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IMPLICATIONS OF THE FINDINGS OF THE MILLENNIUM ECOSYSTEM ASSESSMENT FOR THE FUTURE WORK OF THE CONVENTION

Note by the Executive Secretary

EXECUTIVE SUMMARY

The Millennium Ecosystem Assessment (MA) assessed the consequences of ecosystem change for human well-being and analysed options available to enhance the conservation and sustainable use of biodiversity and ecosystems and their contributions to human well-being. The Conference of the Parties, at its seventh meeting, requested SBSTTA to review the findings of the Assessment, including the synthesis report on biodiversity, and to prepare recommendations to the eighth meeting of the Conference of the Parties.

The Assessment describes the status and trends of biodiversity and of the ecosystem services that are dependent upon it, and projects changes to 2050 (with some data presented for 2010, and some up to 2100) in four plausible future scenarios. It also identified key drivers of biodiversity loss and assessed a range of response options. These findings have a number of possible implications for the future work of the convention that are discussed in the present note. The findings of the Assessment (for example, information about the loss of components of biodiversity, identification of main current and likely future drivers of change, and identification of promising response options) may help shape the priorities under the Convention concerning progress towards the 2010 target and the associated goals and sub-targets; the setting of future targets; and the development and implementation of the programmes of work In addition, the Assessment used a number of the indicators adopted for use by the Conference of the Parties and provides a number of methodologies that could be used in the implementation of the Convention, and tools against which the existing framework of goals and targets and the existing programmes of work of the Conventions may be evaluated. The Assessment also identified some critical areas where further research could make a particular contribution to improving decision-making on biodiversity and ecosystems. The present note also considers the need for future assessments of biodiversity and ecosystems.

* UNEP/CBD/SBSTTA/11/1.

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SUGGESTED RECOMMENDATION

The SBSTTA may wish to recommend that the Conference of the Parties:

1. *Welcomes* the reports of the Millennium Ecosystem Assessment, including the synthesis report on biodiversity and its summary for decision makers;

2. *Notes* that the Assessment has successfully used a number of indicators that are consistent with the framework adopted in decision VII/30;

3. *Takes note* of the main findings of the Biodiversity Synthesis Report, namely that:

(a) Biodiversity is being lost at rates unprecedented in human history;

(b) Losses of biodiversity and decline of ecosystem services constitute a concern for human well-being, especially for the well-being of the poorest;

(c) The costs of biodiversity loss borne by society are rarely assessed, but evidence suggests that they are often greater than the benefits gained through ecosystem changes;

(d) The drivers of biodiversity loss are constant or, more often, increasing in impact;

(e) Many successful response options have been used, but further progress in addressing biodiversity loss will require additional actions to address the main drivers of biodiversity loss; and

(f) Unprecedented additional efforts will be required to achieve, by 2010, a significant reduction in the rate of biodiversity loss at all levels;

4. *Noting* that the Millennium Ecosystem Assessment finds that the degradation of ecosystem services could significantly increase during the first half of this century and is a barrier to achieving the Millennium Development Goals, and that, at the same time, many of the actions needed to promote economic development and reduce hunger and poverty could harm biodiversity, *emphasize* that the Millennium Development Goals and the 2010 target of reducing the rate of biodiversity loss need to be pursued in an integrated manner

5. *Urges* Parties, Governments and organizations to take the measures necessary to meet the 2010 target adopted in the Strategic Plan of the Convention, and the goals and sub-targets adopted in decision VII/30;

6. *Mindful* that the loss of biodiversity is continuing, and recognizing the inertia in ecological systems and in the drivers of biodiversity loss, *decides* that further targets should be set for [2020] and [2050] as part of the process of revising the Strategic Plan beyond 2010, and that these targets will need to address not only the components of biodiversity, but also the range of direct and indirect drivers of biodiversity loss and new understanding of the rates and nature of global biodiversity change.

7. *Decides* to integrate the findings of the Millennium Assessment into the future development of the programmes of work under the Convention, noting in particular:

(a) The urgent need to address over-fishing which is seriously harming marine biodiversity in many parts of the world, often with significant impacts on food security;

(b) The need to address land-use change, particularly from the expansion of agriculture;

(c) The urgent need to address degradation in drylands, some 10-20 per cent of which already suffer from a persistent reduction in their capacity to supply ecosystem services often with significant impacts on livelihood security;

(d) The need to address the multiple drivers of change to inland water ecosystems, which are seriously harming freshwater biodiversity in many parts of the world, often with significant impacts on food security;

(e) The need to address the problems of increasing reactive nitrogen in ecosystems, through both increased efficiency of nitrogen use and by enhancing the capacity of ecosystems, in particular wetlands, to remove reactive nitrogen;

(f) The finding that an increase in average global temperature of two degrees or more above pre-industrial temperatures will give rise to globally significant impacts on ecosystems, and therefore the urgent need for Parties and other Governments to meet their commitments under the United Nations Framework Convention on Climate Change and its Kyoto Protocol in order to avoid dangerous impacts;

(g) The need to take climate change fully into account in activities aimed at the conservation and sustainable use of biodiversity, including through adaptation measures;

(h) The increasing threat of introduction of invasive alien species resulting from the increased levels of transportation, tourism and trade associated with globalization;

8. *Cognizant* of the inter-sectoral nature of many of these issues, *urges* Parties to promote dialogue among different sectors, at the national level and through the process of the Convention , *inter alia*, to address linkages between the conservation and sustainable use of biodiversity, international trade, finance, agriculture, forestry, and fisheries, in order to contribute to the more effective implementation of the Convention, in particular its Article 6;

9. *Cognizant* also of the impacts of the inequalities in the use of resources and the implications of this imbalance for the drivers of biodiversity loss, *urges* Parties to address unsustainable consumption patterns that impact on biodiversity, bearing in mind the common but differentiated responsibilities of States consistent with the Rio Declaration on Environment and Development, and *decides* to consider this issue further at its ninth meeting;

10. *Aware* of the need to improve awareness and understanding of the value of biodiversity, including its role in the provision of ecosystem services, as a means of improving decision making at global, national and local levels, *urges* Parties, Governments and relevant organizations, including scientific bodies, to increase support for research, *inter alia*, to improve measures of biodiversity, biodiversity valuation, and models of biodiversity change.

11. *Requests* SBSTTA and the Executive Secretary to give special attention to socio-economic issues and analysis, including valuation of biodiversity, its components, and of the ecosystem services provided, as well as biodiversity's role in poverty alleviation, in the work of the Convention;

12. *Request* SBSTTA, in further developing its work on environmental impact assessment and strategic environmental assessment, and the ecosystem approach, to make full use of the findings, methodologies, and procedures of the Millennium Assessment, including the sub-global assessments;

13. *Encourage* Parties, Governments and relevant organizations to make use of the findings, methodologies, and procedures of the Millennium Assessment in the application of environmental impact assessments, strategic environmental assessments, and the ecosystem approach;

14. *Urge* Parties, Governments and relevant organizations, to contribute to building capacity to undertake integrated ecosystem assessment, especially in developing countries, including through the provision of financial resources, and the dissemination of findings, methodologies and procedures of the Millennium Assessment;

15. *Requests* the Executive Secretary and Chair of SBSTTA to draw upon the lessons learned from the Millennium Assessment process and to bring these to the attention of the multi-stakeholder consultation process on options for a scientific mechanism for biodiversity advice established by the International Scientific Conference on Biodiversity: Science and Governance, held in Paris from 24 to 28 January 2005;

16. *Requests* SBSTTA and the Executive Secretary to contribute to the evaluation of the Millennium Assessment, due to be undertaken during 2007 by the institutions represented on the

Millennium Assessment Board, focusing in particular on the impact of the Millennium Assessment on implementation of the Convention at global and national levels;

17. *Decides* to consider, at its ninth meeting, the need for another integrated assessment of biodiversity and ecosystems, taking into account the evaluation of the Millennium Assessment to be undertaken during 2007, as well as the outcome of the multi-stakeholder consultation process on options for a scientific mechanism for biodiversity advice

I. INTRODUCTION

1. The Millennium Ecosystem Assessment (MA) was carried out between 2002 and 2005, in response to requests for information received from the Convention on Biological Diversity and other international conventions to assess the consequences of ecosystem change for human well-being and to analyse options available to enhance the conservation and sustainable use of ecosystems and their contributions to human well-being. At its seventh meeting, the Conference of the Parties, in its decision VII/6, requested SBSTTA to review the findings of the Millennium Ecosystem Assessment, including the synthesis report on biodiversity and to prepare recommendations for consideration at the eighth meeting of the Conference of the Parties.

2. The present note has been prepared by the Executive Secretary to assist SBSTTA in this task.

3. Section II of the note provides an overview of the Assessment reports and the process followed in their preparation and review, with the principal findings of the Assessment listed in section III. Remaining sections consider the implications of the Assessment for the future work of the Convention. Section IV considers implications of the Assessment's findings with reference to progress towards the 2010 target and the associated goals and sub targets, the setting of future targets, and development and implementation of the programmes of work in the light of the threats to biodiversity and response options identified in the Assessment. Section V considers the use and application of the Assessment's methods and tools. Section VI reviews gaps and priorities for future research idenfied by the Assessment and section VII considers the need for future assessments.

4. The Biodiversity Synthesis Report is available as an information document, while the Summary for Decision Makers is available as an addendum to the present note (UNEP/CBD/SBSTTA/11/7/Add/1). The other Assessment reports will be made available at www.MAweb.org.

II. BACKGROUND: THE PROCESS AND PRODUCTS OF THE MILLENNIUM ECOSYSTEM ASSESSMENT

5. The Millennium Ecosystem Assessment responds to requests for information received through the Convention on Biological Diversity and other international conventions, and is also designed to meet needs of other stakeholders including business, civil society, and indigenous peoples. The Assessment has been carried out through four working groups (Condition and Trends; Scenarios; Responses; and Sub-Global), and includes sixteen sub-global assessments in addition to the global assessment. Approximately 1,300 experts from 95 countries have participated as authors of the working group reports, review editors, or authors of the sub-global assessments. During 2004, the draft technical assessment reports of the four working groups underwent two rounds of review by Governments and experts. Approximately 50 countries, 800 experts, and 10 national academies of sciences (and other scientific institutions) provided review comments on the draft reports. An independent review board provided oversight for the review process and ensured that all review comments were appropriately addressed by the authors.

6. The reports of the four working groups, which provide the technical foundation for the assessment, comprise approximately 73 chapters and 2000 printed pages. While all of the reports are of relevance to the Convention, some are particularly so:

(a) In the Condition and Trends Report; chapter 4 addresses biodiversity specifically, while chapters 7-17 examine various ecosystem services and chapters 18-27 describe the status and trends of the "MA systems" corresponding to the biomes addressed in the programmes of work under the Convention on Biological Diversity;

(b) In the Scenarios Report; chapter 10 examines the outlook for biodiversity in four scenarios to 2050, and chapter 14 provides policy synthesis for key stakeholders including a section on implications for the Convention on Biological Diversity;

(c) In the Responses Report; chapter 5 examines response options that are directly related to the conservation and sustainable use of biodiversity, while chapters 6-14 examine responses aimed at addressing the drivers of biodiversity loss;

(d) In the Sub-Global Report, chapter 8 focuses on conditions and trends of ecosystem services and biodiversity.

7. Each of the working group reports includes a summary for decision makers, and chapters relating to methodologies and approaches to conducting ecosystem assessments. In addition, a number of synthesis reports summarize the findings most relevant to for particular decision-maker audiences. These include a General Synthesis and a Biodiversity Synthesis Report. The later integrates and synthesizes findings related to biodiversity from the reports of the four working groups of the Millennium Ecosystem Assessment. Besides the general and biodiversity synthesis reports, there are also: the Desertification Synthesis; the Human Health Synthesis; the Wetlands Synthesis; and Opportunities and Challenges for Business and Industry. Each of the synthesis reports includes references to the original source of the material in the full technical assessment reports of the four working groups.

8. A number of national focal points for the Convention on Biological Diversity, other national experts and Secretariat staff members have contributed to the Assessment process as chapter authors and reviewers. Secretariat staff members and the Chair and Chair-elect of SBSTTA have also participated in the preparation of the Biodiversity Synthesis Report. In addition, the Executive Secretary serves on the Board of the Assessment. The Assessment secretariat and Co-Chairs have regularly reported to Conference of the Parties and to SBSTTA, and have organized a number of briefing sessions for delegates to these meetings.

9. At its seventh meeting, the Conference of the Parties, in its decision VII/6, took note of the progress of the Millennium Ecosystem Assessment and the outline for the biodiversity synthesis report, and encouraged national focal points to participate in the review of the Millennium Ecosystem Assessment reports. The Conference of the Parties also requested SBSTTA to review the findings of the Millennium Ecosystem Assessment, including the biodiversity synthesis report, to be taken into account by the Millennium Ecosystem Assessment in finalizing its reports, and to prepare recommendations for considerations at the eighth meeting of the Conference of the Parties.

10. Accordingly, the Summary for Decision Makers, which summarizes the main findings of the biodiversity synthesis report was made available in all official United Nations languages as a working document for the tenth meeting of SBSTTA (UNEP/CBD/SBSTTA/10/6), and the full draft Biodiversity Synthesis Report was made available as an information document (UNEP/CBD/SBSTTA/10/INF/5). The Summary for Decision Makers and the full biodiversity synthesis report were also made available for expert and government review.

11. At its tenth meeting, SBSTTA welcomed the opportunity to review the draft synthesis report on biodiversity and invited the writing team and the Panel of the Millennium Ecosystem Assessment to take into account the comments made by delegations when finalizing the report (recommendation X/3). SBSTTA also noted that, at its eleventh meeting, it would consider the final products of the Millennium Ecosystem Assessment, including the synthesis report on biodiversity, in order to prepare recommendations to the Conference of the Parties concerning the implications of the findings of the Assessment for the future work of the Convention. It also emphasized the need for follow-up communication and public-awareness activities to ensure that the findings of the Assessment are widely and effectively disseminated and used by decision makers.

12. The draft of the synthesis report on biodiversity was revised based on comments of SBSTTA, as well as those received during the expert and Government review, and finalized by the Panel of the Millennium Ecosystem Assessment. Along with the other reports of the Millennium Ecosystem Assessment, the synthesis report was formally reviewed and approved by the Assessment Panel and Board in March 2005.

13. The final version of the Biodiversity Synthesis Report was released in Montreal and London on May 19, 2005 as part of the celebrations for International Biodiversity Day. 1/

III. SUMMARY OF THE MAIN FINDINGS OF THE ASSESSMENT

14. The General Synthesis 2/ provides four main findings:

(a) Over the past 50 years, humans have changed ecosystems more rapidly and extensively than in any comparable period of time in human history, largely to meet rapidly growing demands for food, fresh water, timber, fibre, and fuel. This has resulted in a substantial and largely irreversible loss in the diversity of life on Earth;

(b) The changes that have been made to ecosystems have contributed to substantial net gains in human well-being and economic development, but these gains have been achieved at growing costs in the form of the degradation of many ecosystem services, increased risks of nonlinear changes, and the exacerbation of poverty for some groups of people. These problems, unless addressed, will substantially diminish the benefits that future generations obtain from ecosystems;

(c) The degradation of ecosystem services could grow significantly worse during the first half of this century and is a barrier to achieving the Millennium Development Goals;

(d) The challenge of reversing the degradation of ecosystems while meeting increasing demands for their services can be partially met under some scenarios that the Millennium Assessment has considered, but these involve significant changes in policies, institutions, and practices that are not currently under way. Many options exist to conserve or enhance specific ecosystem services in ways that reduce negative trade-offs or that provide positive synergies with other ecosystem services.

15. In addition to the overall findings, six main findings concerning biodiversity, are provided in the Biodiversity Synthesis report ((UNEP/CBD/SBSTTA/11/7/Add/1).

> Finding #1. Human actions are fundamentally, and to a significant extent irreversibly, changing the diversity of life on Earth, and most of these changes represent a loss of biodiversity. Changes in important components of biological diversity were more rapid in the past 50 years than at any time in human history. Projections and scenarios indicate that these rates will continue, or accelerate, in the future.
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> Finding #2. Biodiversity contributes directly (through provisioning, regulating, and cultural ecosystem services) and indirectly (through supporting ecosystem services) to many constituents of human well-being, including security, basic material for a good life, health, good social relations, and freedom of choice and action. Many people have benefited over the last century from the conversion of natural ecosystems to human-dominated ecosystems and the exploitation of biodiversity. At the same time, however, these losses in biodiversity and changes in ecosystem services have caused some people to experience declining well-being, with poverty in some social groups being exacerbated.
>
> Finding #3. Improved valuation techniques and information on ecosystem services tells us that although many individuals benefit from the actions and activities that lead to biodiversity loss and ecosystem change, the costs borne by society of such changes is often higher. Even in instances where our knowledge of benefits and costs is incomplete, the use of the precautionary approach may be warranted when the costs associated with ecosystem changes may be high or the changes irreversible.

1/ See http://www.biodiv.org/programmes/outreach/awareness/biodiv-day-2005.aspx.

2/ Available at: www.MAweb.org/en/products.aspx

Finding #4. The drivers of loss of biodiversity and the drivers of changes in ecosystem services are either steady, show no evidence of declining over time, or are increasing in intensity.

Finding #5. Many of the actions that have been taken to conserve biodiversity and promote its sustainable use have been successful in limiting biodiversity loss and homogenization to rates lower than they would otherwise have been in the absence of such actions. However, further significant progress will require a portfolio of actions that build on current initiatives to address important direct and indirect drivers of biodiversity loss and ecosystem service degradation.

Finding #6. Unprecedented additional efforts would be needed to achieve, by 2010, a significant reduction in the rate of biodiversity loss at all levels.

IV. IMPLICATIONS OF THE FINDINGS OF THE MILLENNIUM ASSESSMENT FOR THE FUTURE WORK OF THE CONVENTION

A. Prospects for biodiversity in 2010 and beyond

1. The 2010 target

16. The Millennium Ecosystem Assessment finds that unprecedented additional efforts would be needed to achieve, by 2010, a significant reduction in the rate of biodiversity loss at the national, regional and global level. The magnitude of the challenge of slowing the rate of biodiversity loss is demonstrated by the fact that most of the direct drivers of biodiversity loss are projected to either remain constant or to increase in the near future (see figure 3 in the Biodiversity Synthesis Report, Summary for Decision Makers (UNEP/CBD/SBSTTA/11/7/Add.1)). Moreover, inertia in natural and human institutional systems results in time lags—of years, decades, or even centuries—between actions being taken and their impact becoming apparent on biodiversity and ecosystems.

17. The Assessment also finds that—with appropriate responses at the global, regional, and especially national level—it is possible to achieve, by 2010, a reduction in the rate of biodiversity loss for certain components of biodiversity or for certain indicators, and in certain regions. Several of the 2010 sub-targets adopted in decision VII/30 could also be met. For example, if areas of particular importance for biodiversity and functioning ecological networks are maintained within protected areas or by other conservation mechanisms, and if proactive measures are taken to protect endangered species, the rate of biodiversity loss of the targeted habitats and species could be reduced. Further, it would be possible to achieve many of the sub-targets aimed at protecting the components of biodiversity if the response options that are already incorporated into the programmes of work of the Convention on Biological Diversity were implemented.

18. However, it appears highly unlikely that the sub-targets aimed at addressing threats to biodiversity—land-use change, climate change, pollution, and invasive alien species—could be achieved by 2010. It will also be a major challenge to maintain, until 2010 and over the next century, goods and services from biodiversity to support human well-being. 3/ The report of the Scenarios Working Group provides information on prospects up to 2050 across the four MA scenarios for biodiversity (MA chapter S.10) and for the goals and targets of the Convention on Biological Diversity (MA chapter S.14).

19. The evidence examined by the Condition and Trends and Scenarios Working Groups suggests that the 2010 target is very challenging though achievable—at least, in some regions, for some indicators. Parties will need to redouble efforts to meet the 2010 target adopted in the Strategic Plan, and the goals and sub-targets adopted in decision VII/30.

3/ See table 6.1 in the Biodiversity Synthesis Report (UNEP/CBD/SBSTTA/11/7/Add.1), also provided as table 2 in UNEP/CBD/WG-RI/1/2)

2. Longer-term goals and targets.

20. The long-term vision of the Convention, as expressed in the Strategic Plan, is to halt the loss of biodiversity. However, using both current trends and future scenarios, the Millennium Assessment projects that biodiversity loss, and in particular the loss of species diversity and transformation of habitats, is likely to continue for the foreseeable future. This is largely due to inertias in ecological and human systems and the fact that the drivers of biodiversity loss are themselves broadly constant or increasing. Given the characteristic response times for human political and socio-economic systems, and for ecological systems, short-term goals and targets are not sufficient as a policy framework – longer-term goals and targets (such as for 2050) are also needed to guide policy and actions. The development of these goals and targets will need to draw upon new synthetic approaches to understanding the rate and nature of biodiversity change.

21. When the Strategic Plan is reviewed, therefore, consideration might be given to establishing both shorter-term (e.g., 2020) and longer-term (e.g., 2050) targets. These targets will need to address not only biodiversity components, but also direct and indirect drivers of biodiversity loss. For 2020, quantitative targets might already be established, within the framework of goals and targets (adopted by decision VII/30). As noted below, the framework is sufficiently general to be used as a guide, beyond 2010 and up to 2050.

3. The framework of goals and targets

22. The pressures identified by the Millennium Assessment up to 2010 are mostly similar in character, scale, and intensity to those that the international community has experienced over the past 20 years and that are already the subject of the programmes of work of the Convention on Biological Diversity, and are generally well-reflected in the framework of goals and targets adopted by decision VII/30. The framework is also sufficiently general to be used as a guide to the longer-term objectives of the Convention, beyond 2010. However, emerging pressures from climate change and pollution may not be adequately addressed in all the instruments of the Convention on Biological Diversity. For example, targets and associated actions within the Global Strategy for Plant Conservation emphasize issues of habitat loss, conservation of protected areas, and sustainable management but pay less attention to the less tangible, increasing threats of climate change and nutrient loading.

4. Synergies and trade-offs between the objectives of the Convention on Biological Diversity and the Millennium Development Goals

23. There are important linkages between the objectives of the Convention on Biological Diversity (including the 2010 biodiversity target) and the Millennium Development Goals. The Millennium Assessment finds that the degradation of ecosystem services could significantly increase during the first-half of this century and that this is a barrier to achieving the Millennium Development Goals (MDGs).

24. Given that biodiversity underpins the provision of ecosystem services, which in turn affects human well-being, long-term sustainable achievement of the MDGs requires that biodiversity loss be controlled. At the same time, many of the actions that could be implemented to promote economic development and reduce hunger and poverty in the short-run could harm biodiversity. The Millennium Assessment concludes that coordinated implementation of the goals of the Convention on Biological Diversity and the MDGs would facilitate the consideration of the trade-offs and synergies between the two sets of goals so that informed decisions can be made. This implies integration of environmental considerations, including biodiversity, into the implementation not only of MDG 7 (on environmental sustainability) but of all of the relevant MDGs, including those to eliminate poverty and hunger, and improve human health.

25. Such an approach is consistent with decision VII/32 of the Conference of the Parties, in which Parties, Governments, international financial institutions, donors, and relevant intergovernmental organizations, are urged to implement development activities in ways that are consistent with, and do not compromise, the achievement of the objectives of the Convention on Biological Diversity and the 2010

target. At the same time, the Conference of the Parties may wish to consider mitigating action to protect biodiversity in situations where there are inevitable trade-offs between development activities and biodiversity conservation.

B. Review of the main threats to biodiversity

26. The Millennium Assessment identifies five main direct drivers of biodiversity loss (threats to biodiversity). While the Assessment finds that most of the threats are already included in the framework of goals and targets of the Convention on Biological Diversity and addressed through the Convention's programmes of work, some of the findings suggest a prioritization or refocusing of some elements of the programmes of work. In each of the following paragraphs, the finding drawn from the Millennium Assessment is followed by an analysis of whether and how this finding is currently, or should in future be, considered by the programmes of work.

27. For terrestrial ecosystems, the most important direct driver of change in the past 50 years has been land-cover change. Land-use change is projected to continue to be a major driver of biodiversity loss, especially due to agricultural expansion into tropical and sub-tropical forests, grasslands and savannas, especially in sub-Saharan Africa. Issues of land-use change may sometimes fall between more than one programme of work of the Convention without being adequately addressed by any. The issue of expansion of agriculture into forests, for example, is not fully integrated into either of the programmes of work on agricultural biodiversity or forest biodiversity. Degradation in drylands is also a major concern. Some 10-20% of drylands already suffer from a persistent reduction in their capacity to supply ecosystem services often with significant impacts on livelihood security. Within the framework of the Convention, these issues are addressed through the programme of work on the biodiversity of dry and sub-humid lands.

28. For marine ecosystems, the most important direct driver of change in the past 50 years, in the aggregate, has been over-exploitation. Global fisheries landings peaked in the late 1980s and are now declining despite increasing fishing effort. This is seriously harming marine biodiversity in many parts of the world, often with significant potential impacts on food security. Some response measures identified by the Millennium Assessment, such as the establishment of marine protected areas, are already included in the programme of work on marine and coastal biodiversity, but these may not be sufficient, given the urgency of the situation.

