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BIOLOGICAL DIVERSITY OF INLAND WATER ECOSYSTEMS

Linkages between the conservation and sustainable use of the biological diversity of inland water ecosystems and poverty alleviation/sustainable livelihoods, including human health considerations

Note by the Executive Secretary

I. INTRODUCTION

1. In paragraph 25 of decision VII/4, the Conference of the Parties emphasized the critical role of inland water biodiversity for sustainable livelihoods and, accordingly, requested the Executive Secretary, in collaboration with the Food and Agriculture Organization of the United Nations and other relevant organizations, to prepare a study of the linkages between conservation and sustainable use of inland water biodiversity and poverty alleviation/sustainable livelihoods, including human health considerations, for consideration by the Conference of the Parties at its eighth meeting. The study should contain proposals on ways and means to ensure that implementation of the programme of work contributes appropriately to poverty alleviation and sustainable livelihoods.

2. In the inter-sessional period, the Executive Secretary established an informal group on this subject which included relevant expertise from the Food and Agriculture Organization of the United Nations, in particular its Fisheries Department and Regional Office for Asia-Pacific, the CGIAR centres (especially the WorldFish Centre), the Secretariat of the Ramsar Convention and individual members of its Scientific and Technical Review panel and a number of individual experts from other institutions. In addition, discussions on the topic and needs were held on the margins of the ninth meeting of the Conference of the Parties to the Ramsar Convention (7-15 November, 2005, Uganda) with the Ramsar Secretariat, The International Water Management Institute (IWMI), Wetlands International, WWF International, several regional NGOs and others.

* UNEP/CBD/COP/8/1.

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3. Space does not permit a detailed study of this subject in this document. Neither is the readership of this document the key target group for such information. Ways and means to help get key information to key stakeholders are proposed later.

4. Section II of this document explains the complexities of the issue of the biological diversity of inland water ecosystems in relation to poverty alleviation and livelihoods drawing attention to the multi-dimensional nature of these concepts. Section III explores in more detail the subject of the direct contribution of living aquatic resources (i.e., inland fisheries and aquaculture). Section IV introduces the concept of ecosystem services of provided by inland waters as being an appropriate framework to consider the complex linkages. Section V provides information on a selection of existing initiatives, data and published information on this subject. