUCN – The World Conservation Union, The Nature Conservancy, Television Trust for the Environment, and the United Nations Foundation.

14. Since 1991, the UNDP, UNEP and the World Bank have worked with the Global Environment Facility (GEF) to help developing countries fund projects and programmes that protect the global environment. GEF funding is particularly instrumental in mainstreaming biodiversity into other sectors**.** UNDP is working in 66 countries worldwide to ensure that the contribution of biodiversity and ecosystem services to food security, health, livelihoods and reduced vulnerability to natural disasters is factored into national planning for the achievement of development goals, including safeguards to protect these resources.

15. UNDP's Regional Bureaus and Country Offices undertake biodiversity projects that complement the programmes described above and respond to region and country-specific needs. UNDP has Country Offices in 166 countries in five global regions (Africa, Arab States, Asia & the Pacific, Europe and the Commonwealth of Independent States, and Latin America & the Caribbean). These offices usually lead work on the Common Country Assessments and preparation of UN Development Assistance Frameworks.

16. UNDP gets scientific advice and support through its wide biodiversity-related partnership initiatives.

United Nations Environmental Programme (UNEP)

17. The United Nations Environmental Programme (UNEP) is an intergovernmental organisation established by the Stockholm Conference on Human Environment (1972). The Programme has its headquarters in Nairobi (Kenya) with a number of Divisions, regional programmes and collaborating centres, each with specialised expertise and located in different regions of the world. UNEP has contributed to global environmental governance by mobilizing scientific and technical knowledge to support international environmental agenda setting, often culminated in new policy instruments for sustainable development.

18. UNEP played an important role in the establishment of, and acts as a convener for, many scientific advisory groups including the Scientific and Technical Advisory Panel (STAP) of the Global Environment Facility (GEF), the Joint Group of Experts on the Scientific Aspects of Marine Environment Protection (GESAMP), and the Intergovernmental Panel on Climate Change (IPCC), and is currently directly involved in preparation of the Assessment of Assessments and proposals for a Regular Process for Global Reporting and Assessment of the State of the Marine Environment.

19. UNEP also collaborates with a wide range of partners both inside and outside the UN system to provide information on natural resources and their contribution to sustainable development. UNEP participates actively in several global environmental assessments, including the Global International Waters Assessment, the Global Environment Monitoring System Freshwater Quality Programme and the Millennium Ecosystem Assessment, the International Assessment of Agricultural Science and Technology for Development, and The Economics of Ecosystems and Biodiversity. UNEP is also directly involved in the MA follow up.

20. UNEP also carries out global assessments and publishes authoritative reports on human-induced environmental changes, the flag-ship of which is the Global Environment Outlook (GEO). Global Environment Outlook (GEO) is a consultative, participatory, capacity building process for global environmental assessment and reporting on the state of the environment, trends and future outlooks. In its objective to facilitate the interaction between science and policy, GEO is both a process involving stakeholders from across the globe, as well as a product for environmental decision-making. This participatory and consultative process gives GEO assessments scientific credibility, policy relevance and authority.

21. In 2005, the UNEP Governing Council initiated a process to strengthen the scientific base of UNEP through the Science Initiative. The mandate of this initiative is to provide the world community with improved access to meaningful environmental data and information, and to help increase the capacity of governments to use environmental information for decision making and action planning for sustainable human development.

22. The UNEP World Conservation Monitoring Centre is specifically focused on ensuring the availability of information for policy setting and decision making with respect to biodiversity. UNEP-WCMC has been supporting international agreements for nearly 30 years, delivering services that range from managing the CITES Trade Database to managing the 2010 Biodiversity Indicators Partnership.

Scientific and Technical Advisory Panel (STAP) of the Global Environmental Facility

23. The Scientific and Technical Advisory Panel (STAP) provides strategic scientific and technical advice to the Global Environment Facility (GEF) on its strategy and programmes. The Panel has six members who are internationally recognized experts advisers in the GEF's key areas of work (biodiversity, sustainable land management, international waters, climate change, persistent organic pollutants, and sustainable forest management for the period 2007-2009) who are appointed by the Executive Director of UNEP in consultation with the UNDP, the World Bank and the GEF Secretariat. The Panel members are together responsible for

connecting the GEF to the most up to date, authoritative, and globally representative science, supported by a Secretariat based in UNEP's Regional Office for North America in Washington, D.C., and at UNEP's Headquarters in Nairobi.

24. The Panel Members works with a community of experts which represents a network of expertise that the members of the Science Panel draws upon to advise the GEF. The Panel Members work within an active network of scientists supporting all focal areas and their interlinkages. The scientists in the network assist the Panel Members to cover the full range of expertise required to provide policy advice on science and technology to the GEF.

25. STAP's mandate, adopted by the GEF Council in June 2007 include to (i) provide objective, strategic scientific and technical advice on GEF policies, operational strategies, programs and on projects and programmatic approaches; (ii) maintain a database of institutions, networks and individual scientists to provide the necessary expertise and advice for the GEF; (iii) interacts in a complementary manner with other relevant scientific and technical bodies, particularly with the subsidiary bodies of the CBD, the UNFCCC, the UNCCD and the Stockholm Convention on Persistent Organic Pollutants. The STAP also provides expert scientific advice to inter-agency task forces and bodies handling other GEF processes on request.

26. STAP's objectives include: (i) To identify and provide strategic advice on scientific and technical priorities, the scientific and technical coherence of GEF operational programs and strategies, and on emerging issues and gaps relevant to the implementation of operational programs; (ii) To provide scientific and technical advice aimed at strengthening the scientific and technical quality and underpinnings of GEF projects; (iii) To enhance and improve the collaboration with other scientific and technical bodies, communities and private sector in areas of relevance to the GEF priorities; (iv) To advise on capacity building efforts in science and technology relevant for development and implementation of GEF projects; (v) To advise on targeted research relevant to GEF strategic priorities; and (vi) To advise on monitoring and evaluation indicators for focal areas and cross-cutting issues.

Group of Experts on Scientific Aspects of Marine Environmental Protection (GESAMP)

27. The Group of Experts on Scientific Aspects of Marine Environmental Protection (GESAMP) is a body established in 1969 to advise the UN system on the scientific aspects of marine environmental protection. Currently the Group is jointly sponsored by eight UN organizations with responsibilities relating to the marine environment as a mechanism for coordination and collaboration among them. These are: IMO, FAO, UNESCO-IOC, WMO, IAEA, UN, UNEP and UNIDO.

28. GESAMP's mission is to provide authoritative, independent, interdisciplinary scientific advice to organizations and member Governments to support the protection and sustainable use of the marine environment. It's primary mandate is to: (i) integrate and synthesize the results of regional and thematic assessments and scientific studies to support global assessments of the marine environment; (ii) provide scientific and technical guidance on the design and execution of marine environmental assessments; (iii) provide scientific reviews, analyses, and advice on specific topics relevant to the condition of the marine environment, its investigation, protection, and/or management.

29. The Group is also mandated to provide regular overviews of the marine environmental monitoring, assessment and related activities of UN agencies, and advise on how these activities might be improved and better integrated and coordinated, and to identify new and emerging issues regarding the degradation of the marine environment that are of relevance to Governments and Sponsoring Organizations.

30. GESAMP is managed through an Executive Committee consisting of a representative of each Sponsoring Organization (i.e. Technical Secretary) and the Chairperson and Vice-Chairperson of GESAMP. A lead organization, currently IMO, hosts an Administrative Secretariat which is responsible for general administration on behalf of all the Sponsoring Organizations. The functions of the Executive Committee include planning and approving the work plan, selecting members of GESAMP from a pool of experts, and adopting terms of reference for its working groups.

31. Following an independent, in-depth review of GESAMP in 2001, the Group underwent an extensive revitalization process which is still underway. Key actions include: (i) increasing the number of experts from developing countries participating in GESAMP activities; (ii) extending and consolidating GESAMP's networks at the regional and global level; and (iii) supporting GESAMP's participation the UNGA Regular Process.

Intergovernmental Panel on Climate Change (IPCC)

32. The Intergovernmental Panel on Climate Change is the leading body for the assessment of climate change, established by the United Nations Environment Programme (UNEP) and the World Meteorological Organization (WMO). The initial task for the IPCC as outlined in the UN General Assembly Resolution 43/53 of 6 December 1988 was to prepare a comprehensive review and recommendations with respect to the state of knowledge of the science of climate change; social and economic impact of climate change, possible response strategies and elements for inclusion in a possible future international convention on climate.

33. IPCC's work involves both peer review by experts, and review by governments. Thus the review process generally takes place in three stages and results in a full synthesis report with summary for policymakers. Along with the Assessment Reports, the IPCC has produced several Special Reports on various topics of growing interest, and many other papers and contributions to the advancements of the climate change science. It also prepared methodologies and guidelines to be used by Parties under the UNFCCC for preparing their national greenhouse gas inventories.

34. IPCC Working Group I assesses the physical scientific aspects of the climate system and climate change; Working Group II assesses the vulnerability of socio-economic and natural systems to climate change, negative and positive consequences of climate change, and options for adapting to it; and Working Group III assesses options for mitigating climate change through limiting or preventing greenhouse gas emissions and enhancing activities that remove them from the atmosphere. IPCC also established the Task Force on National Greenhouse Gas Inventories (TFI) was established by the to oversee the IPCC National Greenhouse Gas Inventories Programme (IPCC-NGGIP), and the Task Group on Data and Scenario Support for Impacts and Climate Analysis (TGICA) was established to facilitate co-operation between the climate modelling and climate impacts assessment communities.

35. The IPCC is essentially a scientific body. It reviews and assesses the most recent scientific, technical and socio-economic information published worldwide relevant to the understanding of climate change, and thousands of scientists from all over the world contribute to its work. Review is an essential part of the IPCC process, to ensure an objective and complete assessment of current information. The participation of the scientific community in the work of the IPCC has been growing greatly, both in terms of authors and contributors involved in the writing and the reviewing of the reports and of geographic distribution and topics covered by the reports.

36. However, particularly important is the endorsement of certain IPCC reports by governments, who thereby acknowledge the authority of their scientific content. This means that their contents can be communicated to other intergovernmental bodies as already agreed. The scientific evidence brought up by the first IPCC Assessment Report in 1990 unveiled the importance of climate change as a topic deserving a political platform among countries to tackle its consequences. It therefore played a significant role in leading to the creation of the United Nations Framework Convention on Climate Change.

37. The IPCC is an intergovernmental body open to all member countries of UN and WMO. Governments are involved in the IPCC work as they can participate in the review process and in the IPCC plenary sessions, where main decisions about the IPCC work programme are taken and reports are accepted, adopted and approved. It is funded by regular contributions from its parent organizations WMO and UNEP, the UNFCCC and voluntary contributions by its member countries. WMO also hosts the IPCC Secretariat and WMO and UNEP provide one staff member each for the IPCC Secretariat.

International Council for the Exploration of the Sea (ICES)

38. The International Council for the Exploration of the Sea (ICES) was found in 1902 with a mission to facilitate scientific understanding of natural resources in the North Atlantic. Its founding instruments were renewed in 1964, and re-endorsed in 2002 at 100th anniversary of its establishment. By 2006 the ICES convention was adhered to by all 20 States on the North Atlantic coast.

39. The ICES Convention strongly commits all Parties to supply necessary data and scientists to conduct the work to achieve the objectives of the convention which include (i) to promote and encourage research and investigations for the study of the sea particularly those related to the living resources, and (ii) to publish or otherwise disseminate the results of research and investigations carried out under its auspices or to encourage its publication.

40. The ICES Advisory Programme is shaped to advise on the sustainable use of living marine resources and protection of the marine environment. Based on national data and scientific expertise from all ICES countries, and scrutinized by internal and external peer review and stakeholder involvement, the ICES advice guarantees

the highest possible level of excellence, independence and objectivity. This scientific advice is provided to processes ranging from implementation of the OSPAR Convention to agreement on EC fisheries policy.

41. As an intergovernmental body, ICES network relies almost exclusively on the availability of member states to supply it data and scientific capacity. Its annual work programme is approved at the Annual Statutory Meetings of the ICES Council. Two high representatives (Delegates) of each member state contribute to the decisions and take the responsibility that their national institutes will carry out the work which was defined by Council.

42. The ICES Science Programme is committed to (i) understanding how marine ecosystems function, (ii) understanding and quantifying human impacts on marine ecosystems, and (ii) evaluating options for sustainable marine-related industries, especially fishing and mariculture. ICES coordinates science and provides advice on a wide range of issues of a short- to medium-term nature through over a hundred Expert Groups. This requires undertaking diverse activities – from coordinating research to enhancing understanding of population and ecosystem processes, through monitoring programmes, assessments, and their methodologies; to strategies, decision support tools, and implementation.

43. Structurally ICES is organized into a "science area" (overseen by a Science Committee), an "advisory area" under Advisory Committees (including the Advisory Committee for Fishery Management, the Advisory Committee of Ecosystems and Advisory Committee of Marine Environment), and a professional secretariat which serves the Council and the ICES Scientific Network. The network consists of approximately 1600 marine scientists in 200 Institutions in Member States and Affiliate Countries organized in over 100 Expert Groups, 8 Science Committees, and three Advisory Committees.

Global Biodiversity Information Facility (GBIF)

44. The Global Biodiversity Information Facility (GBIF) is an international organisation that is working to make the world's biodiversity data accessible anywhere in the world. Its members include countries and international organisations who have signed a Memorandum of Understanding that they will share biodiversity data and contribute to the development of increasingly effective mechanisms for making those data available via the Internet.

45. GBIF is unique in that it is not a physical infrastructure, but a distributed and digital one that builds on the collective efforts and contributions of thousands of scientists in hundreds of institutes in many countries around the world, providing the tools and guidance that help them make that data available, and the online tools to help others use it.

46. GBIF facilitates the work of a number of different governmental and non-governmental organizations, universities and scientists around the world, organizes a number of symposia and workshops, and sponsors an annual science symposium with a different focus every year. The 2009 science symposium will look at biodiversity and climate change and the role that datasets can play in understanding the effects of climate change on biodiversity and identifying mitigation options.

47. The intention of the strategic plan is that during the current five year period (2008-11), GBIF will become much more useful to its users by greatly improving the GBIF Data Portal system and the underlying web services, focusing in a major way on Participant Nodes and user communities, and emphasizing the improvement and description of data quality. In extending its work with user communities GBIF is increasing its collaboration with a wide range of organizations in order to explore the value of the data available, and to seek to combine it with other data meaningfully.

I. Examples of coordination mechanisms and their components relevant to the science-policy interface

Biodiversity Liaison Group

1. The Biodiversity Liaison Group (BLG) was established following decision VII/26 of the Convention on Biological Diversity (CBD), which called for the establishment of a liaison group to enhance coherence and cooperation in the implementation of the biodiversity-related conventions. The group initially consisted of the heads of the secretariats of the CBD, Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), Convention on Migratory Species (CMS), Ramsar Convention on Wetlands and World Heritage Convention. In 2006, the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA) joined the group.

2. Following an informal first meeting in June 2004,[107] the second meeting of the BLG was held in October 2004. The BLG decided to limit the number of issues it would deal with, in order to ensure focus and progress in implementation. Two priority issues were agreed: the 2010 biodiversity target, and the proposed Global Partnership on Biodiversity. The focus would be on individual contributions to both issues, and what could be strategically done together towards achieving the 2010 target, monitoring and measuring progress in its implementation and reporting.

3. At the third meeting in May 2005, the BLG agreed that the 2010 biodiversity target "*can provide a unifying focus for cooperation among all relevant Conventions and organizations*". It was further recognised that "*the Framework of goals and targets to evaluate progress towards the 2010 target (adopted by CBD Decision VII/30) can be applied* mutatis mutandis *to all five conventions*". The group agreed that "*it would be useful for each Convention, as appropriate, to adopt indicators that are consistent with the Framework of goals and targets adopted by the CBD. This would help to promote coherence among the conventions in policy and implementation and would, for example, foster greater efficiency in reporting*". It was also agreed to prepare a joint paper on options for enhanced cooperation among the five biodiversity-related conventions, which would be made available to upcoming meetings of the participating MEAs.

4. The fourth meeting of the BLG, which took place in October 2005, discussed a comparison of the mode of work of the scientific bodies of the five conventions undertaken by CITES. It was agreed that such a review could help to identify possible ways to strengthen communication among the scientific bodies of the conventions. In this regard, the BLG also considered that an informal meeting of the Chairs of their respective scientific bodies would be of great benefit, noting that "*of particular interest will be to compare how the scientific bodies define their role and how they find the right balance between science and politics*". In addition, the value of harmonizing taxonomic standards and usage of scientific names among the conventions was identified.[108]

5. At its fifth meeting in September 2006, the 2010 biodiversity target was further discussed, in addition to the Addis Ababa Principles and Guidelines on Sustainable Use of Biodiversity as adopted by the CBD. The meeting welcomed the decision by the GEF Council to approve the 2010 Biodiversity Indicators Partnership (2010 BIP), recognising that the project would deliver information relevant to all conventions by disaggregating data according to the components of biodiversity on which the conventions focus. The meeting discussed specific expectations from each partner vis-à-vis the 2010 BIP, and their contributions to the process, and it was agreed that BLG members should inform the project about their needs. It was also agreed to include the 2010 BIP as a standing item on the agenda of future BLG meetings, and to invite UNEP-WCMC to report on progress. In addition, the meeting agreed to organise a meeting of chairs of the scientific and technical bodies or advisory bodies of the biodiversity-related conventions together with representatives of the secretariats and UNEP.

6. Following on from the meeting of the Chairs of the Scientific Advisory Bodies of Biodiversity-related Conventions (see below), the BLG, at its sixth meeting in May 2008, addressed, among others, the harmonization of nomenclature and taxonomy. CITES and CMS were reported to be working towards harmonizing their nomenclature and taxonomy, work which would be finalised in 2009. The meeting also discussed the forthcoming third edition of the *Global Biodiversity Outlook*, to be published by the CBD in 2010.

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[107] The BLG meeting reports can be found at www.cbd.int/cooperation/related-conventions/blg.shtml

[108] The comparison of the mode of work of the scientific bodies of the five conventions eventually appeared in the annex to document SC54 Doc. 13.1 of the CITES Standing Committee (October 2006) and was used to inform the first meeting of the Chairs of the Scientific Advisory Bodies of Biodiversity-related Conventions in July 2007 (UNEP/CBD/CSAB1/3).

It was stated that BLG input was desirable to develop a feeling of 'ownership' of the process and products. By contributing to the work on indicators, for example by disaggregating species-related information to allow specific statements about migratory species or endangered species in trade, BLG members were already part of the process. The meeting also discussed the 2010 BIP and decided that the individual MEAs should pursue establishing their specific indicators in full harmonization with the CBD framework on targets and indicators and the 2010 BIP and should also engage in the process of designing a post-2010 target[109].

7. In summary, while the primary focus of the Biodiversity Liaison Group is not science, it has addressed a small number of items related to the use of science by the biodiversity-related conventions, such as the 2010 biodiversity target and the related 2010 biodiversity indicators, and the use of standardised species nomenclature and taxonomy. It has discussed possible ways for all participating MEAs to contribute to related activities, for example the publication of the *Global Biodiversity Outlook*. It has therefore provided some of the impetus for ensuring a more coordinated approach to issues where there are strong scientific interests.

Meetings of the Chairs of the Scientific Advisory Bodies of Biodiversity-related Conventions

8. The first meeting of the Chairs of the Scientific Advisory Bodies of Biodiversity-related Conventions took place in July 2007. In addition to representatives of CBD, CITES, CMS, Ramsar Convention and World Heritage Convention, the meeting was attended by representatives of the Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention), IUCN, UNFCCC, UNEP, the GEF Scientific and Technical Advisory Panel, and WWF International.

9. The participants agreed[110] that the meeting had provided a useful forum for initiating discussion on areas of cooperation and collaboration on the scientific issues of the various convention processes and their translation into policy, and expressed the hope that the discussions might foster similar approaches and considerations at the national level. While they recognised that the conventions' scientific advisory bodies have different mandates with regard to the issues on which they provide advice to their governing bodies, ranging from strict response to requests by their governing bodies to flexible ways of response both in terms of timing of delivery and identification of emerging issues, participants agreed that it may be possible to benefit from the guidance provided by other conventions' bodies on emerging issues.

10. The meeting also agreed on practical cooperation on the issues of climate change and biodiversity and on the 2010 biodiversity target, including work on a framework beyond 2010. In addition, the group concluded the following[111]:

(a) There is abundant data and information on biodiversity but these data are often not available to the Conventions' scientific advisory bodies. If a need for [IPBES] *is confirmed it should be ensured that its work focuses not on collecting additional data but on bringing together various sources of scientific information, including traditional ecological knowledge, in a coherent and comparable form.*

(b) There are many examples where guidance and guidelines developed by one convention have been endorsed – fully on in part – by other conventions, or where guidance have been jointly developed. It will be useful to fully examine all relevant guidance, including from IUCN, and their respective relevance and adaptability to the work of other conventions... The meeting may wish to consider gaps in the development or application of tools and guidance and deliberate on options for addressing these gaps in a coherent way.

11. The second meeting of the Chairs of the Scientific Advisory Bodies of Biodiversity-related Conventions was held in May 2008, and was also attended by the International Treaty on Plant Genetic Resources for Food and Agriculture and UNCCD. The meeting considered processes and approaches of the Conventions' scientific bodies on providing scientific advice[112], in particular in the following areas.

a) The meeting welcomed the progress made on merging the follow-up process to the Millennium Ecosystem Assessment with discussion on the potential establishment of an international platform to provide scientific advice on biodiversity to multilateral environmental agreements, based on the IMoSEB consultative process.

b) The Ramsar Convention reported on progress in mapping the gaps and complementarities in guidance developed by the conventions (as agreed by the first meeting). Progress had been slower than

[109] See www.cbd.int/cooperation/BLG-6-rep-final-en.doc.
[110] See www.cbd.int/doc/meetings/csab/csab-01/official/csab-01-03-en.doc.
[111] See www.cbd.int/doc/meetings/csab/csab-01/official/csab-01-03-en.doc.
[112] See www.cbd.int/doc/meetings/csab/csab-02/official/csab-02-03-en.doc.

anticipated, because of the multitude of different guidance systems developed for different target groups. An ecosystem-based mapping approach was recommended, which would list the guidance relevant to each ecosystem. The aim of the mapping exercise was to develop a 'Guide to the Guidance', which would help the different national focal points of the Conventions identify relevant guidance across the MEAs.

c) While pointing to a draft resolution for its Standing Committee on priority issues and tasks for the Ramsar Convention during the next triennium, including new and emerging issues, Ramsar flagged the opportunity for joint projects or joint programmes of work. In this context, CITES presented its Work Programme for the CITES Committees from 2007 to 2010, with the aim of identifying possible common areas of interest. It was agreed that sharing of plans and programmes could be used as a basis for identifying opportunities for more coordinated and harmonized approaches to particular issues.

12. In summary, the two meetings of the Chairs of the Scientific Advisory Bodies of Biodiversity-related Conventions can be seen as complementary to those of the Biodiversity Liaison Group, from which they have been mandated, although they are attended by more institutions than the BLG. They have identified a small number of issues where the biodiversity-related conventions could cooperate in improving the scientific advice to their bodies and to Parties, including mapping the guidance developed by the individual conventions and coordination in the requests for scientific advice on various topics. The third meeting is expected to take place immediately before the IPBES Meeting in Nairobi in October 2009.

Joint Liaison Group of the Rio Conventions

13. The Joint Liaison Group (JLG) of the CBD, UNFCCC and UNCCD was established in 2001 as an informal forum for exchanging information, exploring opportunities for synergistic activities and increasing coordination. The JLG comprises the officers of the conventions' scientific subsidiary bodies, the Executive Secretaries, and members of the secretariats[113]. The JLG has met nine times, but as reports of the first three meetings and the sixth meeting are not available online, this brief review focuses on the fifth, seventh and eight meetings of the JLG [114].

14. At the fifth meeting in January 2004, the JLG discussed cooperation on a range of issues, including adaptation, capacity-building and technology transfer; joint activities on information, education and awareness, and research and systematic observation. It was agreed to hold a joint workshop forests and forest ecosystems and to develop a paper on options for enhanced collaboration[115].

15. The paper on options for enhanced collaboration[116], which was made available to the governing bodies of all three conventions, lists examples of collaboration between the conventions, including the following relevant to the coordination of scientific advice: two workshops to examine synergy among the Rio Conventions, organized by the UNFCCC in collaboration with CBD and UNCCD; the joint programme of work on the biodiversity of dry and sub-humid lands between CBD and UNCCD; and the joint workshop on promoting synergy among the Rio Conventions through forests and forest ecosystems organized by UNCCD in collaboration with CBD and UNFCCC. Among the options for enhanced cooperation identified by the paper, the following are particularly relevant for collaboration on and coordination of scientific advice: collaboration among the scientific advisory bodies to the conventions; and cooperation in the development of advice, methodologies and tools. Cooperation in research and monitoring/systematic observation, for example on the global earth observation system of systems (GEOSS) is mentioned specifically.

16. The seventh meeting of the JLG, held in June 2007, noted that the document on options for enhanced cooperation had been welcomed by Parties to all three conventions. The meeting identified some areas for future collaboration, including reducing deforestation, and adaptation to climate change. It was agreed to draft an information note on the links between forests, climate change, desertification and biodiversity; as well as an information note on adaptation activities, plans and programmes adopted within the framework of each convention; and to further analyze a list of activities at the level of the secretariats. The latter list includes the facilitation of joint meetings between the chairs of the scientific bodies of the conventions[117].

17. The eight meeting of the JLG was held in September 2007. The meeting considered progress in the drafting of joint information notes on forests and on adaptation. As to the list of activities at the level of

[113] One of the meetings was also attended by the Ramsar Convention Secretariat.
[114] See www.cbd.int/cooperation/liaison.shtml and unfccc.int/cooperation_and_support/cooperation_with_international_organizations/items/3464.php.
[115] See unfccc.int/files/meetings/workshops/other_meetings/application/pdf/reportjlg5.pdf.
[116] See www.cbd.int/doc/meetings/sbstta/sbstta-10/information/sbstta-10-inf-09-en.pdf.
[117] See www.cbd.int/doc/reports/jlg-07-report-en.pdf.

secretariats, the meeting agreed to categorize these activities in terms of activities that are already on-going, activities that the secretariats could start implementing in the short term, and activities that need further consideration[118].

18. The work of the JLG has been welcomed by the COPs of the participating conventions. For example, the COP of the UNFCCC, in decision 13/CP.8, supported the mandate of the JLG and requested SBSTA to continue and enhance cooperation with the scientific subsidiary bodies of both CBD and UNCCD.

19. CBD COP decision IX/16 provides an example of the way the Conventions have taken up outputs of the JLG. The decision notes with appreciation various outputs of the JLG, including the lists of activities at the level of secretariats, and requested the Executive Secretary to implement relevant activities and to continue discussions within the JLG on other activities. In the same decision, the COP requested "*the Executive Secretary, as far as possible in collaboration with the secretariats of the other two Rio conventions, to compile and synthesize information on interactions between acidification, climate change and multiple nutrient-loading as possible threats to biodiversity during the in-depth reviews of the programmes of work on inland water and marine and coastal biodiversity*."

20. Another example of collaboration is the work of the AHTEG on biodiversity and climate change, which the CBD has convened with the purpose of of providing biodiversity-relevant information to 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[119].

21. In summary, while the focus of the Joint Liaison Group of the Rio Conventions is not science and scientific advice, it has addressed a wide range of issues of relevance to the three conventions, including several relating to the coordination of scientific advice, such as collaboration among the scientific advisory bodies to the conventions, and cooperation in the development of advice, methodologies and tools. A number of joint documents have been drafted and have been taken up by convention bodies, and joint workshops have been organized. Issues for future collaboration have been identified and will be further considered by the relevant bodies of the three conventions and the Joint Liaison Group.

Collaborative Partnership on Forests (CPF)

22. The UN Economic and Social Council (ECOSOC) in its Resolution 2000/35 invited the heads of relevant UN, international and regional bodies to form a collaborative partnership on forest which has then been established as a voluntary arrangement in April 2001 and is chaired by FAO and serviced by the UNFF Secretariat. The CPF currently includes 14 international organizations and secretariats with substantial programmes on forests (CIFOR, FAO, ITTO, IUFRO, CBD, GEF, UNCCD, UNFF, UNFCCC, UNDP, UNEP, ICRAF, WB, IUCN) and aims at promoting the management, conservation and sustainable development of all types of forest and strengthen long term political commitment to this end.

23. CPF members share their experiences and build on them to produce new benefits for their respective constituencies. Increasingly CPF members work together in projects and mobilize resources supporting countries to achieve their forest related goals and supporting implementation of sustainable forest management. Joint initiatives and other collaboration activities are supported by voluntary contribution of the participating members.

24. Among the joint CPF initiatives, there is the "Global Forest Expert Panels" initiative to provide objective and independent scientific assessments of key issues in order to support more informed decision-making at the global level. The initiative is led and coordinated by the International Union of Forest Research Organizations (IUFRO) and the assessments are carried out by thematic Global Forest Expert Panels uniting leading scientists from around the world. The first Global Forest Expert Panel - the "Expert Panel on Adaptation of Forests to Climate Change" - was established up in October 2007 to assess the state of knowledge regarding the impacts of climate change on forests, their implications for human wellbeing, and options for adaptation, as follow up to consultations with policy makers identified adaptation of forests to climate change as an issue of high concern. Other joint initiatives include the Global Forest Information Services (GFIS.net) and the Task Force on Streamlining Forest-related Reporting.

25. The CPF provides major inputs to UNFF and other important international forest dialogues, including the conventions on climate change (UNFCCC), biodiversity (CBD) and desertification (UNCCD). It produces joint statements and papers on key forest issues on the international agenda.

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[118] See www.cbd.int/doc/reports/jlg-08-report-en.pdf.

[119] UNEP/CBD/AHTEG/BD-CC-2/2/5 and UNEP/CBD/AHTEG/BD-CC-2/2/6

26. The CPF usually convenes to discuss strategic areas of coordination between CPF members and to work towards a better coherence vis-à-vis to counties, in conjunction with major events; to keep travel costs low and make efficient use of staff time. The Collaborative Partnership on Forests Framework, produced annually, represents the Partnership's work plan and its progress report.

27. In summary, the Collaborative Partnership on Forest (CPF) is a voluntary arrangement including 14 international organizations and secretariats with substantial programmes on forests, with the aim of promoting the management, conservation and sustainable development of all types of forest and strengthen long term political commitment to this end. Moves towards increased cooperation have been practical in nature, focusing on aligning the work of the member agencies and programmes.

Environmental Management Group (EMG)

28. Chaired by the Executive Director of UNEP and supported by a Secretariat provide by UNEP. the Environmental Management Group (EMG) is a United Nations (UN) System-wide coordination body whose membership consists of UN specialized agencies, programmes, economic commissions, funds and other UN bodies as well as UN/UNEP-administered and non-UN/UNEP-administered Secretariats of MEAs. The EMG has been establisged to further inter-agency cooperation in support of the implementation of the international environmental and human settlement agenda. It identifies issues on the agenda that warrant joint efforts, and finds ways of engaging its collective capacity in coherent management responses to those issues.

29. The Terms of Reference (ToRs) f the EMG were approved in 2000 by the Administrative Committee on Coordination (ACC), which has since been replaced by the Chief Executives Board on Coordination (CEB). It followed a process of consultation carried out through the ACC's Inter-Agency Committee on Sustainable Development (IACSD) and UNEP's Committee of Permanent Representatives in Nairobi. The TOR was presented in a report from the eighth special session of Governing Council of UNEP to the General Assembly (UNEP/GCSS.VII/8). Among its objectives spelled out in the ToRs, there are (i) "*to identify, address and resolve collectively specific problems, issues and tasks on the environmental and human settlements agenda requiring enhanced inter-agency cooperation in a given time-frame through securing effective and collaborative involvement of the relevant United Nations system agencies, programmes and organs and of other potential partners, as appropriate*"; and (ii) "*to provide a forum for an early discussion and sharing of information on emerging problems and issues in the field of environment and human settlements geared at finding collectively the most effective coordinated approach to the solution of new tasks*".

30. Members are engaged in information exchange and stocktaking within an issue management approach to its activities; among issues tackled in the past, there are: Atmosphere/Air Pollution and Industrial Development, Environment Related Capacity Building, Harmonization of Reporting for Bio-diversity related Conventions; while issues currently under consideration by EMG encompass cooperation towards a climate neutral UN and sustainable procurement, sustainable land use, as well as support to the implementation of the 2010 biodiversity target and beyond. EMG facilitates the development of tools, training material and collective approaches to management and programming where needed. Ultimately efforts are geared towards promoting synergy and complementarity between activities and coherence in assisting member states in their efforts to address environmental change.

31. Specific issues are addressed through the establishment of Issue Management Groups (IMGs) whose mandates and time-frame are decided by the EMG members. As required the IMGs are steered by a lead agency which prepares background documents, organizes and chairs the meetings, and elaborates the report on the results of the group's deliberations. The time-bound ad hoc IMGs cease to exist after completion of their tasks, and the EMG adopts the IMG's report upon completion of their tasks. Among currently IMG there are the one the "2010 biodiversity target and beyond" which has been formed to prepare and submit a UN system wide report that may help inform the formulation of future biodiversity targets by Governments. This report will include information provided by individual members on biodiversity aspects of their strategies, programmes, plans and initiatives relevant to the formulation of future biodiversity targets.

32. The EMG reports on its achievements and cooperation to the UNEP Governing Council and other intergovernmental bodies as needed. It also interacts with other Interagency Bodies especially the Chief Executives Board of Coordination (CEB) and its subsidiary bodies.

33. In summary, the Environment Management Group serves as a platform for bringing together all the diverse perspectives, expertise and strengths of the UN system in addressing specific issues in the field of environment and human settlements, thanks to its a broad membership including UN specialized agencies, programmes, economic commissions and organs of the United Nations and UN/UNEP-administered and non-UN/UNEP-administered Secretariats of MEAs. A number of Reports are available on the work conducted

by the EMG. However, the EMG is not focused on science and scientific advice, and addressed coordination across a wide range of issues.

UN Chief Executive Board (CEB)

34. The UN Chief Executives Board (CEB) furthers coordination and cooperation on a whole range of substantive and management issues facing United Nations system organizations. CEB brings together on a regular basis the executive heads of the organizations of the United Nations system, under the chairmanship of the Secretary General of the United Nations. In addition to its regular reviews of contemporary political issues and major concerns facing the UN system, on the basis of recommendations from bodies reporting to it, CEB approves policy statements on behalf of the UN system as a whole. CEB is the successor body to the Administrative Committee on Coordination (ACC). It furthers coordination and cooperation on a whole range of substantive and management issues facing UN system organizations.

35. CEB is supported by three High Level Committees, the division of responsibilities between the three bodies can be summarized as follows:

a) The High Level Committee on Programme (HLCP) promotes global policy coherence, including the development of common policy tools, including toolkits, in addition on its work on global policy and programme issues and global public goods.

b) The High Level Committee on Management (HLCM) is concerned with harmonization of business practices across the system, including general management issues, thus ensuring overall management coherence from global to country level.

c) The UN Development Group (UNDG) promotes coherent and effective oversight, provision of guidance and capacity building with country level partners, coordination of UN development operations at country level, addressing policy guidance issues related to country level operations, including the implementation of the TCPR resolutions, and support to the RC system.

36. In summary, while these committees are not primarily concerned with science and scientific advice, they are concerned with coherence of approach within the UN system on a very broad range of issues, and can therefore be influential in promoting increased coordination on issues that come to their attention.

J. Examples of other organizations involved in the science policy interface and referred to in the text

ASEAN Centre for Biodiversity (ACB)

37. The ASEAN Centre Biodiversity (ACB) is an intergovernmental regional centre that facilitates cooperation and coordination among ASEAN Member States, and with relevant national governments, regional and international organizations on the conservation and sustainable use of biological diversity in the ASEAN region. In 2005, ACB took over the mandate of the ASEAN Regional Centre for Biodiversity Conservation (ARCBC), which was a joint cooperation project of the ASEAN and European Commission.

38. To realise its vision, mission and mandate, the ASEAN Centre for Biodiversity (i) facilitates policy coordination and resolution of cross-country biodiversity conservation issues, (ii) serves as institutional information sharing framework, (iii) carries out proactive monitoring and assessing of biodiversity conservation status to identify critical issues and future trends, (iv) facilitates capacity-building services and technology transfer, including public awareness rising; and (v) undertakes resources mobilisation measures for biodiversity conservation in the region.

39. Joint research/initiatives and research under the thematic umbrella of Managing Biodiversity Information and Knowledge cover the broad topics on developing new biodiversity indicators and indices and linking these to a decision support system, regional analysis algorithms, cross analysis of biodiversity information with socio-economic parameters, establishing and strengthening transboundary biodiversity data centres and their reporting capabilities, harnessing traditional knowledge, and setting up communities of practice actively using knowledge management tools.

DIVERSITAS

40. DIVERSITAS is a collaborative research programme set up to promote and catalyse knowledge about biodiversity including its origins, composition, ecosystem functioning, ecosystem services, maintenance and conservation. The programme is a partnership of inter-governmental and non-governmental organizations which are involved in biodiversity conservation. Through its established network of biodiversity science, DIVERSITAS aims to help maximize the impact of initiatives undertaken around the world. By establishing national committees and collaborating with other organizations, DIVERSITAS enlarges and strengthens scientific networks. In turn, this makes it easier to identify global research priorities, allocate facilities, facilitate knowledge transfer and support capacity building.

41. DIVERSITAS consists of 4 Core Projects: bioGENESIS, which looks at Developing new strategies and tools for discovering and navigating biodiversity; bioDISCOVERY, which is concerned with assessing current levels of biodiversity, developing the scientific basis for monitoring and observing; understanding and predicting changes; ecoSERVICES which looks at expanding biodiversity and ecosystem functioning science to larger scales and over a greater breadth of the biological hierarchy, at linking changes in ecosystem structure and functioning to changes in ecosystem services, and at assessing human response to change in ecosystem services; and bioSUSTAINABILITY, which is concerned with developing new knowledge to guide policy and decision making that support sustainable use of biodiversity. In addition DIVERSITAS has four 'Cross-Cutting Networks' these are: ecoHEALTH, the Global Mountain Biodiversity Assessment, freshwaterBIODIVERSITY, agroBIODIVERSITY and Global Invasive Species programme.

42. The DIVERSITAS Science Plan highlights the need to synthesise existing scientific knowledge, identify gaps and emerging issues and promote new research initiatives while also examining the policy implications of biodiversity science. Ultimately, the goal is to provide government agencies and policy makers with the information required to make sound decisions on biodiversity issues.

European Environmental Agency (EEA)

43. The European Environment Agency (EEA) is an agency of the European Union. It was established in 1994 with the aim of ensuring that decision-makers and the general public are kept informed about the state and outlook of the environment in Europe. The EC Regulation No 401/2009 of the European Parliament and of the Council of 23 April 2009 details current tasks of the Agency. These include: collecting, processing, analysing environmental data to provide EC and its Member States with the objective information required for framing and implementing sound and effective environmental policies.

44. EEA work is structured under several programmes including: air and climate change; governance and networks; integrated environmental assessments; and natural systems and vulnerability. EEA has an independent Scientific Committee tasked to delivering opinion on the EEA work-programmes, and to provide advice on any scientific matter concerning the Agency's activity. EEA cooperates with the UN and its specialised agencies, and with other international activities such as the follow up to the MA, to incorporate European environmental information and experience into international environmental policies and processes.

45. The EEA both gathers and disseminates data and information through the European Environment Information and Observation Network (Eionet). Eionet is a collaborative network of the EEA and all member countries, connecting National Focal Points (NFPs) in the EU Member States and collaborating countries, European Topic Centres (ETCs), National Reference Centres (NRCs) and Commission’s experts.

GEO/GEOSS/GEO-BON

46. The Group on Earth Observations is a voluntary partnership of governments and international organizations set up in response to demand for action to improve access to and use of Earth observation data following the 2002 World Summit on Sustainable Development. GEO is co-ordinating efforts to build a Global Earth Observation System of Systems (GEOSS) on the basis of 10 year implementation plan agreed in 2005. GEOSS aims to provide a range of societal benefits based on use of Earth observation coupled with other data and information. These societal benefits are identified as:

a) reducing loss of life and property from natural and human-induced disasters;

b) understanding environmental factors affecting human health and well-being,

c) improving the management of energy resources,

d) understanding, assessing, predicting, mitigating, and adapting to climate variability and change,

e) improving water resource management through better understanding of the water cycle,

f) improving weather information, forecasting and warning,

g) improving the management and protection of terrestrial, coastal and marine ecosystems,

h) supporting sustainable agriculture and combating desertification, and

i) understanding, monitoring and conserving biodiversity.

47. The GEO Biodiversity Observation Network (GEO-BON) was set up by GEO, NASA and DIVERSITAS as part of GEOSS in 2007, to contribute to the collection, management, sharing, and analysis of data on the status and trends of the world’s biodiversity. GEO-BONs primary function is to facilitate data sharing between different actors, and the aim is that by bringing together the diverse, stand-alone observation instruments and systems now tracking trends in the world’s genetic resources, species and ecosystems, GEO BON will create a global platform for integrating biodiversity data with data on climate and other key variables. It will fill gaps in taxonomic and biological information and speed up the pace at which information is collected and disseminated.

48. As with GEOSS, the aim of GEO-BON is to ascertain the data requirements of user groups, review and prioritize research, facilitate interoperability among observation systems and databases, generate regularly updated assessments of global trends, design decision-support systems that integrate monitoring with modelling and forecasting, and make data and reports available to users.

Inter-American Biodiversity Information Network (IABIN)

49. IABIN is a forum for countries of the Americas to share, collect and use biodiversity information relevant to decision makers, focusing on conservation and natural resource management and education linked to natural resource management in the Americas region. The network is concerned with the creation and promotion of the necessary infrastructure to allow exchange of biodiversity information, including aspects such as training and capacity building, network development and the provision of tools and guidance.

50. IABIN has been endorsed by the heads of state of 34 countries in the Americas, and each of the countries has nominated a focal point. IABIN operates through a membership council called "IABIN Council." The Council is policy focused. It has the authority to make decisions and take action on behalf of IABIN. IABIN is currently substantially supported by the GEF working through the Organization of American States, although other organizations and governments have also contributed substantially. As well as the focus on building the

infrastructure, the network is developing through several thematic approaches covering: pollinators, invasive alien species, and protected areas.

51. The network is currently developing an online platform to collate biodiversity information from diverse sources such as universities, museums and government organizations into one place. IABIN has no formalized membership beyond country membership, although members are expected to work together to collate and share information and to develop partnerships with existing organizations.

International Council for Science (ICSU)

52. Founded in 1931 to promote international scientific activity in the different branches of science and its application for the benefit of humanity, the International Council for Science (ICSU) is one of the oldest non-governmental organizations in the world. ICSU's strength and uniqueness lies in its dual membership, National Scientific Members and International Scientific Unions, whose wide spectrum of scientific expertise allows ICSU to address major, international, interdisciplinary issues which its Members could not handle alone.

53. ICSU seeks to accomplish its role in a number of ways. Over the years, it has addressed specific global issues through the creation of Interdisciplinary Bodies, and of Joint Initiatives in partnership with other organizations. Important programmes of the past include the International Geophysical Year (1957-58) and the International Biological Programme (1964-74). Major current programmes include the International Geosphere-Biosphere Programme: A Study of Global Change (IGBP), the World Climate Research Programme (WCRP), DIVERSITAS: An Integrated Programme of Biodiversity Science and the International Human Dimensions Programme on Global Environmental Change (IHDP).

54. In order to strengthen international science for the benefit of society, ICSU mobilizes the knowledge and resources of the international science community to:

a) identify and address major issues of importance to science and society;

b) facilitate interaction amongst scientists across all disciplines and from all countries;

c) promote the participation of **all** scientists in the international scientific endeavour; and

d) provide independent, authoritative advice to stimulate constructive dialogue between the scientific community and governments, civil society, and the private sector.

International Long Term Ecological Research (ILTER) Network

55. International Long Term Ecological Research describes itself as a ‘network of networks’ consisting of Scientists and organisations involved in long term site-based ecological research across the globe. 32 countries have established formal LTER programmes within their territories. ILTERs goals include fostering and creating collaborations and co-ordination amongst scientists involved in similar ecological research, improving comparability of long-term ecological datasets, delivering scientific information to policy-makers, scientists and the general public and educating a new generation of scientists in long-term ecological research. The long term focus allows the network to concentrate on assessing and resolving complex environmental issues in a wide variety of ecosystems around the world.

56. The ILTER Coordinating Committee consists of 32 individuals (one from each member country) and the Executive Committee consists of between 6 and 8 members. Most ILTER members are national or regional networks of scientists involved in long-term, site based ecological research. These networks have expertise in collecting, managing and analysing long-term environmental data and are responsible for the creation of a large number of unique long-term datasets. In total over 1800 individual scientists are involved, working at hundreds of different sites.

International Union for the Conservation of Nature (IUCN)

57. The International Union for the Conservation of Nature is a global network of governmental and non-governmental organisations, United Nations agencies, companies and local communities. The IUCN is the world’s largest environmental network, with over 1,000 member organisations, over 1,000 professional staff and approximately 11,000 volunteer scientists based in 160 countries, it also has official observer status at the UN. IUCN’s policy and programme is set at members meetings that take place approximately every four years, and in between the organization is run by an elected council.

58. IUCN supports and carries out research on species, biodiversity and ecosystems, runs a large number of practical field projects around the world and carries out policy-making and advocacy work. This information is

managed by a network of over 1,000 professional staff in 60 offices. IUCN's work often focuses on the interaction between local communities and conservation issues.

59. IUCN produces, and is largely responsible for maintaining, the IUCN Red List of Threatened Species, a comprehensive list of species and sub-species, detailing their conservation status, taxonomic information and information on their distribution. This list is based on wide assessments of species status carried out in partnership and collaboration with a wide range of organizations and individuals, and in particular members of the IUCN Species Survival Commission. The Red List is commonly used by governmental and NGOs as the standard by which species' threat levels are assessed and as such, is an important tool in biodiversity conservation at the species level.

60. IUCN is also one of the three organizations that provides advice relating to implementation of the World Heritage Convention. In doing so IUCN relies not only on the expertise of its staff, but calls on its members ship and the members of the expert World Commission on Protected Areas to make input.

Organisation for Economic Co-operation and Development (OECD)

61. The Organization for Economic Co-operation and Development (OECD) was established in 1961 to serve as a forum where Governments of leading developed economies work together to address the economic, social and environmental challenges of globalisation. OECD provides a setting for governments to compare policy experiences, seek answers to common problems, identify good practice and work to coordinate domestic and international policies. OECD is also one of the world's largest and most reliable sources of comparable statistical, economic and social data, and produces internationally agreed instruments, decisions and recommendations to promote good governance in areas such as information and communications policy, taxation and the environment.

62. The Environment Directorate provides governments with the analytical basis to develop policies that are effective and economically efficient, including through country performance reviews, data collection, policy analysis, projections and modelling, and the development of common approaches.

63. The OECD Working Group on Economic Aspects of Biodiversity, focuses on markets for biodiversity, incentives and valuation, access to genetic resources and benefit-sharing, and has been working closely with the CBD on these issues. It also works on other areas of biodiversity, in particular market creation, and seeks active partnerships with other international organizations.

64. The Framework for Common Actions around Shared Goals commits OECD member countries to collaborating on key issues relating to environment and development. Recently three main work streams have emerged as (i) integrating climate adaptation into development co-operation, (ii) financing water supply and sanitation; and (iii) the governance and capacity development for natural resources and environmental management.

65. ENVIRONET works to enhance the coherence of OECD country policies in the areas of environment and development co-operation by bringing together senior-level representatives of development co-operation agencies responsible for environment and environmental specialists from multilateral agencies such as the European Environmental Agency, ECOSOC and the World Bank. Its membership also includes leading international NGOs.

Scientific Committee on Problems of the Environment (SCOPE)

66. The Scientific Committee on Problems of the Environment is an interdisciplinary body consisting of natural and social scientists and scientific institutions which are working together to develop syntheses and reviews of scientific knowledge related to current or potential future environmental issues. It therefore operates at the interface between scientific and decision-making.

67. SCOPE does not carry out field or laboratory based research but works on projects developing state-of-the-art scientific reviews of key environmental issues. Projects are initiated by one or more SCOPE members and are then submitted to the General Assembly and Executive Committee for review and approval. SCOPEs science programme uses a 3 cluster structure (Managing Societal and Natural Resources, Ecosystem Processes and Biodiversity, Health and Environment) which promotes cross-programme co-ordination and interaction.

68. SCOPE consists of 37 national science academies and research councils and 22 international scientific unions. These members constitute the General Assembly, which convenes every three years, and are responsible for electing the Executive Committee. Members are expected to develop activities which support SCOPEs objectives at the National and International level.

69. SCOPE is concerned with reviewing and publishing scientific research and identifying gaps in current scientific research, and communicates project results to scientists, decision-makers and the general public through peer-reviewed scientific monographs and by maintaining a rigorous ongoing publications programme.

Scientific, Technical and Research Commission of the African Union (AU/STRC)

1. The Scientific, Technical and Research Commission of the African Union (AU/STRC) was instituted by Organization of African Uunity in 1964 to replace the Commission for Technical Cooperation in Africa with a mandate to coordinate and promote scientific and technological research and findings, and to serve as a clearing house for all scientific and technical activities for sustainable growth and development on the continent. The AU/STRC is headquartered in Lagos (Nigeria) and it is now one of the departments of the African Union Commission.

2. AU/STRC work focuses on applied research including the development of relevant technologies to inform African Union's policies. It conducts capacity building programmes for policy-makers and other stakeholders in areas of applied science, traditional knowledge and other similar areas. A regional database of national expertise in relevant areas and priority research and capacity building needs is being created in collaboration with national and international partners.

3. The Commission works closely with National Councils for Science and Technology (NCST) or equivalent institutions at tha national level to build capacity and inform policies. Within the AU Commission, STRC collaborates closely with Inter-African Bureau for Animal Resources (AU/BAR) of the Department of Rural Economy and Agriculture (DREA). There is also collaboration with the UN Economic Commission for Africa (ECA) and the International Council for Science Regional Office for Africa (ICSU ROA).

4. The Commission operates through "expert committees" composed of the representatives of African countries who are specialists in identified areas of science and technology. More specialised inter-African sub-committees were created under the AU/STRC. The most relevant areas to science and policies with dedicated sub-committees include soil science, sea and inland fisheries, medicinal plants and traditional medicine, and biodiversity, biotechnology and biosafety.

World Business Council for Sustainable Development (WBCBD)

5. The World Business Council for Sustainable Development is a CEO-led global association of approximately 200 companies dealing exclusively with business and sustainable development. The council functions as a platform for companies to share knowledge and experiences of sustainable development. It is also actively involved with advocacy of business positions on sustainable development and in this capacity, works alongside a variety of governmental and non-governmental organizations. The WBCSD has members from 35 countries and around 20 different industrial sectors. Its stated objectives include being a leading business advocate for sustainable development, promoting the business case for sustainable development; demonstrating the contribution which businesses make to sustainable development and contributing to a sustainable future for developing nations.

6. The WBCSD Ecosystem Focus Area aims to provide a credible engagement and collaboration platform to address challenges and opportunities associated with ecosystems and ecosystem services. It will build on the work of the WBCSD Sustaining Ecosystems Initiative. The Focus Area will support the business license of member companies to operate, innovate and grow by proactively addressing business risks associated with accelerating ecosystem degradation and the loss of ecosystem services. More specifically, it will promote the development and uptake of best practice mitigation and market-based approaches that support the sustainable management and use of ecosystems services – both on a stand-alone basis and in cooperation with other stakeholders.

K. Review of the role of Local Knowledge in Science-Policy Interface Relevant to Biodiversity

1. According to a case study on Mobilizing Traditional Knowledge and Expertise for Decision-Making on Biodiversity issued by the IMoSEB processes,[120] it is now widely accepted in western scientific and policy-making arenas that the knowledge and practices of Indigenous peoples, traditional societies and local communities make important contributions to the maintenance of biological diversity. Simply put, traditional knowledge and expertise cannot be ignored in biodiversity conservation and management efforts. The key challenge at present is to move beyond merely accepting in principle the importance of traditional knowledge in policy-making related to biodiversity conservation and management, to ensuring these knowledges and practices are fully considered and implemented in policy decisions in a more systematic way. This is, however, a complex and multifaceted challenge that involves a number of practical and philosophical considerations of vital importance. Moreover, the situations and priority concerns of Indigenous peoples, traditional societies and local communities are not uniform across the world, so due care is needed to avoid generalizations or extrapolations that may overlook significant regional differences or diversity and lead to erroneous outcomes.

What is local knowledge, and why is it important?

2. Local knowledge (also variously referred to as traditional, indigenous, community, customary, or practical knowledge), refer to the long-standing information, wisdom, traditions and practices of certain indigenous peoples or local communities.[121] In many cases, traditional knowledge has been orally passed for generations from person to person. Some forms of local knowledge are expressed through stories, legends, folklore, rituals, songs, art, and even laws. Other forms of such knowledge are often expressed through different means. One distinction that is often made between local knowledge and modern or 'western' knowledge is that unlike the latter, it does not separate 'secular' or 'rational' knowledge from spiritual knowledge, intuitions, and wisdom. It is often embedded in a cosmology, and the distinction between 'intangible' knowledge and physical things is often blurred. Indeed, holders of local knowledge often claim that their knowledge cannot be divorced from the natural and cultural context within which it has arisen, including their traditional lands and resources, and their kinship and community relations. It is embedded in a social, cultural, political, and economic context, and taking it away from this context (as is sometimes done in 'documentation' exercises), is to devalue it and rob it of its essence.

3. Local knowledge is not, as often perceived, a static phenomenon, but one that is constantly evolving with changes in the internal and external environment of the community concerned. It is also sometimes referred to as 'non-formal' knowledge, but it should be recognized that communities can and have also formalized knowledge systems. While deeply rooted in practical experience, often over generations, but also contains conceptual and theoretical elements. Both formal and non-formal, practical and theoretical, aspects of local knowledge are considered in this paper. The primary distinction made is between these and 'modern scientific' knowledge.

4. For the purposes of this paper, only the knowledge that is relevant to biodiversity is considered; this is also referred to as 'local ecological knowledge'.

5. Local ecological knowledge is one of the fulcrums of survival of traditional societies, it is a part of their life, and impossible to separate from all other aspects of living. It is what gives them to ability to make sense of nature, to find their place and meaning within nature and in relation to each other, to derive physical, material, and cultural sustenance from nature, and to devise means by which nature can be sustained along with sustaining society. The fact that communities have survived for millennia, often in very harsh ecological and physical conditions, is in no small part due to local ecological knowledge. Even in the modern world, local ecological knowledge is crucial to help communities adapt and continue to find meaning and identity. Most commonly accepted is its role in the "traditional" or primary sectors of the economy: agriculture and

[120] Bannister, K., Hardison, P. 2006. Mobilizing Traditional Knowledge and Expertise for Decision-Making on Biodiversity. IMoSEB Case study. www.imoseb.net//content/download/1312/6745/version/5/file/IMoSEB+Case+study+-+TK+%26scientific+expertise+and+decision+making.doc

[121] For the sake of brevity, henceforth the term 'local community', or simply 'community', is used to denote both indigenous peoples and non-indigenous local communities. However recognizes the importance and central place of the term 'indigenous peoples' in any such discussion is recognised.

pastoralism, forestry, fisheries, water, and products made from natural resources such as crafts, furniture, and housing[122]. Given the fact that a majority of the world's population remains dependent on these sectors for their survival and livelihoods, the incalculable contribution of local ecological knowledge is quite clear.

6. Though there has been a tendency amongst modern societies (and learning from them, amongst traditional ones too), to consider local ecological knowledge as 'primitive' and outmoded, it is increasingly clear that it has tremendous contemporary relevance.

7. A whole range of industrial products are dependent on or use local ecological knowledge in varying ways. This is true for sectors like textiles, pharmaceuticals, household good, and so on. Health care, through all systems of medicine, is to varying degrees of extent dependent on local ecological knowledge, or on combinations of local ecological knowledge and modern knowledge. According to the World Health Organisation (WHO), the majority of the world's population (in areas like Africa, up to 80% of the population) is dependent for varying degrees on medicinal plants through traditional health care systems.[123] Numerous studies have demonstrated the contribution that local ecological knowledge also makes to the modern pharmaceutical industry and modern health care, a contribution that may only increase as people in the western world (including westernized people in the 'developing' countries) become more conscious of plant-based cures. The WHO estimates that 25% of modern medicines are made from plants first used traditionally.

8. Services like food distribution, education, climate forecasting and warning, and community care also continue to be performed through institutions using traditional means, and in some cases even modern institutions of the government or corporate sector are discovering the value of this. Rates of maternal mortality at childbirth were reduced significantly when traditional institutions (including the traditional birth attendant) were used in combination with modern communications.[124]

9. Though much more recent, there is now a growing recognition of the role that local ecological knowledge could play in humanity's response to the gravest threat it now faces: climate change. The fact that communities have for centuries and millennia adjusted their behaviour and strategies and knowledge systems to changes in their surrounds, is central to this realisation. Communities adjust their agriculture/pastoralism/fishing and hunting-gathering to subtle or not-so-subtle changes in climate, to threats from other communities or invasions, to disease and epidemics, and so on. Traditional systems appear to be static, but they are indeed dynamic in making such adjustments. Such adaptability could be a key factor in the response that we give as a species, to the impacts of climate change, and the role that local ecological knowledge in all the sectors named above could provide the alternatives needed to build towards a more sustainable way of dealing with our atmosphere.

10. A key scientific question to address is how to assess unsustainability, and what indicators, criteria and methods can be used for this? Here too, traditional knowledge has a vital role, for traditional peoples and communities have used a wide range of their own indicators and methods to get an idea of sustainability. Water flows, the presence/absence or appearance/disappearance of certain species, the behaviour of domestic or wild animals, and other kinds of changes in their surrounds are used in myriad sophisticated ways to learn about ecological changes that may be detrimental or beneficial.

11. In all the above and many more ways, local ecological knowledge is crucial to meeting the goals of a number of international conventions and agreements, including the CBD and other environmental conventions, and the Millennium Development Goals. It is also central to the achievement of the provisions laid out in the UN Declaration on the Rights of Indigenous Peoples.

Threats to local ecological knowledge

12. More than ever before, local ecological knowledge faces serious levels of erosion. As the peoples and communities holding local ecological knowledge themselves face a range of threats from outright annihilation to 'assimilation' into 'mainstream' society, the knowledge they hold also slips away. A clear and alarming indicator is the threat to languages, with some scholars estimating that half of the around 6000 languages spoken

[122] Posey, D. (ed.). 1999. Cultural and Spiritual Values of Biodiversity. UNEP, Nairobi, and Intermediate Technology Publications, London.

[123] www.who.int/mediacentre/factsheets/fs134/en/

[124] Musake, M. 1999. The challenge and opportunities of information and communication technologies in the health sector. Paper prepared for the African Development Forum 1999, Makerere University, Kampala. Cited in: Gorjestani, N. 2004. Indigenous knowledge for development: Opportunities and challenges, in Twarog, S. and Kapoor, P. (Eds.), Protecting and Promoting Traditional Knowledge: Systems, National Experiences and International Dimensions, United Nations Conference on Trade and Development, Document No, United Nations, Geneva, UNCTAD/DITC/TED/10.

today may become extinct by 2050 or 2100.[125] A language (oral or written) is not only a means of communication between members of a people or community, it also contains within it the essence of considerable information and knowledge and wisdom of the people or community. Its loss is therefore a loss of local ecological knowledge, especially in the case where local ecological knowledge has passed down and evolved orally.

13. Across the world, as one model of modern education and means of mass communication spread, newer generations of traditional peoples are simply not imbibing local ecological knowledge in way that their parents or ancestors did. As growing demand for natural resources from a greedy global economy touches every community, elements of local ecological knowledge that managed to maintain sustainable levels of harvest become redundant or sidelined, and soon forgotten. Most of all, as the people in such communities themselves get amalgamated into urban-industrial sectors, they no longer have a need for local ecological knowledge ….at least not for a while till many of them find themselves cast out of the economy and adrift, but now without even their local ecological knowledge or without any natural resources to fall back on.

14. Intellectual property rights regimes also threaten local ecological knowledge, through piracy and wrongful claims of ownership, or through commercialization of knowledge that is held to be common (therefore freely available) or sacred.

Integrating local ecological knowledge into the science-policy interface

15. Given the recognition that local ecological knowledge remains crucial to the goals of biodiversity conservation in particular and environmental sustainability in general, it needs to find a central place in any attempt to influence policy. For this to happen, it is essential that the currently one-sided relationship between modern scientific knowledge and local ecological knowledge, in which the former either displaces or co-opts the latter, is replaced by one that is mutually respectful and on an equal footing. Experts and advocates of both kinds of knowledge need to acknowledge the weaknesses of theirs and the strengths of the other, and explore ways to build synergies that fill each others' gaps and enhance each others' strong points. Given the enormous historical and cultural baggage that comes with both, and some basic differences in premise, this is of course easier said than done. For instance, the fact that local ecological knowledge explicitly combines both factual ('what is') and normative ('what should be') knowledge or opinions, is often considered by advocates of modern science as being problematic because they believe that they are 'objectively' dealing only with 'facts'. But as is shown in successful attempts at combining various forms of knowledge, decision-making based on a mix of facts and values can not only be robust, but actually stronger than one based only on facts…and in any case it is disputed whether any policy decision can ever be free of value judgments. The more it is explicitly recognized that decisions involve a variety of 'ways of seeing', the more it will be possible to integrate, on a respectful plane, local ecological knowledge into policy-making. For instance, structured techniques used to facilitate inter-knowledge exchange for water use planning in Canada, demonstrated that both factual and value-based knowledge can actually help to improve decisions relating to environmental risk.[126]

16. There are an increasing number of such initiatives at integrating local ecological knowledge into processes of gaining greater understanding of ecological issues and influencing policy. Combining the knowledge of indigenous peoples such as the Inuvaluit, with modern scientific understanding, was crucial to the ambitious Arctic Climate Impact Assessment brought out in 2004.[127] Indigenous peoples are now conducting their own assessments in several regions of the world under the Indigenous Peoples Assessment of Climate Change process[128]. In initiating this process, the United Nations University noted that: "*Observations of ecosystem change by indigenous peoples are acting as a sentinel like warning system for climate change. More importantly, the long-term place-based adaptation approaches developed by indigenous peoples provide valuable examples for the global community of low-carbon sustainable lifestyle, critical to developing local adaptations strategies in the face of climate instability*."

17. Drawing from the above mentioned IMoSEB case study, examples of how traditional knowledge and expertise has been mobilised for decision making on biodiversity include the following:

a) Indigenous information networks, community traditional knowledge databases, and community traditional knowledge registers;

[125] en.wikipedia.org/wiki/Endangered_language; www.ogmios.org/manifesto; www.wholeearthmag.com/ArticleBin/325

[126] Failing, L., Gregory R., Harstone, M. 2007. Integrating science and local knowledge in environmental risk management: A decision-focused approach. *Ecological Economics* 64: 47-60.

[127] ACIA. 2004. *Impacts of a Warming Arctic: Arctic Climate Impact Assessment*. Cambridge University Press, Cambridge.

[128] www.unutki.org/default.php?doc_id=96

b) template agreements such as the Template Traditional Knowledge Protocol or the Community-University Research Alliance (CURA) Research Contract;

c) community protocols and codes relating to conducting research and intellectual property, and external codes for researchers, and legal agreements relating to access and benefit sharing;

d) Indigenous structures for co-management, and Indigenous community-based natural and cultural resource management programs; and

e) community-controlled and community-based collaborative research projects, and the creation of new institutions to govern research.

18. According to the authors of the IMoSEB case study, the diverse range in types of tools speaks to a parallel diversity in community needs, priorities, and capacities. Importantly, no one-size-fits-all solution will or can emerge for how traditional knowledge and western science can be brought together in a synergism founded on complementarity, which ultimately is based on mutual respect for difference. Common themes that emerge from the scan include: needs for access to and exchanges of information, needs for models and templates that have been tested on-the-ground, guidance on how to engage and disengage in ethical and equitable relationships (both within and outside of communities), needs to store and manage vast amounts of information in various forms and with built-in mechanisms for multilevel or tiered access and degrees of stringency in control of information flow. While some examples used illustrate the highest levels of community control achievable, most are premised on active participation and full and active representation, working and making decisions in collaboration, co-creating and co-managing new knowledge – and ultimately, sharing power. Perhaps beyond all other hurdles to mobilizing traditional knowledge and expertise for decision-making on biodiversity, is the inherent inequity in distribution of power that stands in the way of governments, academic scientists, policy makers and others seeking meaningful collaborations with Indigenous organisations and communities.

Key gaps

19. Though initiatives at giving local ecological knowledge a more central place in research and planning are increasing, there remain a number of key gaps that need to be urgently plugged. These include:

a) Such initiatives remain a tiny fraction of the practice in the formal world of research, planning, education, and decision-making, and need to be considerably increased in number and scope.

b) Their relative scarcity means that there is as yet no significant move to change the paradigms of formal systems in such a way that multiple knowledge systems and their varying philosophies/approaches are at their very core. For instance, there is probably no university in the world where teaching and research are completely or even predominantly based on such integrated knowledge. It is symbolic of this gap, that even the IPBES initiative is called ‘science-policy interface’, and does not centrally integrate indigenous peoples and local communities in its core processes.

c) Most such initiatives are at the level of research, education, and planning, but avenues for indigenous peoples and local communities to take part in decision-making remain extremely limited, especially when it concerns formal sectors of society and economy, or institutions of governance at national and international levels. Without such access to decision-making, the use of local ecological knowledge will remain marginal.

d) Policies to protect or encourage local ecological knowledge, though increasingly being adopted in countries and international instruments, are usually not accompanied by policies that protect the social, political, economic, and ecological contexts within which local ecological knowledge originates and flourishes. Without this, local ecological knowledge often remains as ‘museumised’ items that are available to admire (and appropriate for use in formal systems), but not as living, evolving systems.

Prerequisites or conditions to meaningful integration

20. Further integration of local ecological knowledge into the science-policy interface requires commitment of all relevant parties to at least the following:

a) Acknowledgement of, and support to, the need to ensure continuation of the social, cultural, economic and political contexts within which such knowledge thrives. This means the full recognition of the territorial, cultural, and political rights and responsibilities of indigenous peoples and local communities. The UN Declaration on the Rights of Indigenous Peoples, provides a good basis for such recognition; such provisions need also to be extended to non-indigenous traditional communities.

b) Encouragement to oral forms of knowledge generation and transmission, even as the demand for 'documentation' gains ground, including through its promotion in modern institutions of learning.

c) Institutions and avenues for cross-fertilization between local ecological knowledge and modern science, learning from each other in respectful ways; this would include fundamental changes in formal education institutions to include 'teachers' from the indigenous and local knowledge systems, and changes in the curriculum and teaching methodologies to include local ecological knowledge and traditional means of knowledge transmission.

d) Safeguarding all the conditions of local ecological knowledge, and the rights of peoples and communities, in any moves to 'document' local ecological knowledge, including the requirement for free and prior informed consent from those whose knowledge is being documented.

e) Ensuring the IPR regimes do not allow for IPR claims on local ecological knowledge; moreover, comprehensively reviewing, with the involvement of indigenous peoples and local communities, all IPR regimes that promote monopolies and inequities in the use and transmission of knowledge, and bringing in forms of knowledge protection that are consistent with the values and cultures of all peoples.[129]

f) Changing the discourse, e.g. using 'knowledge' in place of 'science', and avoiding stereotypic dichotomies such as 'practical' for local ecological knowledge and 'theoretical' for modern science. Amongst the first steps could be to rename the current process 'knowledge-policy interface' rather than 'science-policy interface'!

g) Ensuring and facilitating the full and meaningful participation of indigenous peoples and local communities in national and international policy processes.

[129] GRAIN. 2004. Freedom from IPR: Towards a convergence of movements. Seedling, October 2004 (www.grain.org/seedling/?id=301).

L. Overview of a range of indicator processes on for the global biodiversity-related agreements and other related agreements and programmes

Agreement	Mandate	Current situation
Convention on Biological Diversity	In 2002, in decision VI/26, CBD Parties agreed "*to achieve by 2010 a significant reduction of the current rate of biodiversity loss at global, regional and national level as a contribution to poverty alleviation and to the benefit of all life on Earth*". Assessment of progress in achieving the 2010 biodiversity target and sub-targets is addressed in decisions VII/30 and VIII/15, which also introduce and elaborate a framework of 22 headline biodiversity indicators under seven focal areas, to be used to track progress towards the achievement of these targets.	When the framework was adopted in 2004, some of biodiversity indicators were ready for immediate use at the global scale, but others required further development and testing. Both mature and emerging indicators are being tracked and developed at the global scale by a wide range of scientific organizations as part of the CBD-mandated 2010 Biodiversity Indicators Partnership (2010BIP)[130] co-ordinated by UNEP-WCMC. The 2010BIP has established an independent Scientific Advisory Body to provide scientific oversight, review and validation of the indictor methodologies, and has recently convened an international expert workshop to review the use of indicators so that lessons can be learnt for the Post-2010 targets and indicators (see below).
Ramsar Convention on Wetlands	The Ramsar Convention adopted a set of eight outcome-oriented indicators (with 11 sub-indicators) to monitor effectiveness of the implementation of the Convention[131].	Methodological development for the Ramsar indicators varies. Some will be based on national reporting, others will use different sources. Workshops and focus groups are being carried out with scientific experts and agencies to further this development, however in some cases gaps will remain due to a lack of time and resources to access available data[132]. The Ramsar indicators and sub-indicators have substantial overlap with the CBD indicators. Institutionally there is also close engagement between CBD and Ramsar indicator processes. Through participation in expert group meetings, members of the STRP and Ramsar Secretariat have contributed to the development of the CBD indicators, whilst the Ramsar Indicators are being developed in close partnership with UNEP-WCMC and the 2010BIP.
Convention on Migratory Species	The CMS strategic plan includes 31 indicators under four objectives[133]. Besides process indicators relating to the implementation of the CMS strategy, the CMS indicator framework includes a number of impact indicators relating to the status and trends in, threats to, and level of protection of, migratory species.	Development of migratory species indicators was recognized at CMS COP8 as an appropriate step towards an assessment of the contribution of the Convention in the achievement of the 2010 target. In this regard the CMS Secretariat is working closely with the CBD Secretariat and the 21010BIP in order to adopt indicators that contribute to measuring the achievement of the 2010 Target. Within this process, progress has been recently made in exploring the suitability of two existing indices, Red List Index and the Living Planet Index.
Convention on International Trade in Endangered Species of Wild Fauna and Flora	CITES has a Strategic Vision 2008-2013, that includes 40 indicators under 16 Objectives[134]. These indicators are almost entirely process-based, with no indicators relating directly to the status or trends in biodiversity. Despite the general view that indicators should be outcome-focussed there were challenges in reaching collective agreement on what they should be.	The CITES Secretariat is a member of the 2010BIP and are collaborating on an indicator of the status of species in trade, however this is not being utilised by CITES and is purely a contribution to assessing progress towards the CBD 2010 target. However an additional indicator (3.4.1) is now being formulated, in consultation with IUCN, on CITES' conservation impact. Although CITES gathers and holds a significant amount of population status and other information in documentation related to amendment proposals, the Review of Significant Trade and certain special reports, this data has not been easily searchable. A new on-line tool now being developed with UNEP-WCMC will make the Review of Significant Trade information easier to access and search. CITES needs to partner with other organizations in order to obtain the population status and distribution information that it does not regularly collect through its annual, biennial or special reports.

[130] www.twentyten.net

[131] Ramsar (2008). Further development of indicators of effectiveness of the implementation of the Convention. RAMSAR COP10 DOC.23, paragraphs 2-5.

[132] Personal communication from the Ramsar Secretariat.

[133] CMS strategic plan 2006-2011. UNEP/CMS/Resolution 8.2, Nov 2005.

[134] CITES (2008). Strategic Vision 2008-2013: Development of Indicators. SC57 Com.6

Agreement	Mandate	Current situation
World Heritage Convention	The World Heritage Convention has adopted a results-based management framework with 12 indicators under four strategic objectives[135]. These include two indicators that relate to the state of conservation of sites, and one relating to the level of threat to sites.	Member states are encouraged to take up the use of the indicators in their reporting but an analysis of the extent to which they have done so in reporting to date has not been made.
UN Convention to Combat Desertification	UNCCD is beginning to consider how to better incorporate biodiversity into its areas of work, including the development of indicators.	At the next COP Parties will be considering both indicators and reporting based on discussions that have already taken place in the CRIC. Both the SCBD and the 2010BIP will be participating in the UNCCD Conference of Parties in September 2009.
Millennium Development Goals	The MDGs are a set of eight goals, with associated time-bound targets, adopted by nations in order to reduce poverty in all its forms. Goal 7, to ensure environmental sustainability, incorporates four targets including the CBD 2010 Biodiversity Target. Four of the CBD biodiversity indicators within the 2010BIP are included as MDG indicators (two under Target 7a and two under target 7b).	The UN Statistical Division maintains a database of MDG indicator data[136] that is disaggregated by region and country, and by year. One of the major challenges is rationalising national data (from national reporting) with global data from the international agencies. There are ongoing efforts to achieve this. The same issues apply, regarding national capacity to measure and report on the indicators under MDG-7, as for the CBD indicators.
Streamlining European 2010 Biodiversity Indicators (SEBI2010)	Both the European Union and pan-European processes have adopted the target of *halting* the loss of biodiversity by 2010. SEBI2010 is a pan-European initiative led by the European Environment Agency (EEA) to ensure the development and uptake of a common set of biodiversity indicators to track progress towards this target.	SEBI2010 has 26 indicators under seven focal areas[137], and not unsurprisingly there is considerable overlap with the content of CBD indicator framework. Indeed this was actively worked towards, and the project coordination team included not only European agencies but also UNEP-WCMC with the intention of ensuring close linkages with other initiatives. SEBI2010 also works closely with the 2010BIP
Circumpolar Biodiversity Monitoring Programme (CBMP)	The CBMP was established to provide an integrated and sustained Arctic Biodiversity Monitoring Network. The CBMP functions as an international forum of key scientists and conservation experts from all eight Arctic countries, the six international indigenous organizations of the Arctic Council, and a number of global conservation organizations[138].	The CBMP is planning to develop 13 indicators during 2008-2010 and a further nine indicators in 2011-2012. The CBMP indicators and indices will facilitate the reporting of the Arctic's progress towards the Convention on Biological Diversity's 2010 target to reduce the rate of loss of biodiversity. In that regard there is significant correspondence with the CBD indicator framework.
African Eurasian Waterbird Agreement (AEWA)	The African Eurasian Waterbird Agreement (AEWA) is a stand-alone Multilateral Environmental Agreement (MEA) concluded in 1995 to improve the conservation and management of waterbirds in the African-Eurasian region on Appendix II of CMS. AEWA has adopted a strategic plan for 2009-2017, the goal of which is "*to maintain or to restore migratory waterbird species and their populations at a favourable conservation status throughout their flyways*". The strategic plan includes 28 indicators under five objectives[139].	These indicators are primarily process-based, although some of them relate to the CBD focal areas of sustainable use, threats to biodiversity and resource transfer. AEWA also has a range of targets under the overall goal that relate to improving status and trends of migratory waterbird species and populations.
Organisation for Economic Cooperation and Development (OECD)	The OECD is a unique forum where the governments of 30 democracies work together to address the economic, social and environmental challenges of globalisation. The OECD maintains a database of national environmental indicators as essential tools for tracking environmental progress, supporting policy evaluation and informing the public. These indicators fall into ten categories.[140]	The indicators are endorsed by Environment Ministers and updated reports produced annually based on data provided by Member states' authorities through national reporting, and from other sources. Reports are prepared by the OECD secretariat with support from the OECD Working Group on environmental Information and Outlooks. The OECD does note that that definitions and measurement methods vary among countries, and that inter-country comparisons require careful interpretation.

[135] WHC (2006). Performance Indicators for World Heritage. WHC-06/30.COM/12.
[136] See unstats.un.org/unsd/mdg/Default.aspx
[137] EEA (2007) Halting the loss of biodiversity by 2010: proposal for a first set of indicators to monitor progress in Europe. EEA Technical Report No 11/2007.
[138] CAFF (2008) CBMP Five-Year Implementation Plan.
[139] AEWA (2008). Draft Strategic Plan For The Agreement On The Conservation Of African-Eurasian Migratory Waterbirds For The Period 2009-2017. AEWA/MOP 4.19.
[140] OECD (2008). Key Environmental Indicators. OECD Environment Directorate, Paris.

M. The experience of indicators at the regional level – SEBI2010

1. Streamlining European 2010 Biodiversity Indicators (SEBI2010)[141] is a pan-European initiative led by the European Environment Agency (EEA) to facilitate the development and uptake of a common set of biodiversity indicators to track progress towards the target of *halting* the loss of biodiversity by 2010 adopted by both the European Union and pan-European processes. Development of the indicator set involved a wide range of individuals and organizations contributing directly and through working groups, and has so far resulted in a technical report describing the indicators and how they are calculated and used,[142] and a first assessment of progress based on the indicators[143]. SEBI2010 has identified 26 indicators under seven focal areas, and not unsurprisingly there is considerable overlap with the content of CBD indicator framework. Indeed this was deliberately and actively worked towards so as to ensure a degree of coherence.

2. Some of the key challenges identified in initially developing the set of indicators was in finding indicators which could be calculated for as many pan-European countries as possible, given variation in data availability in particular, in reducing the set of proposed indicators to a manageable number, and in ensuring that the indicators chosen were the ones most helpful for understanding achievement of policy objectives. In addition, as the availability of data from public bodies varies, use was made of data from non-governmental environmental organisations, with the hope that the existence of the set of biodiversity indicators and their recognition in policy documents would motivate countries to improve data collection.

3. However it is important to recognise that these indicators essentially draw primarily on existing data and indicators, and that this brings inherent bias in terms of what data can be used, and the existing were developed for different purposes by different institutions. A working group was therefore established to explore how interlinkages between indicators could increase their value and address some of the concerns.

4. In a preliminary report,[144] the working group considered that while the indicator-set has the potential to enable policy makers to evaluate the progress towards the 2010-target it is questionable whether on the currently produced indicators scientifically sound conclusions could be drawn. The working group considered that improvements were required to inform policy makers in a proper manner, and made the following preliminary recommendations in addition to a list of suggested short-term actions.

5. On the representativeness of the indicators:

a) improve or extend the existing indicators and the databases underlying them to take account of additional species groups and additional genetic resources;

b) seek ways to make more effective use other existing data sources where data are collected in an harmonised way;

c) develop and improve indicators in those areas currently not properly covered, such as those addressing threats, use (goods and services, and sustainable use), ecosystem integrity and responses; and

d) extend monitoring systems to improve coverage and consistency, using harmonised standards and being appropriately quality controlled.

6. On interlinkages between the indicators:

a) build models of the major cause-effect relationship using the DPSIR framework in a concerted scientific manner;

b) make temporal scales, spatial scales, baselines, assessment principles and critical levels more coherent so that indicators have the potential to provide a more coherent picture when taken together;

c) determine critical levels in order to assess whether marine ecosystems, forest and agriculture are sustainably managed; and

d) ensure that those facilitating development of national and regional biodiversity research strategies address these issues.

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141 For all SEBI2010 documentation see biodiversity-chm.eea.europa.eu/information/indicator/F1090245995

142 EEA (2007) Halting the loss of biodiversity by 2010: proposal for a first set of indicators to monitor progress in Europe. EEA Technical Report No 11/2007.

143 EEA (2009) Progress towards the European 2010 biodiversity target. EEA Report No 4/2009

144 Interlinkages between SEBI 2010-indicators: Improving the information power. Intermediate report to the SEBI 2010 Coordination Team, 13 March 2009

7. The preliminary report goes on to say that indicators inform policy makers about the actual change in biodiversity and its use over time and space, and that in combination with models they are an indispensable tool for determining the major causes, their relative contribution, and finding cost-effective measures. Evaluation of the progress to the target is important, but using indicators as a continuous feed back to adjust and fine tune policies is of much higher value. They go on to say that while the cost of implementing their recommendations is high, the societal cost of policy inaction or wrong policies based on invalid information will be much higher.

8. Other working groups are reviewing communications, and biodiversity and climate change.

N. Strengthening the linkages between biodiversity indicators at the global and national scales

1. Two brief notes follow, the first an analysis of what has been said on indicators in the national reports submitted to the CBD by Parties, and the second a series of personal observations by someone who has been involved in running indicator workshops at national and regional levels. Both are included, despite a degree of overlap in the messages they convey, because they each illustrate the current situation from a different perspective.

Reports to the CBD on national level indicators

2. National governments recognise the need to develop their own indicator monitoring programmes, both for national biodiversity planning and for reporting against international commitments like the CBD 2010 Target and the MDGs. This is also encouraged by a number of decisions taken by intergovernmental processes.

3. A review of the available 3rd and 4th National Reports to the CBD suggests that national indicators have been adopted using the CBD framework as a guide, but designed to fit the specific context of a specific country. There is widespread recognition of the importance of national indicators and reference is made in both 3rd and 4th National Reports to a very wide range of indicators. These span all seven CBD focal areas, although overall there is a greater reference to indicators under three focal areas: status and trends of the components of biodiversity; threats to biodiversity, and; ecosystem integrity and ecosystem goods and services.

4. Despite much progress, there is a general perception that further development of national capacity to develop, monitor and report against agreed indicators is required in large parts of the world. National focal points for conventions like the CBD are often required to complete indicator-based reports without access to all of the necessary data (or the technical agencies capable of delivering it) to facilitate accurate, up-to-date, scientifically credible and comparable reporting.

5. A more detailed review of the 47 4th National Reports to the CBD available in June 2009, which asked specifically about indicators, suggested the following observations.

a) Parties are in different stages as far as the use of national indicators to specifically measure progress towards the 2010 target is concerned. Some indicated that they do not have national indicators; some indicated that indicators are being developed; some mentioned indicators in their report but no further detail or data were provided, some eluded to indicators in the report and presented information showing trends in status of biodiversity and ecosystems. Few Parties reported on the indicators with evidence of use.

b) Numerous Parties mentioned they have not developed national biodiversity indicators. Reasons for this include a lack of administrative and technical capacity, inadequate funding available to the government, and political instability meaning routinely monitoring indicators was not feasible.

c) The majority of Parties listed indicators that were in development. Quantitative indicator data was not often presented as evidence of change. Some Parties used simple (qualitative) scoring to show if there has been progress, no change or negative development with regard to specific global 2010 indicators.

d) The majority of developing countries blamed their inability to routinely apply indicators on lack of capacity, lack of consistent trend data, absence of ecological baselines against which change is measured and lack of established monitoring systems. “Marginalisation” of environmental ministries and limited knowledge on the definition of indicators to measure progress towards the 2010 CBD target also hinders progress.

e) Although there is often a vast body of national data available on various aspects of biodiversity in a country, many of the data sets are “one-off” studies, often covering only a portion of the country. As a result, it can be a challenge to find ways of integrating different data sets and making them comparable to produce time series statistics.

f) A lack of institutional responsibility and accountability for biodiversity survey and monitoring makes it very difficult for some countries to establish and verify biodiversity trends. Data ownership and management were common problems. Many government institutions do not have data management structures in place so that data and information is often ‘person-bound’ rather than ‘institution-bound’.

g) Sustaining good biodiversity monitoring systems over time is a major challenge in some cases, particularly after donors exit.

Strengthening the linkages between biodiversity indicators at the global and national scales – a personal perspective

6. The following is based on experience UNEP-WCMC has gained from leading two indicator-related GEF projects, and one project supported by the UN Development Account. The *Biodiversity Indicators for National Use* involved experience in Ecuador, Kenya, Philippines and Ukraine, and the ongoing *2010 Biodiversity Indicators Partnership* project (which has some national support components) and *Building national capacity for policy-making and reporting on MDG-7 environmental sustainability and the 2010 Biodiversity Target* project have so far involved regional workshops in Cambodia, Costa Rica, Kenya, South Africa, Thailand and Trinidad.

7. The CBD Conference of the Parties emphasised that national biodiversity strategies and action plans, as the primary mechanisms for the implementation of the Convention and its Strategic Plan, should be developed and/or reviewed with due regard to the relevant aspects of the four goals of the Strategic Plan, and the goals established by decision VII/30. The COP also invited Parties and Governments to use existing national indicators or to establish national indicators, as well as emphasising the need for capacity-building.

8. Having said that, experience from the 2010BIP workshops on national biodiversity indicators suggests that most of these countries are not developing indicators within the CBD 2010 target indicator framework *per se*, although some have carried out one-off exercises to compile relevant information for the purpose of the CBD 4th National Report.

9. The linkages between global and national biodiversity indicator production and use would appear to currently be weak, and there is even a risk of actions for global biodiversity indicator reporting being a distraction from national biodiversity conservation actions. One of the reasons for the few linkages of data and reporting between global and national biodiversity indicators is that they are mostly produced for different users and differed purposes.

a) Global scale: The motivations for global-scale indicators are usually: for reporting on progress in achieving global targets; as a communication tool by interest groups to raise awareness of particular topics; and to support global-scale strategic planning and prioritisation.

b) National scale: The aims of national-scale indicator development commonly include: to aid the design and monitoring of conservation strategies; to assist the development of policies and management plans for commercially important biodiversity; and to raise awareness and actions for topics of importance to interest groups, including NGOs and academia.

10. For an indicator to be produced on a consistent basis over time it is necessary for there to be an agency with this responsibility. This agency also has to have the capacity to obtain and analyse the data and communicate the results. One of the reasons for the very limited development of national biodiversity indicators in developing countries is that there is rarely an institution with a clear role and capacity for the consistent production of biodiversity indicators. And while there is usually some relevant data for the production of indicators, this is often not systematically gathered and used as indicators to support decision-making.

11. The principal need for biodiversity information at the national scale is to support the design and implementation of NBSAPs and biodiversity-relevant decision-making by all sectors of society. Very few developing countries have information management systems suitable for the inclusion of biodiversity and ecosystem service considerations in the design of their country's development plans. Currently issues such as land use change for biofuel production or intensifying food production, or programmes for reducing emissions from deforestation and forest degradation are those that will require detailed information on the biodiversity values of major land areas, and changes in those values over time. These information needs may or may not coincide with those of international indicators and reporting requirements, but they will inevitably be the priority at the national level.

12. Based on these observations, it is suggested that the following two points need to be considered closely when developing successful biodiversity indicators to support management actions:

a) Indicators must be seen as part of a process of understanding and managing biodiversity and the natural environment. They are not the start or the end points for analysis and decision-making, but information tools to help identify and understand important issues and to monitor progress.

b) Indicators for reporting and management decision-making should be designed in relation to a description of the desired state or behaviour of a process or issue. Ideally the definition of desired states and behaviours of an issue should be informed by conceptual models including both biophysical and socio-elements

and their relationships. Conceptual models and indicators of their variables also form the basis of models for scenario analysis, to explore possible consequences of policy options.

13. While global biodiversity indicators are undoubtedly important, in order to best support national efforts, further development of the indicator frameworks for MEAs and other international processes with national implications should probably focus on strengthening the information for actions to implement those agreements and processes at the national level, with global scale reporting and analysis a vital but secondary objective. This will help ensure that not only are national needs directly supported, but that there is therefore a clear “interest” in maintaining the relevant data into the future.

O. International expert workshop on the 2010 Biodiversity Indicators and Post-2010 Indicator Development (6-8 July 2009)

1. In July 2009, UNEP-WCMC convened a workshop with the CBD Secretariat and the support of the UK Government to review the use and effectiveness of the 2010 biodiversity indicators, and to consider implications for development of the post-2010 targets and indicators. Discussions at this workshop, which involved 70 stakeholders from some 25 countries, focused on four key areas: sufficiency of the current 2010 biodiversity indicator set; its scientific rigour; the policy relevance of the indicators; and their effective communication.

2. The key lessons learnt were identified by participants as:

a) the framework is comprehensive, and can be mapped to other frameworks (such as DPSIR), but there have been problems showing how it fits together to integrate the indicators into a coherent story, and the complexity of biodiversity and of the framework is a continuing problem in terms of communicating to disparate audiences;

b) the framework is primarily structured around CBD priorities, but its relevance to other sectors and MEA processes is less clear, thereby hindering its uptake and use beyond the CBD, meanwhile the parallel development of the CBD targets/ goals and the indicator framework has led to a disconnect which was not intended;

c) the framework is flexible, thereby enabling implementation at a variety of scales, and focusing on outcomes has focused minds and spurred engagement, and this has facilitated political adoption, but the absence of clear targets and awareness raising is a barrier to arousing public interest;

d) there is a tension between scientific rigour and communicating the results of the indicators to a variety of audiences (both are needed), and methods for assessing the significance of change, and distance to target are underdeveloped, which is a problem for both scientific rigour and communication of the results;

e) some indicators are well developed, others are still under developed, and the current indicator set is incomplete in a number of areas, including wild genetic resources, human well-being, ecosystem quality and services, threats, sustainable use, ABS and so on; and

f) there is no clear process or criteria for evaluating the scientific rigour of the indicators; the representatively and adequacy of the data underlying them needs to be transparently documented, and their geographic, taxonomic and temporal coverage needs to be improved;

g) the communication that has taken place has been ad-hoc, opportunistic, and more focused on reporting than a systematic effort to convey the lessons from the indicators, meanwhile biodiversity means different things to different sectors, and the messages from individual indicators and the set as a whole do not take this fully into account.

3. The full report was still being prepared when this gap analysis was completed, but the preliminary conclusions of the three day meeting pending review of the meeting report included the following.

a) A small set of (10-15) broad head-line indicators, clearly linked to the main target and/or sub targets, should be maintained/developed, based on a set of sub-indicators/categories in order to communicate the indicator set through key storylines and clear, policy relevant messages, while maintaining a flexible framework to cater for national/regional needs.

b) The current framework of global indicators should be modified and simplified into four focal areas: threats to biodiversity; state of biodiversity; ecosystem services; and policy responses. Existing indicators should be re-aligned with the new framework, as appropriate, in order to maintain continuity and enhance their use. The relationships between the focal areas and indicators and new post-2010 targets should be clearly explained and documented, including the scientific basis and assumptions.

c) Some additional indicators on threats to biodiversity, status of species diversity, ecosystem extent and condition, ecosystem services and policy responses should be developed in order to provide a more complete and flexible set of indicators to monitor progress towards a post-2010 target and to clearly link actions and biodiversity outcomes to benefits for people.

d) National capacity for framework application, indicator development, data collection and information management should be further developed and properly resourced in order to strengthen countries' ability to develop, monitor and communicate on a participatory, sustained and integrated basis.

e) Priority should be given to developing a communication strategy for the post 2010 targets and indicators in order to inform policy discussions and ensure effective communication of the multiple messages coming from the indicators into all sectors, ensuring that the relevance of the message to human wellbeing was clearly understood.

4. Additionally participants recognised that a flexible and inclusive process/partnership for post-2010 indicator development should be maintained and adequately resourced in order to increase collaboration in the development, quality control, implementation and communication of indicators at all levels, including the sharing of experience and the building of capacity.

P. Areas of overlap of various indicator processes with the CBD biodiversity indicator framework, an example using selected processes[145]

Ramsar Indicators of Effectiveness	Global 2010 indicators	SEBI2010 (Europe)	MDG indicators
A: The overall conservation status of wetlands (i) Status and trends in ecosystem extent (ii) Trends in conservation status of wetlands – qualitative assessment	Trends in extent of selected biomes, ecosystems and habitats	Trends in extent and composition of selected ecosystems in Europe Change in status of habitats of European interest	None
B: The status of the ecological character of Ramsar sites (i) Trends in conservation status of Ramsar sites – qualitative assessment	Ecosystem integrity and ecosystem goods and services: connectivity / fragmentation of ecosystems	Change in status of habitats of European interest Changes in patch size distribution of natural areas Status and trends in the fragmentation of river systems	None
C: Water quality (i) Trends in dissolved nitrate / nitrogen concentration (ii) Trends in Biological Oxygen Demand (BOD)	Ecosystem integrity and ecosystem goods and services: water quality of freshwater ecosystems	Nutrients in transitional, coastal, and marine ecosystems Water quality in freshwater	None
D: The frequency of threats affecting Ramsar sites (i) The frequency of threats affecting Ramsar sites – qualitative assessment	Trends in nitrogen deposition Trends in invasive alien species	Critical load exceedance for nitrogen Alien and invasive alien species in Europe Impact of climate change on biodiversity: species abundance indicator	None
E: Wetland sites with successfully implemented conservation or wise use management plans (i) Trends in management effectiveness in Ramsar sites (ii) Management effectiveness in Ramsar sites – distribution of scores	Protected areas management effectiveness	None	None
F: Overall population trends of wetland taxa (i) Status and trends of waterbird biogeographic populations	Trends in abundance and distribution of selected species	Trends in abundance and distribution of selected species: European butterflies and common birds	None
G: Changes in threat status of wetland tax (i) Wetland Red List Index	Change in status of threatened species	IUCN Red List for European Species Change in status of species of European interest	MDG7: Ensure environmental sustainability 7.7 Proportion of species threatened with extinction
H: The proportion of candidate Ramsar sites designated so far (i) Coverage of the wetland biodiversity resource by designated Ramsar sites	Coverage of protected areas and overlays with biodiversity Status of resource transfers: official development assistance in support of the Convention	Trends in national establishment of protected areas Designated sites under the EU Habitats and Birds Directives	MDG7: Ensure environmental sustainability 7.6 Proportion of terrestrial and marine areas protected.

[145] Adapted from Ramsar COP10 Doc.23

Q. Review of assessments and their role in the conservation and sustainable use of biodiversity and ecosystem services

1. Assessments are social processes, which aim to bring the findings of science to bear on policy and decision-making. They involve a dialogue and interface between the policy or decision-making community and the scientific community, in order to: 1) determine and articulate policy needs for scientific information; 2) to respond to those needs through a credible process of information compilation and then critical judgement of that information; and 3) the communication of the assessment findings to decision-makers in a policy-relevant manner. Although scientific reviews have been widely conducted, assessments on biodiversity and ecosystems services, which provide critical judgement of the information in response to the needs of decision-makers, are relatively recent.

2. Assessments can be undertaken at multiple scales, to meet the needs of multiple or single decision-makers, and there is a wide variety of existing and recent assessment initiatives focused on biodiversity and ecosystem services at global, regional, national and local scales.

Recent and ongoing assessment initiatives

3. During the last decade, there has been a proliferation of assessments relating to biodiversity and ecosystem services, at global and sub-global scales. Drawing on early experiences of the Intergovernmental Panel on Climate Change (IPCC) and other assessments such as on ozone and on biodiversity in the 1990s, the most recent series of global assessments have increasingly been designed to be policy-relevant, credible and legitimate. They have also increasingly aimed to be more integrated in the manner in which biodiversity and ecosystems services issues are assessed.

4. Key amongst recent global assessments of biodiversity and ecosystem services have been the Millennium Ecosystem Assessment (MA), the 4th Global Environment Outlook (GEO4), the IPCC 4th assessment report (AR4), the International Assessment of Agricultural Science and Technology for Development (IAASTD), the Comprehensive Assessment of Water Management in Agriculture (CAWMA), the 2nd Global Biodiversity Outlook (GBO2), the 2005 Forest Resources Assessment (FRA), the Global International Waters Assessment (GIWA), and the global Assessment of Peatlands, Biodiversity and Climate Change.

5. The thematic focus of recent global assessments varies between those focusing strictly on biodiversity assessment, such as the GBO or IUCN Red List assessments, those encompassing a broad ecosystem service assessment, such as the MA and GEO, and those focussing on a narrower range of specific ecosystem services, such as FRA, GIWA, IAASTD, LADA. Likewise, many of the recent and ongoing global assessments cover a full range of ecosystems, such as in the MA, GEO, and IPCC, and some focus on specific ecosystem types, such as GIWA, LADA, FRA, and the Assessment of Peatlands, Biodiversity and Climate Change.

6. Most recent and ongoing assessments evaluate both environmental and socio-economic factors. Key elements include: status and trend of natural resources and their relationship with human well-being and development, environmental issues and impacts of drivers of change on the environment, and scenarios and response options. Only one of the ongoing global assessments, the Global Biodiversity Outlook (GBO), additionally evaluates the implementation of a specific corresponding policy mechanism (the CBD) for its impact on biodiversity and ecosystem services. The World Water Development Report (WWDR) and the Comprehensive Assessment of Water Management in Agriculture (CAWMA) also considered the effectiveness of resource management, but not with regards to a particular policy, and the MA considered the effectiveness of a broad range of policy responses, but not comprehensively with regard to particular policy mechanisms.

7. In addition to variation in content and coverage, recent assessments also vary considerably in their design and process. Some, such as the MA and GIWA, were designed as one-off assessments that could be repeated in the future should the demand and resources exist. Others, such as GEO, GBO, IPCC, and FRA, are part of ongoing assessment initiatives (see diagram illustrating schedule and Table below). Some, such as the MA, the IPCC and GEO, involve a broad spectrum of the scientific community, whilst others, such as the GBO and FRA, are based on contributions from a more selective group of experts (see Table below). The breadth of stated target audiences also varies considerably between assessments.

8. There is a wide range of scientific community and non-governmental involvement in assessments. Assessments with high numbers of individual involvement (1000-2500 individuals) include MA, IPCC, GIWA, and the RedList assessments. Assessments with medium involvement (400-900 individuals) include CAWMA and the GEO. Assessments with low involvement (<60 individuals compiling the assessment material) include AoA (GMA), FRA, TEEB, GBO, and WWDR. Despite the relatively smaller number of scientists involved in some of these processes, many of these assessments have very strong and credible scientific involvement within

multi-stakeholder advisory groups or guidance teams, and often draw on the work of many hundreds or more individuals beyond the direct assessment team.

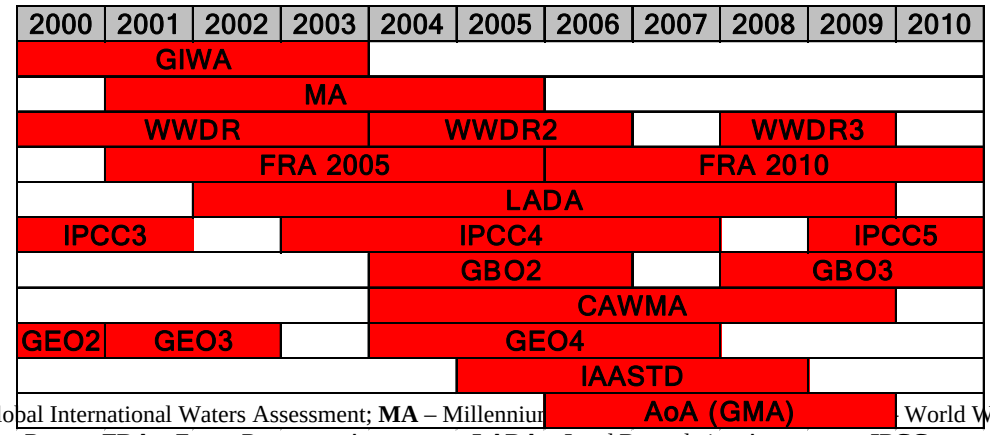
9. In the case of terrestrial biodiversity and ecosystem services, the vast majority of the data and much of the expertise for its analysis is found in civil society – including in the various science institutions and networks, and in non-governmental organisations at national, regional and international scales. Data, information and expertise is also held by local communities, and the private sector (especially in the case of some provisioning services).

10. A number of recent global assessments, such as GEO4, and the IPCC 4th assessment, have been overseen by intergovernmental governance bodies, providing significant legitimacy for their findings amongst national governments. In the case of the MA and IAASTD, the assessments were overseen by a multi-stakeholder board, including governmental, non-governmental and private sector stakeholders. Experiences from these and earlier assessments, such as the Global Biodiversity Assessment in the mid-1990's, suggest that strong governmental involvement in assessment governance supports (although does not guarantee) the uptake of assessment findings by governments. In addition to Governments, many civil society actors, including NGOs, private sector organisations, and community groups are also key users of assessment information.

11. Along with the recent proliferation of global assessments, there has also been an increasing number of sub-global assessments conducted and planned in the last decade – at scales from continental to local communities. The MA, GIWA, GEO4 and IAASTD explicitly included sub-global (in most cases regional, and in the case of the MA some multi-scale) assessment elements. A range of independent regional assessments have also been conducted, such as the Arctic Climate Change Impact Assessment, and there have been many national level assessment-type activities, often as part of national state of the environment reporting processes. In the coastal and marine realm, the Global and Regional Marine Assessment Database (GRAMED) lists more than 70 regional assessments.

12. Sub-global assessments vary considerably in their scope and coverage, depending on the geographic location and information needs for decision-making at the scale of assessment. They also use a wide variety of data and indicators, which has allowed for those assessments to better respond to user needs at the scale of operation.

Schedule of key international biodiversity and ecosystem services assessments, 2000-2010.



GIWA - Global International Waters Assessment; **MA** – Millennium [illegible] World Water Development Report; **FRA** – Forest Resources Assessment; **LADA** – Land Degradation Assessment; **IPCC** – Intergovernmental Panel on Climate Change; **GBO** – Global Biodiversity Outlook; **CAWMA** – Comprehensive Assessment of water management in agriculture; **GEO** – Global Environmental Outlook; **IAASTD** – International Assessment of Agricultural Science and Technology for Development; **AoA (GMA)** – building the foundations for a Regular Process for the Global Reporting and Assessment of the state of the marine environment, including socio-economic aspects.

Strengths of existing processes

13. There is no doubt that issues which have been treated comprehensively by a credible, legitimate and relevant assessment processes have had higher political prominence, and have been addressed in more comprehensive and sophisticated ways in policy fora than those issues which have not been considered by such assessments. The Scientific Assessments of Ozone depletion, and the IPCC, for example, have had considerable impact on the discourse and (in the case of climate change, ongoing) policy processes. It is a widely held belief that this is in large part due to the intergovernmental character of the governing bodies of these assessments.

These assessments are frequently cited as the latest source of credible information, including in decisions of the MEAs and in ongoing policy dialogues.

14. The Millennium Ecosystem Assessment, despite being frequently cited as falling short in its communication potential, has however brought the concept of ecosystem services, and to some degree the process of integrated assessment, into mainstream environmental and development political processes, and is frequently cited in environmental, and development dialogues. Likewise, GBO2 remains a key point of reference within the CBD to the status of global biodiversity. For those user communities that have requested scientific information, and for which assessments have been undertaken at the particular scale and with the particular focus of relevance, there have been considerable benefits from the recent series of assessment initiatives. In particular, regular assessments, such as the IPCC, the Ozone assessment, the GBO, and FRA, provide an opportunity to periodically update the state of knowledge, and to provide focused assessment on emerging policy issues.

Weaknesses, gaps and needs in assessment processes

15. Although many recent assessments have been designed with the explicit intention of influencing decision-makers within the context of Multilateral Environmental Agreements, only very few, including the MA, IPCC, LADA and GBO, have been explicitly endorsed by those MEAs that they seek to inform. Of the assessments explicitly endorsed or otherwise officially recognised by MEAs, only the IPCC and GBO are anticipated to be repeated in the future - the remainder were conceived as one-off initiatives. Other assessments, such as GEO and GIWA have been endorsed by other decision-making, or intergovernmental, fora such as the UNEP Governing Council. Lack of endorsement by the MEAs can restrict the ability of MEA Secretariats to play a role in supporting the assessment processes, and communicating their findings to Government users. Although some assessments with intergovernmental governing bodies have had relatively little impact on policy processes, it is clear that formal recognition and endorsement by users is critical for the successful impact of an assessment.

16. At the sub-global scale there remains relatively little coherence or coordination between approaches to assessment within and between scales. Even those assessments that are well networked within the MA follow-up process make use of a wide variety of data and indicators within a diversity of thematic scope and geographical coverage, which complicates the synthesis of lessons across assessment initiatives, and hampers the process of drawing conclusions relating to multi-scale aspects of biodiversity and ecosystem services. There remains significant potential for better linking assessments at different geographic scales, and with different but related thematic foci, through the use of a core set of common, scaleable variables. This would allow for the assessment of linkages between ecosystem services at different scales – for example global climate regulation and local climate-related hazard prevention. Likewise, effective and coherent assessments linking global and local values of biodiversity conservation have been limited to date.

17. A wide variety of conceptual frameworks are also used for assessment design and implementation, although at a global scale for recent integrated assessments, and in many regional and national assessments, there has been an increasing convergence on variations of the framework developed in the MA global and sub-global assessments (an ecosystem services and human well-being focused variation of the DPSIR framework). The forthcoming publication of the MA methodology manual, currently being finalised by UNEP-WCMC and partners, is likely to help considerably in bringing coherence to assessment process and design in the future, although there remains a continued need for coordination, and remains a gap in any process by which syntheses from the ongoing and completed sub-global assessments can be drawn in the future.

18. Many assessment initiatives have been limited by data and information availability. This is the case at all geographic scales for a range of ecosystem services and for biodiversity. Gaps in data for biodiversity and non-provisioning ecosystem services are particularly widespread, and in many cases prevent more comprehensive assessment being completed at global, regional, national or local scales. In terms of scope and coverage of ecosystems considered by biodiversity and ecosystem services assessments, there has also been relatively less assessment focussed in some key biomes and system types, including islands, mountains, wetlands, oceans, polar and urban systems. Relatively less attention has also been given to regulating and supporting services, and there remain key assessment gaps on the interlinkages between biodiversity and climate change.

19. Whilst there are expected to be ongoing periodic assessments planned that focus on climate (IPCC), water (WWDR), forest resources (FRA) and biodiversity (GBO), (see diagram illustrating schedule) few of these or other ongoing assessments provide flexible mechanisms to respond to demands from Multilateral Environmental Agreements for targeted or rapid integrated assessments on emerging issues relating to biodiversity and the full spectrum of ecosystem services. In addition, although there may be spin-off benefits from the convening of the scientific community which helps to accelerate the publication of scientific papers,

the long time-scale periodicity of the ongoing global assessments can preclude responding to many emerging issues in a timely manner to guide decision-making, even for those selected issues which are covered by such assessments.

Global assessment initiatives relating to biodiversity and ecosystem services

Assessment	Focus	Timeframe	Key elements	Scale	Scientific Involvement	Target audience	Website
CAWMA	Water and Agriculture	One-off.	Benefits, costs and impacts of water management.	Global and national (developing countries).	~700 agricultural and environmental scientists.	Investors, private sector, and decision-makers.	www.iwmi.cgiar.org/Assessment/
FRA	Forest resources	Periodic (5 years)	State of forests, drivers of pressures and change.	Global, regional, and national.	Global advisory group guides compilation of national data.	National policy-makers, and international negotiations.	www.fao.org/forestry/fra
GBO	Biodiversity	Periodic - 2001, 2006, 2010	Status and trends of biodiversity and analysis of CBD implementation.	Global.	Summary of existing information by selected experts.	CBD and governments.	www.cbd.int/gbo
GEA	Energy	One-off.	Issue analysis and assessment of challenges.	Global, regional, national, typological.	~25 experts.	UNCED, CSD, and EU Energy Initiative for Poverty Eradication.	www.iiasa.ac.at/Research/ENE/GEA
GEO	Environmental change and development	Periodic global and regional assessment. Ongoing sub-global reporting.	State and trends of environment, human dimensions of change, scenarios.	Global and regional.	~400 individual scientists involved as authors and reviewers in GEO4.	UNEP Governing Council, and governments.	www.unep.org/geo
GIWA	International waters	Global assessment in 2006, sub global assessments in 2005.	Status and scenarios for transboundary waters (coastal and inland).	Global, regional, and subregional.	~2000 experts and scientists.	Decision-makers, environmental managers, GEF and its partners.	www.unep.org/dewa/giwa/
IAASTD	Agriculture	One-off	Agricultural knowledge, science and technology.	Global and 5 regions.	~900 experts and scientists.	National and local governments, and international agencies.	www.agassessment.org/
IPCC	Climate change	Periodic (~5 years)	Assessment causes, impacts, and scenarios for adaptation and mitigation.	Global, regional, and sub-regional.	~2500 authors and reviewers in AR4.	Public, private sector, national and international conventions.	www.ipcc.ch
LADA	Land degradation	One-off	Status assessments, monitoring methodology, strategy recommendations.	Global, national and local.	22 international and national partner organizations and agencies.	UNCCD and national governments.	www.fao.org/nr/lada/
MA	Ecosystem Services and Human Well-being	One-off global assessment 2001-2005. Sub-global assessments ongoing	Assessment of status, scenarios and response options.	Global and ~30 sub-global assessments from local to regional.	~1300 individual scientists involved as authors and reviewers.	CBD, Ramsar, UNCCD, CMS, and Private Sector	www.MAweb.org
Red List	Conservation status of species in the wild	Ongoing assessment, with periodic updates	Threat assessment of species.	Global.	~2500 members of IUCN's Species Survival Commission.	Species conservation practitioners and policy makers.	www.iucn.org/redlist
TEEB	Economics of biodiversity and ecosystem services	One-off, currently ongoing	Analysis of costs of biodiversity loss and ecosystem services, and costs of management.	Global.	Selected experts.	Decision-makers, and CBD.	ec.europa.eu/environment/nature/biodiversity/economics
WWDR	Water resources	Periodic - 2003, 2006, 2009	Status assessment on freshwater resources and analysis of management.	Global, regional, and basin.	24 UN agencies + international partners.	Decision-makers.	www.unesco.org/water/wwap/wwdr

R. Examples of horizon scanning and futures techniques for providing early warnings on emerging issues of concern

1. Horizon scanning can be defined as "*the systematic examination of potential threats, opportunities and likely future developments which are at the margins of current thinking and planning*"[146]. It can be used as the first stage in a futures or foresight approach, where horizon scanning identifies emerging issues and trends that can then be explored in detail using a diversity of futures techniques. Such approaches are best developed in the business sector for analysis of future markets, strategic planning and risk management, but have been increasingly used by governments, particularly in response to international security and health concerns. The environment, including biodiversity, has increasingly featured in such exercises with recognition that environmental degradation will have a significant impact on future development, security and the economy. In turn, a number of programmes have emerged to assess the potential impacts of future social, economic and environmental trends on biodiversity.

The horizon scanning process

2. A useful generic framework for horizon scanning is proposed by the SKEP (Scientific Knowledge for Environmental Protection) ERA-Net project, based on their review of environmental horizon scanning across EU member states[147]. This presents a process with three main elements:

3. Gathering knowledge: a first step that generates a large volume of information on future issues and trends from a wide range of sources e.g. science and technology publications; conference proceedings, patent applications; media sources; policy and political developments; and individual testimonies from experts, activists, analysts, politicians, business leaders and lay people. This information can be gathered with broad literature and internet reviews; and by stakeholder engagement through interviews and workshops.

4. Organizing knowledge: developing scenarios, sorting issues for their likely importance and prioritising issues for further exploration. This tends to involve the use of criteria that 'rank' issues on likely importance, and consultative process with stakeholders.

5. Using the outputs: e.g. to inform research strategies, design policies or to initiate and inform dialogue with stakeholders.

6. The SKEP review stresses the need for adequate stakeholder engagement in each stage of this process to gather knowledge from all relevant sources; confront different perspectives; make planning procedures more legitimate and democratic and ensure stakeholders are committed to implementation. This is particularly important where issues are highly contentious or there is a high degree of uncertainty. This will require adequate participation of all stakeholders including researchers, policy makers and the public.

Futures techniques and initiatives

7. In addition to scenarios, which are discussed elsewhere in this gap analysis, a wide range of futures techniques can be used to explore issues raised through horizon scanning, ranging from the simple workshop-based techniques, to the highly sophisticated. Examples are provided in the following table as illustrations of some of the most relevant initiatives.

8. A number of countries have established national horizon scanning or foresight initiatives that cover sustainable development and environment issues, including biodiversity (some examples are included in the table). These have not been reviewed comprehensively but are likely to provide important sources of information that could be integrated into international assessments.

9. Finally, even a quick literature review reveals significant published research concerned with future trends and scenarios for biodiversity - including those linked to one or to multiple drivers of biodiversity loss such as agriculture, land use change, climate change, energy scenarios etc. Without more extensive review it is not possible to know how involved policy makers have been in this research or the uptake of such research in policy making.

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[146] Defra, UK definition of Horizon scanning 2002. See horizonscanning.defra.gov.uk/

[147] SKEP ERA-net : Scientific Knowledge for Environmental Protection. How to identify emerging long term strategic issues for environmental research and policies: A diversity of possible approaches. See www.skep-era.net/site/files/WP6_%20Diversity%20of%20approaches191206.pdf.

Examples of futures initiatives

Organisation	Programme	Description	Outputs
Africa Biodiversity Collaborative Group	Mapping future trends and interventions for biodiversity policy over the next 10 years.	On 15 May 2008 ABCG organised a meeting on *Mapping future trends and interventions for Biodiversity conservation in Africa over the next 10 years* supported by the USAID/Africa Programme[148]. The meeting sought to identify the drivers of past, present and future change in biodiversity in Africa, map trends and identify predictable trends and key uncertainties. This meeting was followed by a workshop on *The Future of Biodiversity in Africa* (September 2008) where African conservation leaders were engaged in narrating alternative futures for biodiversity in Africa and interventions appropriate for USAID and other stakeholders into the future. This exercise produced a shared vision statement and highlighted key necessary interventions for biodiversity. This was used by African partners and by US AID and other donors in their biodiversity programming.	Vision for biodiversity and reports
Institute for Futures Studies and Technology Assessment		German non-profit research institute. Addresses a range of sustainable development issues.	Various
IUCN	Future of Sustainability	This is an international consultative process aiming to develop a new sustainability vision and strategy relevant to the global challenges of the 21st century such as climate change, peak oil, continuing loss of biodiversity, poverty and unsustainable production and consumption. It aims to engage leading thinkers and institutions from around the world at global and regional level, and from different constituencies including conservation and environment leaders; government representatives; economists; the social justice community; business leaders; and young people. It is employing traditional discussion forums as well as Web2 and mobile phone technologies to generate and share new concepts. The ideas generated by the initiative will help inform the long-term direction and strategy of IUCN.	Various
Landcare Research	Future Scenarios for New Zealand Biodiversity	Four contrasting futures scenarios.	Reports and Scenarios game
OECD	International Futures Programme	The OECD International Futures Programme aims to provide the organisation with an early warning of emerging issues, pinpoint major developments, and analyse key long-term concerns to help governments respond. The Programme uses a variety of tools including multi-year projects, high-level conferences, expert workshops, and consultations, a futures-oriented online information system, and a network of contacts from government, industry, academia and civil society. Ongoing projects include 'The Bioeconomy to 2030[149] – focusing on the broad range of economic activities arising from the biosciences (including biofuels).	Various
Scientific Knowledge for Environmental Protection- EU Framework project	Workpackages include investigating emerging issues for future research planning	Network of Environmental research funders with aim of improving co-ordination of research.	Various. Including on emerging technologies and review of horizon scanning approaches across European Member states.
Shell	Global energy scenarios 2050	To assist thinking about the future of energy, Shell has developed two scenarios[150] to describe alternatives ways that energy consumption and production may develop. Shell uses these scenarios to test their strategy against a range of possible long-term developments and to examine and communicate ways in which a more sustainable future could be achieved.	Scenarios reports and toolkits
Siemens	Pictures of the future programme	Scenarios of tomorrow's world and technologies over next two decades, including environmental technologies	Quarterly publications

[148] Reports and documents at www.abcg.org/

[149] See www.oecd.org/department/0,3355,en_2649_36831301_1_1_1_1_1,00.html

[150] See www.static.shell.com/static/aboutshell/downloads/our_strategy/shell_global_scenarios/SES booklet 25 of July 2008.pdf

Organisation	Programme	Description	Outputs
The next 20 years series	Forecasts on the future	Online discussion and (US-based) seminar series on emerging trends and scenarios	Online resource includes selected articles on all key trends
University of Cambridge, UK and the Cambridge Conservation Initiative	Conservation Futures Programme	Partnership between the university of Cambridge and 8 conservation organisations (BirdLife International, British Trust for Ornithology, Fauna and Flora International, RSPB, IUCN, TRAFFIC, Tropical Biology Association and UNEP-WCMC) to identify and address emerging issues for conservation and to foster closer integration between research and policy	Includes Sutherland et. al. 'An assessment of the 100 questions of greatest importance to the conservation of global biodiversity' a collaborative exercise between CCI and a range of other partners.
University of Stellenbosh	South African Institute for Futures research	Specialises in futures research as support for corporate strategic management	Various (e.g. ecosystems and business)
UK Global Environmental Change Committee	Global Biodiversity Subgroup	Group consisting of key government and other funders of biodiversity research in UK. Set up to identify and review research gaps and recommend strategic priorities for UK and EU science.	Most recent reports on Ocean Acidification and Biodiversity and climate change.
UK Government Office for Science	Horizon Scanning and Foresight programmes	Regular cross-government strategic Horizon Scans- particularly to spot implications of emerging science and technology; and in depth exploration of selected issues using a range of futures techniques. Current topics include Land Use and Sustainable Energy	Sigma scan- issues across public policy agenda Delta scan-future science and technology issues and trends and their implications Briefing papers on key S+T issues Reports on future evolutions and challenges and options to address these
US Environmental Protection Agency	Environmental Futures Programme	Programme to develop organisational capacity for foresight and pilot futures activity on key issues	Recent outputs include a review of 'Second life' and potential opportunities for EPA
Wildlife Conservation Society	Futures Group	The Wildlife Conservation Society (WCS) futures group was formed in 2004 to give WCS broad guidance on how it should think about the long-term future. Through a process led by Bio-era (an independent research consulting firm) the group developed a series of scenarios151 to explore how conservation activities and strategies might shift over the next 20 years in response to global circumstances and the interplay between politics, technology, economics; and to highlight where WCS might need to adapt its strategies and develop new capabilities. WCS view these scenarios as a 'first step' in thinking about how opportunities and challenges for conservation could change in the future; and to engage stakeholders in further discussion.	''Future of the wild' report- 6 scenarios and key questions raised for WCS/conservation

S. Review of Capacity Fundamental to the Science-Policy Interface through National Capacity Self-Assessments

1. Capacity building for biodiversity and ecosystem services is a cross-cutting and multi-level key constituent for environmental governance in which all legitimate stakeholders exercise their rights equitably,

[151] See www.wcs.org/media/file/Futures_of_the_Wild.pdf

through informed and active participation. The importance of capacity building is recognized by all Rio Conventions[152] and actively implemented by national and international stakeholders.

2. There are three levels for targeted national capacity building action: the individual, the institutional and the national systemic levels. Capacity building efforts are likely to have the greatest impact if they are considered as part of a holistic approach. The outcomes to be achieved should contribute to all levels, especially the individual and the institutional.

3. There are many institutions, programmes and processes supporting capacity building in developing countries and countries with economies in transition, including UNDP, UNEP and FAO, GEF and a wide range of other multilateral and bilateral development assistance agencies, most of the MEAs, as well as some assessment processes. For example the following.

4. The UN Development Assistance Framework (UNDAF)[153] describes how UN agencies and programmes working at the national level can coherently respond to the priorities identified in national development frameworks supporting countries in achieving MDG-related national priorities. Capacity building needs of developing countries are identified in many of the National Biodiversity Strategies and Action Plans (NBSAPs) developed in the context of the CBD, the Poverty Reduction Strategy Papers, the National Adaptation Programmes of Action to Climate Change, and so on. Building on these nationally identified priorities, the UN Development Assistance Framework identifies how UN agencies and programmes working at the national level can support countries in achieving MDG-related national priorities.

5. The UNEP Bali Strategic Plan for Technology Support and Capacity-building[154] provides for a framework and systematic measures for technological support and capacity building based on national or regional priorities and needs:

a) To strengthen the capacity, in particular of developing countries and countries with economies in transition, to, inter alia: participate fully in the development of coherent international environmental policy, particularly with regard to MEAs; improve compliance with international agreements and implementation of their obligations at the national level; and improve achievement of national environmental goals, targets and objectives; and

b) To support a number of important capacity building needs, including the need to strengthen national capacities for data collection, research, analysis, monitoring and integrated environmental assessment; support for assessments of environmental issues of regional and subregional importance and for the assessment and early warning of emerging environmental issues; support for scientific exchanges and for the establishment of environmental and inter-disciplinary information networks; and promotion of coherent partnership approaches.

6. The National Capacity Self-Assessment (NCSA) programme for environmental management,[155] established by the GEF, in collaboration with United Nations Development Programme (UNDP) and the United Nations Environment Programme (UNEP), to identify capacity needs of developing countries to effectively meet the challenges of national and global sustainable development and environmental governance, and to strategically enhance their capacity.

7. However, despite these efforts, there remain considerable gaps in capacity relevant for the science-policy interface on biodiversity and ecosystem services in developing countries, and the capacity divide continues to be a severe obstacle to equitable participation of developing countries and those with economies under transition in the processes relevant to the science-policy interface on biodiversity, ecosystem services, and beyond.[156,157]

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[152] Scientific research, training, information exchange and capacity-building provisions are provided for by Articles 12-17 of the Convention on Biological Diversity.

[153] http://www.undg.org/?P=232

[154] UNEP/GC/23/6/Add.1

[155] GEF/C.22/8, Strategic Approach to Enhancing Capacity Building

[156] Karlsson, S. *et al*. 2007. Understanding the North-South knowledge divide and its implication for policy: a quantitative analysis of the generation of scientific knowledge in the environmental sciences. *Environmental Science and Policy* 10(7): 668-684; Najam, A. 2005. Developing Countries and Global Environmental Governance: From Contestation to Participation to Engagement. *International Environmental Agreements: Politics. Law and Economics* 5(3); UN/JIU/REP/2008/3

[157] Najam, A. (2005) Developing Countries and Global Environmental Governance: From Contestation to Participation to Engagement. *International Environmental Agreements: Politics, Law and Economics* 5: 303–321.

8. A sample of 26 NCSA reports[158] (out of 80 completed projects with reports accessible through the Programme's website) was analysed for common capacity priority constraints. Because of the cross-cutting nature of natural resources, relevant needs identified under cross-cutting issues[159] were considered, in addition to findings under the biodiversity thematic assessment. Specific objectives[160] of NCSAs varied according to each country's background, however most recommendations strongly supported the strengthening of existing institutional frameworks along with meeting individual capacity needs to supply needed human capacity. The results of this review are used in the following analysis.

Capacity for effective communication of knowledge needs

9. In countries with limited scientific and technical capacity, instructions on research priorities from policy makers are often 'vague' since they tend to leave science to scientists. There is a minimum level of environmental awareness needed on the part of policy makers to adequately formulate the need in term of scientific information for the policy processes.

10. Academies of Science, Science and Technology Councils and other similar institutions play vital framework and coordination roles for knowledge production, standardization and management. However these institutions lack in many developing countries; and where they exist, they largely depend not on funding from national government but often support from abroad. For example in Africa in 2001, only nine out of 53 countries had independent Science Academies.[161]

11. Effective coordination of scientific and technological research has the potential to stretch often limited budgets. This is particularly essential in developing countries and economies in transition where R&D budgets as a proportion of national GDP is very small.[162] Cooperation between researchers and institutions inside a country, including data and facilities sharing, can improve its effectiveness in knowledge production. NCSAs highlighted the following as some of the key priorities in identifying and communicating knowledge needs:

a) build institutional capacity in assessing research gaps for actual and future knowledge and information needs for effective policy-making;

b) create or strengthen frameworks to guide research programmes in a coherent manner, responsible for standardised research (serve as guarantors of research quality) and increase credibility in science-policy interface;

c) establish clear coordination mechanisms between knowledge producers and knowledge users to support policy-making processes; and

d) build institutional capacity to raise funds (from government, business and elsewhere) for research projects and programmes for individual and institutional capacity building, and knowledge production.

Capacity for effective production of scientific knowledge relevant to policy needs

12. Adequate information for the science-policy interface is lacking where knowledge generation capacity is in short supply or poorly coordinated. In the absence of empirical data, one alternative is the knowledge gleaned from case studies as source of information. Often the urgency and scale of challenges at hand do not favour such an approach.

13. Where scientific and technological capacity is in good supply, by pursuing their endogenous interests, researchers' combined output generate enough new knowledge out of which needed information to feed into

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[158] http://ncsa.undp.org/. Sample countries are: Azerbaijan, Belarus, Belize, China, Ecuador, Eritrea, Ghana, Guyana, Hungary, India, Indonesia, Jamaica, Jordan, Kazakhstan, Liberia, Malaysia, Morocco, Namibia, Palau, Philippines, Solomon Islands, Sudan, Uganda, Uruguay, Venezuela and Yemen.

[159] These reflect an increased relevance for biodiversity and ecosystem services in the wider context of the sustainable development. See: Adomokai, R. & Sheate, W.R. 2004. Community participation and decision making in the Niger Delta. *Environmental Impact Assessment Review* 25(5): 495-518; Najam, A. 2005. Quoted above.

[160] General guidelines include: (a) to identify or review priority needs for action in three thematic areas (including Biodiversity); (b) to explore related capacity needs within and across the thematic areas (including Ecosystem Services); (c) to prepare a plan of action to address the capacity needs, including funding options; and (d) to identify synergies between country action and other plans within the environment framework.

[161] Hassan, M.H.A., 2001. Can science save Africa? *Science* 292.

[162] Karlsson, S., Srebotnjak, T., Gonzales, P., 2007. Understanding the North-South knowledge divide and its implication for policy: a quantitative analysis of the generation of scientific knowledge in the environmental sciences. Environmental Science and Policy, 10 (7), p. 669.

decision-making processes can be assembled. However, in developing countries, such capacity tends to be lacking. This leads to channelling of existing capacity to more policy-specific areas of need. The resulting lower visibility and presence at the global stage has potential to affect scientific legitimacy in the science-policy processes.

14. In the absence of adequate scientific information, policy makers' choice is either to rely on less relevant information, outsource such advice from abroad, or ignore the need for scientific advice in policy-making. Credibility of scientific knowledge and legitimacy of the scientific community might be compromised. Other salient priorities include:

a) consolidating education in science and technology from primary to tertiary, to nurture talents and produce the number of graduates needed by institutions and the community at large;

b) building sufficient level of individual scientific manpower (taxonomists, ecologists…) to document and supply baseline data, knowledge and information on key components of biodiversity and natural resources;

c) building adequate data and knowledge management capacity (establish, consolidate and utilise baseline and monitoring data) to support planning mechanisms at various levels;

d) strengthening capacity to link scientific research with indigenous knowledge in all areas in addition to the traditional sectors of traditional medicine and food production;

e) developing, adapting and monitoring practical indicators and putting in place early warning systems for environmental emergencies to inform policy response; and

f) using innovation in research and policy-making to respond to new threats such as the invasive species or climate change to biodiversity and natural resources.

Capacity for effective communication of knowledge to decision makers and the public at larger

15. Putting in place legal framework that gives a right to participate is not enough to generate people's participation.[163] Effectiveness of community participation in environmental decision-making requires an understanding of political context, suitability of the decision-making process, and community awareness of environmental issues. The lack of adequate level of awareness has double negative implication: low level of public participation to decision-making and difficulties in complying with resulting new policies. Therefore achieving good level of awareness about environmental issues among the general public is a major goal in capacity building. The following were also identified as ways of building this capacity by NCSAs:

a) build capacity of policy-makers to grasp the essence of environmental issues, key concepts to effectively use scientific information in their deliberations;

b) build capacity of knowledge producers to communicate effectively their findings to policy makers and the large public;

c) use training, education and awareness-raising as channels to knowledge and information sharing with the public to gain their interest and participation;

d) strengthen capacity to document and disseminate indigenous knowledge and practices in natural resources management beyond the traditional sectors of traditional medicine and food production; and

e) facilitate access (availability and accessibility) to knowledge and information between all interested stakeholders.

Capacity for effective use of knowledge in formulating policy choices and their implementation

16. Rio Conventions obligations consistently call for the establishment of legal and institutional enabling frameworks at national level for their implementation. This constitutes the overall environment in which policy making processes can take place. It facilitates the mainstreaming of environmental issues into national plans and provides required resources for action. The increase in the number of ministries of environment throughout developing countries over the past three decades is herald to reflect the acceptance of environmental issues as a priority.[164]

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[163] Adomokai, R. & Sheate, W.R. (2004) Community participation and environmental decision-making in the Niger delta, Environmental Impact Assessment Review, 24 (5): 495-518.

[164] Najam, A. 2005. Developing Countries and Global Environmental Governance: From Contestation to Participation to Engagement. *International Environmental Agreements*. 5: 303-321.

17. However a sizeable number of NCSAs reported ineffective frameworks to guide action for biodiversity and natural resources in a coherent manner. The need for inter-institutional coordination and participation mechanism was also underlined.

18. For regional and international policy making, negotiators from all countries are increasingly required to assimilate vast amounts of scientific information at ever increasing rates[165]. Sufficient capacity means multidisciplinary teams that include sufficiently qualified members to access and interpret such information in light of issues on the negotiating table. Inter-disciplinary capacity also helps handling cross-cutting issues such as potential impacts of trade agreements and policies on biodiversity and natural resources more effectively.

19. Overall, the following were typical priorities in building capacity to effectively use existing knowledge:

a) build capacity at systemic level to serve as a framework for management of all the policy-making processes;

b) acquire capacity to combine and use environmental, social and economic information on a suitable scale for sustainability, vulnerability or adaptation studies;

c) enhance effectiveness of inter-institutional coordination and participation mechanism;

d) put in place and publicise mechanisms for community participation in decision-making on environmental issues;

e) strengthen institutional adaptability and ability to innovate and meet new challenges; and

f) build individual and institutional capacity in negotiation skills and policy formulation of processes especially at levels higher than the national level.

Some lessons learnt from NCSA Programme

20. By their "national" focus, NCSAs did not consider capacity (in data, knowledge, information) that might exist outside national borders, in countries which may be facing similar issues. Such data and knowledge could be very relevant to science-policy interface or requiring minor adjustment to be used (knowledge doesn't have to be internally-generated for each country to be useful to its policy needs). NCSAs identified opportunities for UNDP/UNEP regional offices and other regional coordination mechanisms to facilitate data, knowledge and information sharing, capacity exchanges and synergies at regional level.

21. From ongoing debates on data sharing and publication[166], many potential benefits are anticipated to be gained from such widespread data availability. However, getting access to data only represents a first step in acquiring sound information for decision-making and implementation. Scientific and technological know-how would be needed to fully equip most NCSA countries take full advantage of such data.

22. Capacity building is one of major areas for bilateral, regional and multilateral co-operation. Scientific institutions in developing countries still largely rely on the generosity of international donors rather than their own national governments to meet their basic financial and manpower needed. Ultimate solution may be found in addressing the underlying causes. UNIDO[167] singles out adequate levels of public investment in science and investment, combined with well designed and effectively implemented policies in developing world to achieve sustainable scientific capacity.

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[165] Karlsson, S., Srebotnjak, T., Gonzales, P., 2007. Understanding the North-South knowledge divide and its implication for policy: a quantitative analysis of the generation of scientific knowledge in the environmental sciences. *Environmental Science and Policy* 10(7) : 668-684

[166] Arunachalam, S. 2008. Open access to scientific knowledge. *DESIDOC Journal of Library and Information Technology* 28(1): 7-14; Arzberger, P *et al*. 2004. An international framework to promote access to data. *Science* 303(5665) 1777-1778; Costello, M.J. 2009. Motivating online publication of data. *BioScience* 59(5):418-427; Research Information Network 2008. To share or not to share: Publication and quality assurance of research data outputs. http://www.rin.ac.uk/data-publication.

[167] UNIDO 2005. Science, technology and innovation in developing countries: some elements for defining policies and assigning resources. IDR2005 Background Paper Series

T. Invasive Alien Species

1. Invasive alien species are species whose introduction and/or spread beyond their natural distribution threaten biological diversity. Invasive alien species are found across taxonomic groups (animals, plants, fungi and microorganisms) and are commonly regarded as one of the top three drivers of biodiversity loss. Increased trade, travel and tourism have facilitated the movement of invasive alien species increasing their potential range and rates of introduction with significant consequences. Invasive alien species impact a range of ecosystems (e.g., forests, marine and coastal area, dry and sub-humid lands, inland waters) and sectors (e.g., environment, agriculture, livestock, fisheries, forestry, trade, transport and human health).

2. At the ecological level, invasive alien species can change ecosystem structures by impacting ecosystem services and species compositions. In economic terms, some experts estimate the global cost of invasive alien species at US$1.4 trillion annually. Their movement and spread are also linked to other drivers of global change, such as climate change, desertification, fire, etc. Despite their relevance across a spectrum of environmental issues, invasive alien species have been addressed at differing levels of depth within major multilateral environmental agreements (MEAs), ranging from detailed discussions under the Convention on Biological Diversity to passing references under the U.N. Framework Convention on Climate Change and the U.N. Convention to Combat Desertification.

3. The present study will examine the extent to which invasive alien species have been addressed in MEAs and the type and level of scientific input into those discussions. The analysis will focus only on discussions, decisions and documentation specifically related to invasive alien species and not sub-items or passing references. MEAs considered include: the Convention on Biological Diversity (CBD); the Convention on International Trade in Endangered Species (CITES); the Convention on Migratory Species (CMS); the Ramsar Convention on Wetlands of International Importance; the U.N. Convention to Combat Desertification (UNCCD); the U.N. Framework Convention on Climate Change (UNFCCC); and the World Heritage Convention under the U.N. Educational, Scientific and Cultural Organisation (UNESCO). Consideration will also be given to independent organizations with relevant scientific and technical expertise, and their role in providing input into MEAs.

4. Convention on Biological Diversity (CBD): Invasive alien species are a cross-cutting issue under the CBD and are referenced in Article 8(h) of the Convention, which calls upon Parties to “prevent the introduction of, control or eradicate those alien species which threaten ecosystems, habitats or species.” The CBD’s Subsidiary Body on Scientific Technical and Technological Advice (SBSTTA) has addressed the issue six times, considering eight official background documents and fifteen information documents, and producing six recommendations. The Conference of the Parties (COP) has addressed the issue five times, considering three official background documents and five information documents, and adopting five decisions. Of SBSTTA’s information documents, four explicitly state that they were written by an external expert/consultant (the actual number may be higher), and eight are inputs from technical meetings and/or organizations. For the COP, two information documents are from external expert workshops. Additionally, both SBSTTA and the COP have considered invasive alien species in other thematic areas such as forest biodiversity, marine and coastal biodiversity, inland waters, island biodiversity, the Global Strategy for Plant Conservation, impact assessment and protected areas.

a) In addition to these inputs, the CBD Secretariat has facilitated external scientific and technical input into the Convention through a range of activities including:

b) Creating an International Liaison Group on invasive alien species including the secretariats of relevant international agreements as well as GISP and IUCN (2008);

c) Convening a meeting of an Ad Hoc Technical Expert Group (AHTEG) on gaps and inconsistencies in the international legal framework related to invasive alien species (2005);

d) Convening an invasive alien species liaison group which met in conjunction with a workshop on the Global Invasive Species Programme’s (GISP) first phase of activities (2000);

e) Co-convening an expert workshop on pre-screening imports of live animals in international trade with GISP, IUCN’s Invasive Species Specialist Group (ISSG) and the University of Notre Dame (2008);

f) Co-convening an expert workshop on potential terrestrial and aquatic elements of a joint work programme on invasive alien species with GISP (2005);

g) Co-convening an expert workshop on potential marine and coastal elements of a joint work programme on invasive alien species with GISP and the UNEP Regional Seas Programme (2005);

h) Inviting Hal Mooney, an invasive species expert and former chair of GISP, to make a keynote address to SBSTTA4 (1999).

5. The liaison group of 1999 and the AHTEG were both composed of representatives nominated by Parties and a number of "observers" from non-Parties, inter-governmental organizations and non-governmental organizations.[168] The liaison group included: 6 experts from governments and 10 experts not affiliated with a government. The AHTEG included: 14 experts nominated by Parties and 10 observers, 7 of whom were not affiliated with a government. Generally, the Party-appointed representatives were experts in their field (particularly with the AHTEG) although both groups did include individuals with a broader responsibility for the CBD and/or biodiversity within their government (i.e., the usual SBSTTA and COP delegates).

6. For input outside of governments, a number of SBSTTA and COP recommendations highlight and request input from GISP, particularly regarding its Global Strategy, management techniques, information resources and other expertise, as well as other expert organizations such as ISSG, DIVERSITAS and other multilateral agreements. Several of the information documents were prepared by these institutions, including a toolkit of best management practices, socioeconomic assessments of island ecosystems and inland water systems, and a guide to designing legal frameworks. Additionally, personal communication with present and former staff from GISP and ISSG indicate significant informal communication with the CBD Secretariat, particularly around the preparation of background documents and information for meetings of the COP, SBSTTA and the AHTEG. For example, in the context of COP9's in depth review on invasive alien species, GISP solicited input from all the Parties with a particular stress on those countries where GISP members had offices, and then helped compile input and extract general trends and capacity needs.

7. In addition to the International Liaison Group involving other agreements, the CBD Secretariat has used joint work plans with the Ramsar Convention and the International Plant Protection Convention to identify relevant areas of collaboration on invasive alien species. A memorandum of understanding has also been signed with GISP and a draft joint work programme has been developed to guide future work. Finally, the controversy surrounding the adoption of the COP Decision VI/23 in 2002 (which was a procedural issue arising from concern over trade-related language in the Guiding Principles for the Prevention, Introduction and Mitigation of Impacts of Alien Species that Threaten Ecosystems, Habitats or Species) arguably diverted attention at subsequent COP and SBSTTA away meetings from scientific and technical issues and toward broader political debates over trade and precaution.

8. Ramsar Convention on Wetlands of International Importance: Ramsar bodies have discussed invasive alien species on six occasions with one official background paper and one draft resolution for COP consideration. More specifically, the Scientific and Technical Review Panel (STRP) considered the issue four times and issued four STRP Decisions on the topic (STRP8-11, 1999-2003). Ramsar COP7 (May 1999, San Jose, Costa Rica) considered a background paper and keynote address presented by Dr. Geoffrey Howard with IUCN and affiliated with GISP. Decision VII/14 directed the STRP to consider the need for guidelines specific to wetlands in view of ongoing by the CBD (e.g., the Guiding Principles) and GISP. STRP8 then established a Working Group on Invasive Species to: comment on guidance being developed by IUCN and the CBD's SBSTTA; determine the sufficiency of such guidance for the Ramsar Convention and contribute to its development where appropriate; and provide input on risk assessment approaches.

9. Ramsar COP8 (November 2002, Valencia, Spain) considered a draft resolution (finalized as Decision VIII/18) but at the recommendation of the Standing Committee did not review the CBD's Guiding Principles as well as a draft guide on invasive alien species and wetlands prepared by Dr. Howard and approved by STRP10 (June 2001, Gland, Switzerland). The political controversy surrounding the adoption of Decision VI/23 and the Guiding Principles at CBD COP6 (April 2002, The Hague, Netherlands) consequently extended into the Ramsar Convention. Continued concern in the Standing Committee by a number of Parties involved in the CBD debates led to the removal of the draft guide and the CBD's Guiding Principles from consideration by Ramsar COP8.

10. The STRP's Working Group on Invasive Species was open to input and participation by outside experts including those from IUCN, GISP as well as the CBD Secretariat. The Working Group also developed formal inputs for consideration by the CBD SBSTTA and COP in negotiating the Guiding Principles (a formal presentation was delivered by the Ramsar Secretariat to CBD SBSTTA6 on behalf of the STRP). Ramsar and the CBD developed a joint work plan which was approved initially in 1998 and has included a number of subsequent updates. The Work Plan has included alien species as a cross-cutting element, and has included the

[168] Liaison groups are generally informal and are convened by the CBD Secretariat to gather and assess information on a specific topic. Ad Hoc Technical Liaison Groups are formally created and thereby are officially recognized within the Convention process, usually through production of their reports as SBSTTA or COP meeting documents.

work of expert groups like GISP and IUCN. Invasive alien species have also been referenced in Ramsar documentation and discussions around: application of the ecosystem approach; environmental impact and risk assessments; and national management of wetland sites.

11. Convention on International Trade in Endangered Species (CITES): The CITES process has considered invasive alien species on four occasions involving one background document and one revised resolution. COP13 (Bangkok, Thailand, October 2004) passed Resolution 13.10, which *inter alia* called for exploration of synergies with the CBD and instructed the CITES Secretariat, in conjunction with the Animals and Plants Committees, to establish cooperation with the CBD Secretariat and the ISSG. The CITES Plants and Animals Committees then considered the issue in two joint sessions (Geneva, Switzerland, May 2005; Lima, Peru, July 2006). For the Committee meetings in 2005, no background document was prepared although specific recommendations were made on listing potentially invasive CITES species and identifying possibilities for contributing to the implementation of the CBD's Guiding Principles (outlined in a background document prepared by the CITES Secretariat for the 2006 meetings of the Plants and Animals Committees). ISSG provided input particularly with regard to further exploration of linkages under CBD Decision VIII/27. However the Plants and Animals Committees eventually agreed that the issue was not a major priority for future discussion and that the CBD Secretariat could provide relevant updates in the future. The provision in Resolution 13.10 calling for cooperation with ISSG was thereby removed in a revision of the Resolution at COP14 (The Hague, Netherlands, June 2007). While acknowledging the limited capacity of convention secretariats, this is one instance where Parties took the decision to remove a direct channel for scientific and technical input into the CITES process.

12. Convention on Migratory Species (CMS): Within the CMS, invasive alien species are listed as one of the primary threats and challenges, and the issue was included as a sub-agenda item at the 14th meeting of the Scientific Council. Although discussion was limited and there was no dedicated background document, the meeting highlighted a study reviewing the impact of invasive alien species on migratory species. This study is reportedly still underway and will be provided for future consideration by the Scientific Council. Invasive alien species are sometimes peripherally associated with the issue of avian influenza, although significant debate ranges within the scientific community over the extent to which avian influenza can be considered invasive especially if conveyed through natural migration. In this area, the CMS and the U.N. Food and Agriculture Organization have convened a Scientific Task Force on Avian Influenza and Wild Birds and have been involved in two technical workshops focusing on the topic). The work of the task force has been considered by the Scientific Council and also incorporated into COP Resolution 9.8 (although there is no direct reference to invasive alien species). More specific references to invasive alien species have arisen in discussions and materials on: threats to specific migratory species; capacity building efforts; climate change impacts; and particular action plans and memoranda of understanding.

13. Other Multilateral Environmental Agreements: The UNCCD, the UNFCCC and the World Heritage Convention have taken no formal decisions on the topic of invasive alien species. Under the UNCCD, reference to the issue has arisen in: assessments of land degradation provided to the COP and the Committee on Science and Technology; linkages to the work of the CBD and its work programme on dry and sub-humid lands; and regional and national reports and action plans.

14. Under the UNFCCC, reference to the issue has arisen in: documents and supporting materials provided to the COP and Subsidiary Body for Scientific and Technological Advice on topics of adaptation and land use, land-use change and forestry; national adaptation programmes of action to climate change; and linkages to the CBD on climate and biodiversity issues, particularly adaptation.

15. Within the World Heritage Convention, reference to the issue has arisen in: documentation and decisions relating to the "State of Conservation" and management recommendations for specific World Heritage sites; and discussions on the impacts of climate change on World Heritage sites.

16. Supporting Institutions: A number of independent organizations have provided input into MEA discussions on invasive alien species, including the Global Invasive Species Programme (GISP), IUCN (Secretariat), IUCN's Invasive Species Specialist Group (ISSG), DIVERSITAS, the Global Invasive Species Information Network (GISIN) and the Pet Industry Joint Advisory Council (PIJAC). Within the CBD process, GISP has played a major role as it was basically conceived at the Norway/U.N. Conference on Alien Species (July 1996, Trondheim, Norway), which was designed to focus the CBD's attention on the issue. GISP was

initially organized under the auspices of the Scientific Committee on Problems of the Environment (SCOPE), IUCN and CABI, in association with DIVERSITAS.[169]

17. The initial concept of GISP was to gather the best minds (and later the best organizations) working on the issue of invasive alien species at the global level. The first phase of GISP was designed to consolidate available scientific and management information to raise awareness of the issue and to present best management practices. Through the use of thematic working groups GISP focused on key issues such as pathways, management, socioeconomics, etc., while simultaneously engaging national agencies and experts through a series of regional workshops. This model helped to funnel information developed by the international working groups down to the national level, while raising national level priorities and capacity needs to the global level. Information from both efforts was also channelled into the CBD.

18. As GISP and international discussions matured, the focus turned more to implementation and ensuring that science was informing the development of policy tools. With a slate of priorities defined in CBD decisions, GISP has facilitated dialogue with scientific and technical experts to most appropriately direct their input into guidance for Convention bodies as well as for national implementers. Recent examples include, cooperation with DIVERSITAS around COP9; work with the CBD Secretariat, ISSG and the University of Notre Dame around pre-screening animals in international trade; support to the government of New Zealand on regional island coordination and invasive alien species; and development of training courses with World Bank funding on national legal frameworks and economic assessments. By virtue of its global position and wide range of contacts, GISP has been most effective when serving as a facilitator to manage and package existing information and expertise

19. On a more direct level, GISP has also regularly participated at advisory group, SBSTTA and COP meetings. This longstanding involvement with the CBD, provides an understanding of the process and context by which GISP can convey information to the CBD Secretariat (informally and as information papers) as well as directly to Parties. Side events and distribution of other publications at relevant meetings are another mode of input. In many cases, the government representatives that GISP engaged at the country level later served on national delegations within CBD discussions on invasive alien species. Arguably, GISP's "success" is largely due to its longstanding role in collating and providing information, as few others would serve this role in its absence. It should also be noted that GISP's particularly niche has been the CBD, although it has engaged members and partners working in other forums (e.g., the International Plant Protection Convention, the International Maritime Organization and the Ramsar Convention).

20. IUCN and IUCN's ISSG have also played complementary roles through: development of technical materials such as the IUCN Guidelines for the Prevention of Biodiversity Loss due to Biological Invasion; provision of advice and background information to the CBD, CITES and the Ramsar Convention; creation of information exchange and database tools; a repository for data on particular invasive species and their management; and participation in meetings.[170] A final reference should be made to the Pet Industry Advisory Committee (PIJAC), which has also been active in providing scientific and technical advice from the perspective of the private sector. PIJAC was involved in the negotiation of the CBD's Guiding Principles and has been developing input and management tools on the pre-screening of live animal species in international trade.

21. Analysis and Lessons Learned: Among those MEAs that have directly addressed the issue of invasive alien species, the CBD has taken the lead in the number of decisions and amount of substantive guidance that it has delivered. The CBD has also developed mechanisms to collaborate with other MEAs including through an International Liaison Group, joint work plans and informal communications between Secretariats. These relationships have helped other MEAs streamline their work, as witnessed by recommendations of the Ramsar Convention's STRP to assess how existing guidance from the CBD, IUCN and GISP can be adapted to the wetlands context, as well as by the decision within CITES to leave the bulk of substantive work on the topic to the CBD. Thus, input that expert groups like GISP, IUCN and ISSG have had into the CBD process through the development of technical information fed into CBD recommendations and decisions has been disseminated to other MEAs. It should also be recognized that bodies like the CBD's liaison group and AHTEG, and Ramsar

[169] In 2005, GISP was founded as a separate legal entity under a partnership of CABI, IUCN, the South African National Biodiversity Institute and the Nature Conservancy.

[170] As previously mentioned, the core secretariat of IUCN is a GISP member, whereas the Invasive Species Specialist Group of IUCN's Species Survival Commission is independent. Discussions are underway on how best to manage the relationship with GISP to focus on each institutions' expertise and maximize the limited amount of resources available.

Convention's Working Group on Invasive Species, which incorporate experts from Parties, have provided scientific input into the broader Convention bodies.[171]

22. Key lessons learned include:

a) Use of specialized groups within the CBD and Ramsar have provided a means for input by national experts appointed by Parties, as well as intergovernmental and non-governmental experts;

b) MEAs, particularly the CBD, the Ramsar Convention and CITES, have welcomed and benefited from the input of external scientific experts and organizations;

c) Use of specialized groups and external experts roughly correlates with the production of more information documents and formal background documents;

d) Input by specialized groups has generally been guided by priorities identified by convention processes, thereby reflecting an interest in furthering implementation; and

e) The efficacy of that advice largely depends on frameworks within or across conventions that clearly delineate how they can be applied at the international, regional and/or national level (e.g., input into guiding principles, guidelines or standards vs. issue specific tools/methodologies).

[171] The unanticipated downside of this close inter-relationship was the dampening effect of the controversy over CBD Decision VI/23. Beyond the realm of the CBD, this resulted in removal of the CBD Guiding Principles and the STRP-approved draft guidelines on wetlands and invasive alien species from consideration by Ramsar Convention COP8. Recent discussions within the CBD and the Ramsar Convention suggest that the lingering impacts of this political issue have largely passed, thereby providing the opportunity to refocus on the management and capacity needs of the Parties.

U. National Biodiversity Strategies and Action Plans

Introduction to National Biodiversity Strategies and Action Plans

1. Article 6 of the Convention on Biological Diversity (CBD) requests Parties to *develop national strategies, plans or programmes for the conservation and sustainable use of biological diversity or adapt for this purpose existing strategies, plans or programmes which shall reflect*, inter alia, *the measures set out in this Convention relevant to the Contracting Party concerned*. In accordance with this, the Conference of the Parties (COP), in decision III/9, reaffirmed *the great importance of the development and implementation by all Parties of national strategies, plans and programmes in accordance with Article 6 of the Convention* and produced specific guidance to Parties for developing and implementing National Biodiversity Strategies and Action Plans (NBSAPs) (decisions II/7, III/9, IX/8, among others).

2. Through decision VI/26, the COP adopted the Strategic Plan of the Convention. The Plan contains goal 3: *National biodiversity strategies and action plans and the integration of biodiversity concerns into relevant sectors serve as an effective framework for the implementation of the Convention.* Two objectives relevant to NBSAPs accompany the goal: 3.1: *Every party has effective national stragies, plans and programmes in place to provide a national framework for implementing the three objectives of the Convention and to set clear national priorities*; 3.4: *The priorities in national biodiversity strategies and action plans are being actively implemented, as a means to achieve national implementation of the Covention, and as a significant contribution towards the global biodiversity agenda*. Clearly, NBSAPs have been recognised as a key mechanism for implementing the CBD.

3. As of July 2009, 166 of the 191 Parties to the CBD have developed NBSAPs.[172] A detailed review of NBSAPs has been undertaken by the second meeting of the Working Group on Review of Implementation of the Convention (WGRI 2) in 2007. Since January 2008, the CBD Secretariat has undertaken 12 regional and subregional capacity development workshops on implementing NBSAPs and mainstreaming biodiversity, in 11 regions and subregions.

4. A number of documents have been providing guidance to the development of NBSAPs. Miller & Lanou (1995)[173] presented models for national biodiversity planning. Regarding the science-policy interface, they noted a number of scientific obstacles from the review of early experiences of national biodiversity planning: lack of research on biodiversity's role in ecosystems; lack of sufficient scientific and economic data; lack of trained biosystematists; lack of information-management capacity; and duplication of scientific efforts. Among the institutional obstacles identified was the lack of communication between the scientific community and policy-makers. The authors suggest an illustrative biodiversity planning process that includes representatives of academic and research institutions. Those would play a major role at various stages of the development process for the national biodiversity strategy, including, among others, biodiversity assessment (inventory of biodiversity; valuation of biodiversity) and the setting of objectives and targets for the components of biodiversity.

5. Prescott et al (2000)[174] developed a biodiversity planning matrix, which includes 15 topics that the planning process would need to consider. They suggest specific scientific input for the theme of conservation of natural resources, which could be envisaged to support the identification of pressures and impacts, setting objectives or directions and develop indicators.

6. Based on the Argentinean experience, Fernández (1998)[175] provided guidance for national-level biodiversity action plans. He includes authorities that establish policies in the field of science in the list of

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172 http://www.cbd.int/nbsap/, accessed on 16 July 2009.

173 Miller, K., Lanou, S.M. 1995. *National Biodiversity Planning: Guidelines Based on Early Experiences Around the World*. World Resources Institute, United Nations Environment Programme and The World Conservation Union. Washington D.C., Nairobi, Gland.

174 Prescott, J., Gauthier, B., Sodi, J.N.M. 2000. Guide to Developing a Biodiversity Strategy from a Sustainable Development Perspective. Institut de l'énergie et de l'environnement de la Francophonie, Ministère de l'Environnement de Québec, United Nations Development Programme and United Nations Environment Programme. Québec, Canada.

175 Fernández, J.J.G. 1998. Guide for the Preparation of Action Plans within the Framework of the Convention on Biological Diversity. United Nations Development Programme. http://www.unon.org/dgefftp/NCSAResources/Assessment%20Guidelines/Other%20Guides/Guidelines%20for%20NBSAPs%2009Jun04.doc. Accessed on 17 July 2009.

institutions that may be invited to participate in the biodiversity planning process. As an example of actions under an action plan, the author mentions scientific research programmes run by the State or universities, which incorporate new priorities related to the Biodiversity Convention. Academics are named as participants for national workshops that elaborate a draft biodiversity action plan.

7. None of these guidance documents for NBSAP development lend a strong role to scientists and academia. Other stakeholders, such as government agencies, indigenous groups, business and NGOs, play a more prominent role. Accordingly, basing the NBSAP on scientific evidence does not feature in these guidance documents.

8. In decision IX/8, the COP provided further guidance to Parties on developing, implementing and revising their NBSAPs. The COP stressed, among others, the need to take into account the ecosystem approach; to highlight the contribution of biodiversity to poverty eradication, national development and human well-being; and to identify the main threats to biodiversity. It asked to identify relevant stakeholders from all major groups for each of the actions of the NBSAPs and to strengthen *the contribution of the scientific community in order to improve the science/policy interface to support research-based advice on biodiversity.*

Stakeholders and organizations involved relevant for the science-policy interface

9. The synthesis and analysis of obstacles to implementation of NBSAPS: Lessons learned from the review, effectiveness of policy instruments and strategic priorities for action, presented at the second meeting of the Working Group on Review of Implementation of the Convention on Biological Diversity (WGRI-2), identified the lack of effective partnerships as a high or medium-level obstacle to the implementation of the Convention (UNEP/CBD/WG-RI/2/2/Add.1). The review named insufficient stakeholder involvement as a lesson to be learned from the experience with NBSAPs and marked a mechanism to facilitate continued consultation with all stakeholders including, among others, academia, as priority action at the national level.

10. CBD document UNEP/CBD/COP/9/14/Rev.1 reviewed the implementation of the Convention and its Strategic Plan and made specific reference to implementation of the NBSAP-related goals of the Strategic Plan. It found that *stakeholder consultations have been a major part of NBSAP preparation, However, the range of stakeholders involved is often not adequate to ensure effective ownership of NBSAPs or to ensure mainstreaming of biodiversity beyond the environment community*. It was also found that *effective communication programmes are lacking from many NBSAPs*. On the other hand, the above-mentioned regional and sub-regional NBSAP workshops revealed that *the need for wide stakeholder participation in the development and implementation of NBSAPs is widely understood*.

11. It is beyond the scope of this case study to review the available NBSAPs for the level of participation of stakeholders such as academia and the scientific community. It is assumed that the lack of adequate involvement of stakeholders in the development of NBSAPs extends to the scientific community. This assumption is further confirmed by further weaknesses as reviewed below.

Lack of scientific input to NBSAP development and implementation

12. UNEP/CBD/WG-RI/2/2/Add.1 found for least developed countries a lack of scientific research capacities, together with the loss of traditional knowledge and the underutilisation of existing scientific and traditional knowledge, as challenges to implementing the CBD. The document states specifically that NBSAPs frequently suffer from a lack of knowledge and understanding of biodiversity and ecosystem services, including a lack of awareness of the economic value of biodiversity, and a lack of application of the ecosystem approach. Emerton (2001)[176] identified insufficient involvement of economists as one of the challenges and constraints to using economic tools and measures in NBSAPs.

13. All these findings confirm that NBSAPs have suffered from insufficient scientific input, with an impact on the quality with which issues have been addressed in many NBSAPs. This refers to some key aspects of implementation of the CBD, such as the ecosystem approach and the economic valuation of biodiversity. Both issues have increasingly been recognised as key elements for biodiversity conservation and sustainable use,[177] and the deficiencies recognised for NBSAPs mirror general challenges to the implementation of the Convention (see UNEP/CBD/WGRI/2/INF/1/Add.1 and UNEP/CBD/COP/9/14/Rev.1).

[176] Emerton, L. 2001. National Biodiversity Strategies and Action Plans: A Review of Experiences, Lessons Learned and Ways Forward. IUCN Regional Environmental Economics Programme for Asia, Karachi.

[177] See for example Millennium Ecosystem Assessment. 2005. *Ecosystems and Human Well-being: Biodiversity Synthesis.* World Resources Institute, Washington D.C.

Lessons learned and needs for the science-policy interface in development and implementation of NBSAPs

14. The reviews of experiences on the science-policy interface in the process of development and implementation of NBSAPs, as undertaken by the documents and workshops mentioned above, have drawn a number of lessons relevant for the science-policy interface in the development and implementation of NBSAPs.

a) Stronger involvement of science in the development of NBSAPs: The reviews stated that scientists should be invited from the early stages of NBSAP development to contribute to the development of the Strategy, in particular in the following areas: the ecosystem approach; understanding the role of biodiversity in supporting human well-being and contributing to sustainable development and the alleviation of poverty; and economic valuation of biodiversity. It can be concluded that scientists should participate in developing monitoring schemes for the implementation and effectiveness of NBSAPs as well as in their review.

b) Strengthen the knowledge base for the scientific evidence for NBSAPs: The Regional Capacity Development Workshop for Europe on National Biodiversity Strategies and Action Plans and Mainstreaming of Biodiversity, held in 2008 in Germany[178], recommended developing the evidence base for NBSAPs to strengthen data collection and management, to develop indicators to track the status of biodiversity and ecosystem services and publicise the results, and to use independent scientific review of NBSAP implementation. The review of NBSAPs by the Working Group on Review of Implementation recommended strengthening national Clearing-House Mechanisms to promote scientific and technical cooperation with other Parties, and lending the CBD Clearing-House Mechanism a role in promoting exchange of experiences and lessons learned among countries (UNEP/CBD/WG-RI/2/2/Add.1).

c) Reinforce communication efforts: The need for improved communication of the NBSAPs, including the process of its development and review, to a range of stakeholders has been stressed. The stakeholders would include the scientific community in order to give them a better sense of ownership of the NBSAP and to secure their contribution. Communication, it was stated, should be strategic, evidence-based and target-group oriented and communication plans should be concrete and include short and long-term goals.

[178] See workshop report at http://www.bfn.de/fileadmin/MDB/documents/ina/Vilm_NBSAP_101008-final.pdf.

V. The example of Reducing Emissions from Deforestation and Forest Degradation in Developing Countries (REDD)

1. The United Nations Framework Convention on Climate Change (UNFCCC) is currently developing a mechanism for reducing emissions from deforestation and degradation in developing countries (REDD) for inclusion in the next climate agreement in 2012. This case study focuses on the science-policy interface of biodiversity, ecosystem services and REDD.

2. Although REDD is clearly connected to biodiversity issues, it has been developed first and foremost as an emissions reduction mechanism under the UNFCCC. There are two main ways in which biodiversity and ecosystem services are relevant to the REDD debate:

a) REDD is a mechanism that deals specifically with the ecosystem service of climate regulation, and aims to reduce emissions of greenhouse gases by reducing deforestation and forest degradation in developing countries.

b) Although REDD is designed primarily as mechanism for climate change mitigation, there are significant biodiversity and ecosystem benefits ('co-benefits') that can be gained through reducing deforestation. There may also be some risks to biodiversity conservation arising from REDD.

3. The science-policy interface for these two aspects of REDD and biodiversity/ecosystem services will be considered separately, whilst recognising that there is some level of overlap between the two.

The climate regulatory role of biodiversity (forest)

4. The UNFCCC has a well established reputation for the use of science in the development of climate policy. This science is delivered by the IPCC, which has established itself as the authoritative source for climate change related information, and periodically provides this information through a Summary for Policymakers and a full report. The strength of the IPCC at the science-policy interface is its credibility and relevance, although criticisms have been levelled over the inability of the process to provide updated information at intervals shorter than a 5-6 year time period.

5. The IPCC has played a significant role in the development of REDD, which was first proposed as an agenda item under the UNFCCC by Papua New Guinea in 2005, following information reported in the 2001 IPCC Third Assessment Report (TAR). The case for such a mechanism gained credibility under the UNFCCC when the IPCC Fourth Assessment Report (IPCC 4AR) again highlighted forest loss as a large source of greenhouse gas emissions, and reduction of those emissions as a cost-effective mitigation option. This contributed to the inclusion of REDD in the Bali Action Plan at COP 13 in December 2007[179]. Since then, there has been a proliferation of policy relevant research in this field, and the REDD debate has been informed by processes outside of the IPCC, such as through reports commissioned by National Governments, environmental organisations, and the UNFCCC.

6. COP 13 mandated the Subsidiary Body for Scientific and Technological Advice (SBSTA) to discuss approaches to stimulate action for REDD, and to provide methodological guidance. Some aspects of REDD, such as Monitoring, Reporting and Verification (MRV) of emissions, and the establishment of Reference Levels (RLs) against which to measure emissions reductions, require significant scientific input. The preference of SBSTA to base its conclusions on scientific evidence have been made clear through the following actions:

a) a workshop has been convened to discuss MRV at the request of the COP;[180]

b) an expert meeting has been convened on RLs[181] at the explicit request of SBSTA;

c) input from groups/expert meetings outside the UNFCCC process has been welcomed;

d) the debate on REDD has been influenced by this scientific input; and

e) the use of IPCC guidance and guidelines is recommended.[182]

[179] Decision 1/CP.13
[180] Decision 2/CP.13
[181] FCCC/SBSTA/2009/2
[182] FCCC/SBSTA/2009/L.9

7. In turn, the scientific community has organised meetings and provided SBSTA with information on specific, identified topics such as the availability and accuracy of remote sensing techniques for biomass monitoring.

8. However, REDD is still under negotiation, and as a negotiated mechanism, much depends upon political feasibility. Although the UNFCCC makes good use of scientific information, the outcomes do not always reflect this science due to the number of other factors that must be taken into consideration. The extent to which scientific information on issues such as MRV and RLs feeds through the negotiating process is likely to go some way towards determining the success of the mechanism. This requires the scientific community to continue to feed clear messages into the policy process, while remaining aware of the political implications of these messages; and for policy makers to remain receptive to scientific input.

REDD and 'co-benefits'

9. The opportunities for (and risks to) biodiversity and ecosystem services from REDD have not received so much attention. The implementation of REDD, by maintaining biodiversity-rich tropical forests, should have significant biodiversity and ecosystem service benefits. There may also be some risks; for example, a successful REDD mechanism may lead to increased conversion pressures on low-carbon forests and non-forest ecosystems, with consequent threats to the biodiversity of those systems[183].

10. The link between science and policy is not as strong in this case for a number of reasons:

a) Even though policy makers might be aware of the issues surrounding REDD and biodiversity, many question the relevance and legitimacy for discussion or inclusion under the UNFCCC, which deals specifically with climate change issues

b) Scientists and environmental organisations have for the most part been feeding biodiversity information into the REDD discussions on an ad hoc basis, with different messages coming from different organisations, which has an impact on the credibility of the information. Clear messages have only been put forward relatively late in proceedings

c) Scientific understanding of the relationship between carbon, biodiversity, and ecosystem services is not well developed.

11. However, the Convention on Biological Diversity (CBD) Ad Hoc Technical Expert Group (AHTEG) on Biodiversity and Climate Change has recently been providing the UNFCCC with guidance on the linkages between biodiversity and climate change by reviewing the recent science on this topic (including REDD related information).

12. The CBD AHTEG has promoted a dialogue between scientists and policy makers, and produced a coordinated message from a number of different actors. For example, the AHTEG established that careful consideration is required over the rules and definitions regarding plantation forest and natural forest to ensure that REDD does not create perverse incentives to replace natural forests with plantations. The AHTEG has emphasised that this would not only be bad for biodiversity, but that it could also reduce the mitigation capacity of forests, in part by reducing their resilience to climate impacts. The eventual impact of the work of the AHTEG is not yet known, as its work is still ongoing. Nevertheless, text recognising the importance of promoting co-benefits from REDD, including biodiversity, has been put forward to UNFCCC COP 15 as draft text for a decision[184].

13. The main purpose of the CBD AHTEG is to feed into the UNFCCC process, but it should be emphasised that there is also scope for science to influence policy at the national scale. REDD will have to be implemented at the national scale, albeit within an international framework. Countries may therefore choose to incorporate biodiversity and ecosystem service considerations into REDD strategies if they have the relevant information available. This suggests that the scale at which science can best influence policy needs to be carefully assessed, and an appropriate audience targeted.

Conclusions

14. As REDD is an ongoing process, it is difficult to draw firm conclusions on the strengths and weaknesses of the science-policy interface. However, some observations can be made. With regard to the climate regulatory

[183] Miles,L., Kapos,V. 2008. Reducing greenhouse gas emissions from deforestation and forest degradation: Global land-use implications. *Science* 320, 1454-1455.

[184] FCCC/SBSTA/2009/L.9

role of biodiversity, there has been a large degree of interaction between scientists and policy makers, to the extent that scientists have engaged in policy relevant research, and have had some success in feeding this into the formulation of the REDD mechanism. In terms of biodiversity as a 'co-benefit' of REDD, the science has been less influential. Many REDD policy makers question the relevance of biodiversity information, and scientists have put conflicting messages across on an ad hoc basis. However, the CBD AHTEG has highlighted the importance of developing a coherent approach for bringing clear and relevant messages to discussions from a legitimate source. The extent to which the science is reflected in the final negotiated REDD agreement remains to be seen.

W. Fisheries Management and Biodiversity

1. Fisheries are the largest source of anthropogenic impacts on the marine environment. The UN Food and Agriculture Organization's most recent assessment[185] tells us that fisheries annually generate 85 billion dollars, employ 200 million people and supply at least 15 percent of the animal protein used for human consumption. They also point out that 28% of fish stocks are currently overexploited or collapsed, while 52% are fully exploited.

2. Fisheries threaten biodiversity in a number of ways. Biological extinction from directed fishing pressure is rare because fishing becomes unprofitable before biological extinction is threatened, but depleted species may easily be caught by fisheries directed at other species. Overfishing increases vulnerability to extinction from other sources, such as habitat destruction[186]. Bycatch of untargeted species is a global problem. Beyond non-target fish species, interest in bycatch has focussed mainly on marine mammals, but problems exist with seabirds and benthic organisms as well[187]. Fishing changes both trophic relationships and the genetic make-up of populations[188]. Fisheries also generate impacts on marine habitats; especially bottom trawl nets remove physical features, and reduce the complexity of structures that maintain biodiversity[189].

3. Fish stocks are a common pool resource, meaning a resource from which it is costly to exclude users. When such resources are valuable and there is open access, users have no incentive to conserve since the fruits of such conservation can simply be taken by another user[190]. This is the main reason the global fleet is far larger than what is needed for sustainable fishing. To protect both economic value and environmental integrity, access to the resource must be controlled. This is most effectively done by a combination of access rights for individuals or groups, a set of technical restrictions on when, where and how to fish, and monitoring and enforcement mechanisms. Management functions are nearly always the responsibility of government acting on behalf of the public who are the final owners of the resource. However, hard experience has shown that the complexity of fisheries makes effective "top down" management nearly impossible. Extensive stakeholder participation, particularly by the fishing industry and environmental advocates, has played an important role nearly every time fisheries management has worked well[191].

The Science/Policy Institutions of the Common Fisheries Policy

4. Scientific input is a critical factor in fisheries management and the way this is handled in the Common Fisheries Policy (CFP) of the European Union is particularly illuminating. In spite of arguably having the largest, best financed, and best trained fisheries science cadre on the planet, the EU has one of the weakest sustainability records. In 2002, scientific advisory work for the CFP cost 78 million Euros and 4500 person days were spent by scientist in related international meetings[192]. The European Commission itself describes the result: "88% of Community stocks are being fished beyond Maximum Sustainable Yield ... 30% of these stocks are outside safe biological limits ... European fisheries today depend on young and small fish that mostly get caught before they can reproduce"[193].

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185 FAO 2009. *The State of the Worlds Fisheries and Aquaculture 2008.* Rome: The Food and Agriculture Organization of the United Nations

186 ICES (International Council for the Exploration of the Sea) 2006a. Report of Working Group for Regional Ecosystem Description (WGRED), 30 January-3 February 2006, ICES Headquarters. ACE:03. 129 pp.

187 Payne, A. 2001 Documentation of the Scientific Literature Pertaining to Environmental Issues Arising from the Implementation of the Common Fisheries Policy. In: The European Commission Studies and Support Services Related to the Common Fisheries Policy: Dissemination of the Results of Biological Studies. Lymington, Hampshire, UK: MacAlister Elliott and Partners Ltd.

188 ICES (International Council for the Exploration of the Sea) 2006b. Report of the Working Group on Ecosystem Effects of Fishing Activities (WGECO), 5-12 April 2006 , ICES Headquarters, Copenhagen. ACE:05. 174 pp

189 ICES (International Council for the Exploration of the Sea) 2000. Report of the Working Group on Ecosystem Effects of Fishing Activities (WGECO). ICES CM 2000/ACME

190 Scott, A. 1955 "The Fishery: the Objectives of Sole Ownership" *Journal of Political Economy* 63:116-124

191 Wilson, D.C. J.R. Nielsen and P. Degnbol (Eds.), 2003. The Fisheries Co-management Experience: Accomplishments, Challenges and Prospects. Dordrecht, The Netherlands: Kluwer Academic Publishers. Pp. 193-209.

192 EASE 2007 Final Report of the European Advisory System Evaluation Project (EASE). EU Fifth Framework Programme No Q5CA-2002-01693.

193 CEC Commission of the European Communities. 2009. Green Paper: Reform of the Common Fisheries Policy Brussels, COM: 163, p. 7

5. Only two parts of the science/policy interface of the CFP actually touch the sea: the fishing and research survey vessels. Both of these feed data into the National Fisheries Institutes (NFIs), the fisheries laboratories operated by EU Member States. Survey vessels gather data through scientific protocols while fishing fleets do so through mandated data collection procedures outlined by the EU's Data Collection Regulation.

6. The fisheries advice system moves up to the European level when the NFIs supply their scientists, along with their data, to the expert groups of the International Council for the Exploration of the Sea (ICES). This is a multi-lateral organization with 20 member countries. At ICES expert groups assess stocks; these assessments are passed on to review groups, and then to groups that draft advice based on the assessments. The advice becomes official ICES advice when approved by the Advisory Committee, on which all ICES member countries sit.

7. ICES gives this official advice to the European Commission where the central actor is the Directorate General for Maritime Affairs and Fisheries (DG MARE). Fisheries advisors do not receive the advice directly; rather it passes through the Scientific, Technical and Economic Committee for Fisheries (STECF). The critical difference between STECF and ICES is that STECF operates under DG MARE's direct control. However, ICES and STECF scientists are mainly the same people. Because of this redundancy, and a desire for increased saliency of advice, some at DG MARE have argued that resources should be shifted from ICES to STECF[194]. However, the EU negotiates the sharing of many important fish stocks with Norway, Russia, and Iceland and these negotiations required an independent source of fisheries advice. This reality secures ICES' role.

8. When the advice generation process is over, DG MARE makes proposals on the fisheries legislation for the coming year to the Council of Ministers. The Council makes the final decisions, but they must be based on a Commission proposal. Once these negotiations start, the role of scientific advice is formally ended.

Weaknesses and Gaps in the CFP Science/Policy Interface

9. An underlying weakness is that the CFP, and hence its science/policy interface, is primarily designed to divide single species fish stocks among Member States. Not only does this mean that conservation takes second place, by design if not stated intent, the single-species focus also impedes ecosystem considerations, including more realistic approaches to biodiversity.

10. The problem of dividing the fish has also led to the heavy use of quota-based management, i.e. controlling how many fish can be taken, rather than effort-based management, i.e. controlling how much time people can fish. Quota management is both more politically expedient and economically efficient because quotas are easy to measure, and hence to divide among Member States or trade among fishers. The science/policy problem is that quota management not only requires the prediction of how many fish can be caught in the coming year, it tends to bias the information used in these calculations by increasing incentives for discarding and illegal landings. If the amount of fishing you can do is limited, then you catch as many fish as you can in the time you are given. But if the amount of fish you can catch is limited, then you are more likely to throw away a less valuable fish, which is taking up both space and quota, when you later catch a more valuable one. When fishers catch a mix of species at the same time, as is often the case in Europe, quota management is particularly difficult. Effort management can be based on observing trends in catch rather than forecasting future amounts of fish, and incentives for behaviours that bias data are weaker. It is also better for controlling impacts on many stocks in a mixed fishery. However, fishing effort is much harder to measure when trying to distribute rights to fish – indeed, the fish catch in a given time frame constantly increases as technology improves. In the CFP discarding of fish at sea and illegal landings have been a large problem. Gathering data on these discards is very sensitive. Fishers are perfectly willing to discuss the issue privately, but they are very careful about public admissions. This situation has improved with strengthened EU-level oversight and funds for monitoring, but the underlying incentive problem is still very much in place.

11. Scientific uncertainty in this system is very high. In addition to data gathering problems such as discards and illegal landings, uncertainty is found in the number of fish that die from fishing as opposed to other factors, estimates of fish ages and their weight at particular ages, and the relationship between the number of fish in a stock in one year and the number of fish that will be added in the next year. These factors are all more or less uncertain, depending on the species. Uncertainty also increases as the condition of stocks deteriorates. The population dynamics of stocks at historically low levels are just not well understood.

12. Scientists trying to communicate these uncertainties surround their numerical tables with extensive qualitative caveats. But DG MARE wants clarity in their advice, usually in the form of a number on a table. They have asked for scientific advice that is not open to interpretation, but which allows flexible options for

[194] Wilson, D.C. 2009 *The Paradoxes of Transparency: Science and the Ecosystem Approach to Fisheries Management in Europe*. Amsterdam: University of Amsterdam Press

policy goals. If simultaneous clarity and flexibility is the goal, complex models giving point estimates surrounded by pages of caveats seems a poor way to attain it[195]. These predictive models and point estimates, however, provide the forecasts needed for quota distributions.

13. In a large, tightly coupled science/policy system like the CFP, saliency can receive greater priority than either legitimacy or credibility. A scientist working at DG MARE said: "you have to say so many days for a hundred different fleets, you have to come up with a number for the next regulation, you just need that number to come from somewhere, and as long as it is on the best possible technical basis you could just consider it to be engineering rather than science, and it may be perfectly valid without having all these features that you would need to have legitimate and credible science"[196]. Pressures to "inflate the science boundary" emerge from asking scientists to come produce "findings" about issues that are as much moral and practical as they are scientific.

14. These problems have led to a generally negative view of science among the fishing public. Questions about the legitimacy of EU fisheries management target science more often than is the case in, for example, Norway[197]. The fisheries scientists serving the CFP are frustrated and even demoralized. Many feel that what they are being asked to do is not "science". They look for ways to resist the inflation of the science boundary. In a survey of fisheries scientists around the North Sea, 16% reported that "sometimes" and 60% reported that "often or very often" they felt "asked to create certainty that is not really there". Furthermore, 14% reported that "sometimes" and 56% reported that "often or very often" they felt "asked to answer impossible questions". One scientist was heard pleading to his expert group: "We should stop pretending that we know how many fish there are"[198].

15. When DG MARE sends its proposals to the Council of Ministers the formal role of science suddenly ends. DG MARE is required to consider the best science when making its proposals; the Council is not so required. This leads to an interesting paradox, the initial Commission proposals must be backed by science, but the eventual compromise between the Commission and the Council does not have to be validated by any principle of governance, including scientific justification.

16. The Council's decisions have been "moderately responsive to ICES advice" according to Patterson and Résimont's (2007, p. 716) analysis of 436 records of advice and policy result for fish stocks between 1987 and 2005. This study found that policy moves in the direction of the advice, but not as far as it recommends. This pattern is similar to that found in other science/policy domains[199].

Strengths in the Science/Policy Interface of the CFP

17. The strengths of the CFP are not seen in its results, but rather in broad efforts at reform that involve a breaking down of barriers between scientists, policy-makers and stakeholders in a search for solutions. Scientists in Europe have become tired of failure. Starting a decade ago, ICES began asking social scientists to contribute to a broad and ongoing analysis of what has gone wrong. Much of what you have read here results from that decision.

18. ICES scientists have become more directly involved with stakeholders. A minor division has emerged between the ICES scientists who are deeply involved in the advice system and the larger group that is peripheral to it, or rather was peripheral until demands for ecosystem advice began to increase. Many advisory scientists have abandoned the "white coated expert" style and become more comfortable working within an extended peer community[200].

19. Several different kinds of joint activities have emerged. The most popular has been collaborative research with the fishing industry. This has led to improved data collection, as well as new assessments of stocks using both local and scientific knowledge. Another emerging boundary object is participatory modelling[201], using

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[195] Wilson, D.C., Delaney, A.E. 2005. Scientific Knowledge and Participation in the Management of Fisheries in the North Sea. In Gray, T.S. (Ed) *Participation in Fisheries Governance.* Springer.

[196] Wilson, D.C. 2009 *The Paradoxes of Transparency: Science and the Ecosystem Approach to Fisheries Management in Europe*. Amsterdam: University of Amsterdam Press.

[197] Schwach, V., *et al*. 2007. Policy and knowledge in fisheries management: a policy brief. *ICES Journal of Marine Science* 64(4): 798-803

[198] Wilson, D.C. 2009. Quoted above.

[199] Clark, W.C., *et al*. 2006. Evaluating the Influence of Global Environmental Assessments. In: Mitchell, R.B. *et al.* (Eds.), *Global Environmental Assessments: Information and Influence.* MIT Press.

[200] Ravetz, J.R. 1999. What is Post-Normal Science? *Futures* 31:647-653.

[201] Hegland, T. J., Wilson, D.C. 2009. Participatory Modelling in EU Fisheries Management. *in press*

scenarios to evaluate management options along with stakeholders. The emphasis here is on using scenarios as a way to examine the meaning of uncertainty.

20. The Regional Advisory Councils (RAC) stakeholder fora were set up in 2002 as a small step away from top-down management. They do not have budgets for their own scientific advice; currently DG MARE seems to want them to express general opinions about policy questions based on their impressions. CFP reform will require true stakeholder involvement, and the RACs are determined to develop detailed and effective management plans that can have an impact. Some ICES scientists have found ways to support the RACs in these endeavours.

21. Finally, the CFP is moving away from the emphasis on individual fish stocks as the new EU Marine Directive comes into force. Europe is now committed to an ecosystem approach. Developing the science for this has become an important effort within ICES. The top-down decision-making structures of the CFP, however, have a long way to go before they can begin to address an ecosystem approach.

Lessons Learned

22. Lessons that emerge from this science/policy interface case include:

a) Policy objectives should be set in ways that take into account the science/policy interface. The overreliance on forms of management that solve political problems, but perform poorly from a knowledge development perspective, has been damaging.

b) It helps to place uncertainty in its various forms at the centre of the discussion rather than as an afterthought expressed as an error term surrounded by caveats. Moving away from reliance on forecasts toward more humble scenario-based modelling, particularly using participatory modelling is one important tool for doing this.

c) Scientists resist when they do not approve of how their knowledge is being used. Such resistance in this case included a willingness to move away from the role of objective experts who provide facts for bureaucrats to make decisions about to a much more interactive style. This style might be characterized as a sort of “scientific counselling” for stakeholders and policy-makers. Such activities strengthen and enrich the science/policy interface and help make the boundary between science and non-science clearer. They help reduce the inflation of the science boundary. Many ICES scientists from the advisory service, if not as much from other parts of ICES have supported and embodied these changes in style.

d) The question of in-house versus independent sources of scientific advice is not as central as is often argued. In this case, ICES is formally entirely independent of the Commission, while the legitimacy crisis in fisheries is particularly focussed on science. What seems really important in respect to saliency is the ease of communication between policy-makers and scientists, and, in respect to legitimacy, the perceptions of independence is more important than the legal relationship.

X. List of Acronyms and Abbreviations

2010 BIP	2010 Biodiversity Indicators Partnership
ABGC	Africa Biodiversity Collaborative Group
ABS	Access and Benefit Sharing
ACB	ASEAN Centre for Biodiversity
ACIA	Arctic Climate Impact Assessment
AEWA	African-Eurasian Waterbirds Agreement
AHTEG	Ad Hoc Technical Expert Group (CBD)
ANDES	Intercommunity Agreement for Equitable Benefit-Sharing Derived from Uses of Collective Biocultural Resources
AoA	Assessment of Assessments
AR4	4th Assessment Report (IPCC)
ASEAN	Association of South-East Asian Nations
AU/STRC	African Union's Scientific, Technical and Research Commission
BLG	Biodiversity Liaison Group
BOD	Biological Oxygen Demand
CAWMA	Comprehensive Assessment of Water Management in Agriculture
CBD	Convention on Biological Diversity
CBMP	Circumpolar Biodiversity Monitoring Program
CCA	Common Country Assessment
CCAD	Central American Commission on Environment and Development
CEC	North American Commission for Environmental Cooperation
CCD	see UNCCD
CFP	Common Fisheries Policy (EU)
CGIAR	Consultative Group on International Agricultural Research
CGR	Commission on Genetic Resources for Food and Agriculture
CHM	Clearing House Mechanism
CI	Conservation International
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CMS	Conservation on Migratory Species
CONABIO	Comision Nacional el Conocimiento y Uso de la Biodiversidad (Mexico)
COP	Conference of the Parties
CPF	Collaborative Partnership on Forests
CRIC	Committee for the Review of Implementation of the Convention (UNCCD)
CSD	Commission on Sustainable Development
CST	Committee on Science and Technology (UNCCD)
CURA	Community-University Research Alliance
DCDC	Development Concepts and Doctrine Centre (UK)
DEFRA	Department for Environment, Food and Rural Affairs (UK)
DEPI	UNEP Division of Environmental Policy Implementation
DG MARE	Directorate General for Maritime Affairs and Fisheries (EU)
DIVERSITAS	An international programme of biodiversity science
DPSIR	Causal framework for describing interaction - Driver, Pressure, State, Impact, Response
EASE	European Association of Science Editors
EC	European Commission
ECOSOC	United Nations Economic and Social Council
EEA	European Environment Agency
Eionet	European environment information and observation network
EMG	Environmental Management Group (UN)
EPA	Environmental Protection Agency
EPBRS	European Platform for Biodiversity Research Strategy
ERA-Net	Networking the European Research Area
ESPA	Ecosystem Services for Poverty Alleviation Programme
EU	European Union
EUROSTAT	Statistical Office of the European Communities
FAO	Food and Agriculture Organization of the United Nations
FRA	Forest Resources Assessment
GA	General Assembly (UN)

GBIF	Global Biodiversity Information Facility
GBO	Global Biodiversity Outlook
GC	Governing Council (UNEP)
GCOS	Global Climate Observing System
GCSS	Special Session of the Governing Council (UNEP)
GEA	Global Energy Assessment
GEF	Global Environmental Facility
GEO	Global Environmental Outlook
GEO-BON	Group on Earth Observations Biodiversity Observation Network
GEOSS	Global Earth Observation System of Systems
GESAMP	Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection
GISP	Global Invasive Species Programme
GIWA	Global International Waters Assessment
GLOBIO	Global Methodology for Mapping Human Impacts on the Biosphere (a model)
GoE	Group of Experts
GOOS	Global Ocean Observing System
GRAMED	Global and Regional Marine Assessment Database
GRAME	Global Reporting and Assessment of the state of the Marine Environment
GRID-	Arendal Norwegian Centre supporting the UNEP
GTOS	Global Terrestrial Observing System
IAASTD	International Assessment of Agricultural Knowledge, Science and Technology for Development
IABIN	Inter-American Biodiversity Information Network
IAEG	Inter-Agency Expert Group (UN)
IAS	Institute of Advanced Studies (UNU)
ICAO	International Cooperative Agricultural Organisation
ICCROM	International Centre for the Study of the Preservation and Restoration of Cultural Property
ICES	International Council for the Exploration of the Sea
ICOMOS	International Council on Monuments and Sites
ICSU	International Council for Science
IEEP	Institute for European Environmental Policy
IGBP	International Geosphere-Biosphere Programme
IHDP	International Human Dimension Programme on Global Environmental Change
IGO	Intergovernmental Organisation
ILTER	International Long-Term Ecological Research
IMG	Issue Management Group (EMG)
IMO	International Maritime Organisation
IMoSEB	International Mechanism of Scientific Expertise on Biodiversity
InVEST	Integrated Valuation of Ecosystem Services and Tradeoffs (a model)
IPBES	Intergovernmental Platform on Biodiversity and Ecosystem Services
IPBES Meeting	Ad hoc intergovernmental and multi-stakeholder meeting on an IPBES
IPPC	International Plant Protection Convention
IPR	Intellectual Property Rights
ISSC	International Social Science Council
ISSG	Invasive Species Specialist Group (IUCN)
ITPGRFA	International Treaty on Plant Genetic Resources for Food and Agriculture
ITIS	Integrated Taxonomic Information System
IUCN	International Union for Conservation of Nature
JIU	Joint Inspection Unit (UN)
JLG	Joint Liaison Group
JNCC	Joint Nature Conservation Committee (UK)
LADA	Land Degradation Assessment in Drylands
LEK	Local Ecological Knowledge
LULUCF	Land-use, land-use change and forestry
MA	Millennium Ecosystem Assessment
MAB	Man and the Biosphere (UNESCO)
MDG	Millennium Development Goal
MEA	Multilateral Environmental Agreement
MOD	Ministry of Defense
MRV	Monitoring, Reporting and verification
NBSAP	National Biodiversity Strategies and Action Plan

NCSA	National Capacity Self-Assessment
NFI	National Fishery Institute
NGO	Non-Governmental Organization
OARE	Online Access to Research in the Environment
OASIS	Organization for the Advancement of Structured Information Standards
OECD	Organization for Economic Co-operation and Development
PEARL	Prototype Environmental Assessment and Reporting Landscape
PEI	Poverty-Environmental Initiative
PIJAC	Pet Industry Joint Advisory Council
RAC	Regional Advisory Council
RAIPON	Russian Association of Indigenous Peoples of the North
Ramsar	Ramsar Convention on Wetlands
REDD	Reducing Emissions from Deforestation and Forest Degradation in Developing Countries
SAEON	South African Environmental Observation Network
SBSTA	Subsidiary Body on Scientific and Technological Advice (UNFCCC)
SBSTTA	Subsidiary Body on Scientific, Technical and Technological Advice
SCOPE	Scientific Committee on Problems of the Environment
SEBI2010	Streamlining European 2010 Biodiversity Indicators
SG	Secretary-General (UN)
SGA	Sub-Global Assessment
SKEP	Scientific Knowledge for Environmental Protection
SPAW	Protocol Concerning Specially Protected Areas and Wildlife (Cartagena Convention)
SSC	Species Survival Commission (IUCN)
STAP	Scientific and Technical Advisory Panel (CGF)
STECF	Scientific, Technical and Economic Committee for Fisheries
TDWG	Taxonomic Database Working Group
STRP	Scientific and Technical Review Panel (Ramsar)
TEEB	The Economics of Ecosystems and Biodiversity
TNC	The Nature Conservancy
TRAFFIC	The wildlife trade monitoring network
TUMRA	Traditional use agreement for sustainable harvesting
TWAS	Third World Academy of Sciences
UN	United Nations
UNCCD	United Nations Convention to Combat Desertification
UNCED	United Nations Conference on Environment and Development
UNDAF	United Nations Development Assistance Framework
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNEP-WCMC	UNEP World Conservation Monitoring Centre
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNF	United Nations Foundation
UNFCCC	United Nations Framework Convention on Climate Change
UNGA	United Nations General Assembly
UNIDO	United Nations Industrial Development Organization
UNPFII	United Nations Permanent Forum on Indigenous Issues
UNU	United Nations University
USAID	United States Agency for International Development
WB	World Bank
WBCSD	World Business Council for Sustainable Development
WCS	Wildlife Conservation Society
WGPA	Ad Hoc Open-Ended Working Group on Protected Areas (CBD)
WGRI	Ad Hoc Open-Ended Working Group on Review of Implementation of the Convention (CBD)
WHC	World Heritage Convention
WHO	World Health Organisation
WMO	World Meteorological Organization
WRI	World Resources Institute
WSSD	World Summit on Sustainable Development
WWAP	World Water Assessment Programme
WWDR	World Water Development Report
WWF	World Wide Fund For Nature