29. For freshwater ecosystems, depending on the region, the most important direct drivers of change in the past 50 years include physical changes, modification of water regimes, invasive species, and pollution, sedimentation and eutrophication. Such pressures are likely to intensify as demand for water continues to increase. The drivers of change are thus found to be largely external to inland water ecosystems, and this means that the programme of work on the biodiversity of inland waters (which addresses these drivers) needs to be implemented by actors across many economic sectors.

30. Over the past four decades, nutrient loading has emerged as one of the most important drivers of ecosystem change in terrestrial, freshwater, and coastal ecosystems. Humans now produce more reactive nitrogen than is produced by all natural pathways combined. Nitrogen use is projected to increase by 20-50% globally over the next fifty years, with most of the increase occurring within Asia. The consequences are increased eutrophication of waterways and species loss in temperate forests and grasslands. While there are targets and indicators related to this issue within the framework adopted by decision VII/30, the issue is not fully integrated into all of the relevant programmes of work. The programme of work on marine and coastal biodiversity covers land-based pollution, and the programme of work on inland waters addresses the threat of eutrophication, but there is a need for greater integration of this issue into this programme of work on agricultural biodiversity, and this matter could be considered when this programme of work is reviewed by SBSTTA in preparation for the ninth meeting of the Conference of the Parties. Addressing this problem will require both the promotion of increased efficiency of nitrogen use and the conservation of wetlands to maintain or increase the capacity to filter

and denitrify excess nutrients. Again, addressing this issue effectively will require outreach to the agricultural and other economic sectors.

31. Climate change in the past century has already had a measurable impact on biodiversity, and is projected to have greater impacts in the future. The Millennium Assessment expects that an increase in average global temperature beyond two degrees above pre-industrial temperatures will give rise to globally significant impacts on ecosystems. There is an urgent need for Parties and other Governments to address this threat, inter alia, through their commitments under the UNFCCC and its Kyoto Protocol, in order to lessen dangerous impacts on ecosystems. At the same time, activities aimed at the conservation and sustainable use of biodiversity (including the development and management of protected areas) also need to fully take into account climate change, including through adaptation measures, and the need for adaptation needs to be borne in mind in the implementation of all thematic programmes of work.

32. There is an increasing threat of introduction of invasive alien species associated with increased transport, tourism and trade associated with globalization. This threat will need to be taken into account when SBSTTA addresses this issue in depth in preparation for the ninth meeting of the Conference of the Parties.

C. Response options

1. Options identified by the Millennium Assessment

33. The Millennium Assessment identifies and assessed a number of response options. Those highlighted in the Biodiversity synthesis are the following:

A. Responses with a primary goal of conservation:

- Protected areas, including marine protected areas.
- Species protection and recovery measures for threatened species.
- *Ex situ* and *in situ* conservation of genetic diversity.
- Ecosystem restoration.

B. Responses with a primary goal of sustainable use:

- Payments and markets for biodiversity and ecosystem services.
- Incorporating considerations of biodiversity conservation into management practices in sectors such as agriculture, forestry, and fisheries.
- Capture of benefits by local communities.

C. Integrated responses that address both conservation and sustainable use:

- Increased coordination among multilateral environmental agreements and between environmental agreements and other international economic and social institutions.
- Public awareness, communication, and education.
- Enhancement of human and institutional capacity for assessing the consequences of ecosystem change for human well-being and acting on such assessments.
- Increased integration of sectoral responses.

D. Responses that address direct and indirect drivers and that seek to establish enabling conditions:

- Elimination of subsidies that promote excessive use of ecosystem services (and, where possible, transfer of these subsidies to payments for non-marketed ecosystem services)..
- Sustainable intensification of agriculture.
- Addressing unsustainable consumption patterns.
- Slowing and adapting to climate change.
- Slowing the global growth in nutrient loading.

- Correction of market failures and internalization of environmental externalities that lead to the degradation of ecosystem services.
- Integration of biodiversity conservation and development planning.
- Increased transparency and accountability of Government and private-sector performance in decisions that affect ecosystems, including through greater involvement of concerned stakeholders in decision-making.
- Scientific findings and data need to be made available to all of society.

34. The possible response options should be considered when the programmes of work of the Convention are reviewed. The ecosystem approach adopted in decision VI/6 provides a framework for designing and implementing the entire range of necessary responses listed above, ranging from those directly addressing the needs for conservation and sustainable use of biodiversity to those necessary to address other indirect and direct drivers that influence ecosystems.

35. The usefulness of the ecosystem approach is further supported by the findings of the Assessment. This approach is well suited to the need to take into account the trade-offs that exist in the management of ecosystems and incorporates the need both for coordination across sectors and management across scales.

2. Implications: the need for inter-sectoral integration

36. Many of the responses designed with the conservation or sustainable use of biodiversity as the primary goal (listed under A, B and C above) will not be sustainable or sufficient unless other indirect and direct drivers of change are addressed, and enabling conditions are established. For example, the sustainability of protected areas will be severely threatened by human-induced climate change. Responses also need to address the enabling conditions that determine the effectiveness and degree of implementation of the biodiversity-focused actions.

37. Many of the responses that address direct and indirect drivers and that seek to establish enabling conditions (listed under D above) imply coordinated measures across various economic sectors, including energy, agriculture, forestry and fisheries. Many also have important implications for socio-economic and trade policy. While the need for mainstreaming biodiversity considerations across sectors is recognized in the Convention (Article 6(b)), and has been emphasised in a number of decisions of the Conference of the Parties, progress in achieving integration of biodiversity has been very limited. Frequently discussion of these issues by SBSTTA and the Conference of the Parties has been difficult because of the political sensitivities involved. However these issues need to be discussed and resolved if meaningful progress towards the 2010 target and implementation of the Convention is to be achieved. There may be a need to promote dialogue among different sectors, at the national level and through the process of the Convention on Biological Diversity, *inter alia*, to address linkages between the conservation and sustainable use of biodiversity and the economic sectors, in order to contribute to the more effective implementation of the Convention, particularly its Article 6.

3. Implications: addressing unsustainable consumption

38. Ecosystem services cannot be sustainable globally if the growth in consumption of services continues unabated. At the same time, as it is recognized in the preamble of the Convention, economic and social development and poverty eradication are the first and overriding priorities of developing countries. It will therefore be necessary to address the impacts of the inequalities in the use of resources and their implications for the drivers of biodiversity loss, *and* to consider unsustainable consumption patterns that impact on biodiversity, bearing in mind the common but differentiated responsibilities of States consistent with the Rio Declaration on Environment and Development.

39. The reduction of unsustainable consumption is reflected in the framework adopted by decision VII/30, and SBSTTA has proposed a corresponding indicator (reccommendation X/5), but the issue is not yet fully integrated into the programmes of work developed the Convention.

D. Valuation of biodiversity and related issues

40. The Millennium Assessment finds that there is substantial scope for greater protection of biodiversity through actions justified on their economic merits for material or other benefits to human well-being. Realizing this potential requires a greater effort towards understanding and computing the value of biodiversity, its components and the provision of ecosystem services, together with the use of the resulting information and understanding in decision making. This includes the use of market mechanisms, where appropriate, as well as the valuation of servcies that are non-marketed. This need could be taken into account, *inter alia*, as part of the in-depth review of the programme of work on incentive measures in prearation for the ninth meeting of the Conference of the Parties.

41. There is a need for increased attention in the work of the Convention to socio-economic issues and analysis, including biodiversity valuation, as well as to the topic of promoting markets for ecosystem services. But care should be taken not to further marginalize the world's poor in doing so. The role of biodiversity in contributing to poverty alleviation should also be better understood, and ways to enhance this contribution explored.

42. It is important to note that the term and concept of "ecosystem services" in no way implies an automatic requirement or obligation on the part of the consumer to pay directly for the supply of the service. The term does, however, imply that the service is of value to people (in terms of economic, health, cultural or other benefits) and that the degradation or loss of the service represents a harmful impact on human well-being. There are a variety of policy choices available to reduce the degradation of ecosystem services and retain the benefits for people, including regulatory approaches, technological approaches, and economic approaches. Different societies can decide for themselves which will be most effective and culturally appropriate approach to take.

V. LESSONS LEARNED FROM THE USE OF INDICATORS UNDER THE MILLENNIUM ASSESSMENT, THE APPLICATION OF THE SCENARIOS, AND THE USE OF THE ASSESSMENT METHODOLOGIES

A. Use of the indicators

43. The MA used a number of indicators drawn from the framework of the Convention on Biological Diversity for monitoring progress towards the 2010 target, thus contributing to the testing of the indicators as envisaged in decision VII/30.

44. Of the indicators for immediate testing (decision VII/30, SBSTTA recommendation X/5), the Millennium Assessment used the following, providing time-series data in each case: trends in extent of selected biomes, ecosystems and habitats; trends in abundance and distribution of selected species; coverage of protected areas; change in status of threatened species; nitrogen deposition; trends in invasive alien species (for selected regions only); marine tropic index; and incidence of human-induced ecosystem failure (trends in the frequency of major floods and fires).

45. In addition, the Millennium Assessment used the following indicators, but with no time-series data: Connectivity/fragmentation of ecosystems (for forest biomes, and inland waters). The Assessment also provided an overall assessment of the status and trends in the provision of ecosystem goods and services.

46. In light of the Millennium Assessment, the following conclusions can be drawn concerning the indicator framework for assessing progress towards the 2010 target:

(a) Information is already available to use several of the indicators of the Convention on Biological Diversity to describe current trends in biodiversity, the drivers of change, and some response options;

(b) Only a sub-set of these indicators however, are likely to have sufficient resolution to determine a change in the rate of biodiversity loss by 2010. (such indicators might include: habitat change in certain types of ecosystems, trends in abundance and distribution of selected species, the status of threatened species, and the marine trophic index);

(c) There are a number of indicators recommended for immediate testing for which data cover too short a time period to determine current trends at the global level. (These include: trends in genetic diversity of domesticated animals, cultivated plants, and fish species of major socioeconomic importance; area of forest, agricultural and aquaculture ecosystems under sustainable management; connectivity/fragmentation of ecosystems; trends in invasive alien species.)

47. In summary, while we still lack comprehensive global-scale measures to assess progress towards the 2010 target, the experience of the Millennium Assessment shows that it is possible to describe trends in the status of biodiversity using these indicators. A common message emerges: that biodiversity is in decline, but targeted response options – whether through protected areas, or species management programmes, can reverse this trend for specific habitats or species.

B. Application of the scenario tools to the programmes of work

48. The robustness of the design of programmes of work under the Convention can be tested by examining how their proposed activities and projected outcomes would play out under the four scenarios constructed by the Assessment. As an example, the Scenarios Working Group applied the four Assessment scenarios to the programme of work on forest biological diversity. This programme was chosen because it contains a comprehensive set of policy responses that address the main threats to biodiversity assessed within the Assessment. The results of this exercise show that the wide range of current policy responses in the program of work is generally robust to the different plausible futures. This approach of testing of the programmes of work under the various scenarios could be applied more generally to the remaining programmes of work of the Convention on Biological Diversity. Indeed, it is proposed that the Assessment scenarios be used as a tool when conducting the in-depth reviews of the programmes of work (see UNEP/CBD/WG-RI/1/9, Annex III).

C. Use of assessment methodologies

49. The Millennium Assessment reports provide a substantial set of guidance on integrated assessment methodologies. The reports thus constitute a useful resource for Governments and organizations to use for their own purposes, including in the application of environmental impact assessments and strategic environmental assessments, the application of the ecosystem approach, the preparation of national biodiversity strategies and action plans, and the general task of monitoring implementation of national obligations under the Convention.

VI. IDENTIFIED NEEDS FOR FURTHER RESEARCH AND MONITORING

50. While the Millennium Assessment synthesized a large amount of existing knowledge, it also identified key gaps in knowledge and understanding that hinder decision-making concerning biodiversity and ecosystems. Better prediction of the impacts of drivers on biodiversity, ecosystem functioning, and ecosystem services, together with improved measures of biodiversity, would aid decision-making at all levels. More specifically:

(a) Models need to be developed and used to make better use of observational data for determining the trends and conditions of biodiversity;

(b) Additional effort is required to reduce critical uncertainties, including uncertainties around thresholds associated with changes in biodiversity, ecosystem functioning, and ecosystem services;

(c) Additional measures of biodiversity are needed to meet the needs of stakeholders, and to assist in communication, setting achievable targets, addressing trade-offs between biodiversity conservation and other objectives (Given the multiple components of and values associated with biodiversity, no single measure is likely to be suitable for all needs.);

(d) Practical tools for biodiversity valuation are needed to allow comparison the total economic value of alternative biodiversity management options;

(e) There are major gaps in information on non-marketed ecosystem services, and their value, including their potential contribution to poverty alleviation.

51. In addition, there are gaps in global and national monitoring systems which need to be addressed.

VII. CONSIDERATION OF THE NEED FOR FUTURE ASSESSMENTS

52. Much attention has been given to improving the scientific and technical input into the Convention process. SBSTTA, which has a responsibility to ensure that scientific assessments are carried out in an authoritative and objective manner, draws upon the work of ad hoc technical expert groups, assessments affiliated with the Convention on Biological Diversity such as the Millennium Assessment, independent assessments such as the Intergovernmental Panel on Climate Change, the work of other organizations, and expertise contracted by the Secretariat. At the same time there have been discussions within the UNEP Governing Council to establish as International Panel on Environmental Change, and the International Conference "Biodiversity: Science and Governance, held in Paris, January 2005, recommended the launch of an international multi-stakeholder consultative process to assess the need for an international mechanism which would provide a critical assessment of the scientific information and policy options required for decision-making". The Millennium Assessment, in its design, anticipated that—if the assessment proved to be useful to its stakeholders—future assessments modelled on the Millennium Assessment would be repeated. The indicators selected in the Assessment, and the process of data archival, has been arranged to facilitate the operations of any future assessment addressing the linkages between biodiversity and ecosystem change and human well-being.

53. If the Executive Secretary and Chair of SBSTTA participate in the multi-stakeholder consultative process, they might usefully draw upon the lessons learned from the Millennium Assessment process concerning the necessary elements for a successful assessment process (including, for example, issues related to: the scope and modalities of an assessment; the role of stakeholders in design, preparation and peer-review, incorporation of sub-global assessments; incorporations of different types of knowledge).

54. It is premature to address the need for another assessment of the scale of the Millennium Assessment at this. Firstly, the multi-stakeholder process referred to above has only recently been initiated and is due to report in 2006/2007. Secondly it is too soon to evaluate the effectiveness of the Millennium Assessment. An evaluation is due to be undertaken by the institutions represented on the Millennium Assessment Board during 2006-2007. SBSTTA and the Executive Secretary could contribute to that review focussing in particular on the impact of the MA in the process of the Convention on Biological Diversity at global and national levels. Also during 2007, SBSTTA could review the need for an assessment body, an independent one-off assessment, or an assessment body established in partnership with other related conventions, in light of the report of the multi-stakeholder process, and the evaluation of the Millennium Assessment. If it is concluded that there is a need for a further assessment at that time, SBSTTA may wish to give consideration to the scope (comprehensive versus specific), scale (global versus sub-global) and periodicity of the assessments, the use of modelling and scenarios, and the relationship with other ongoing assessment processes.
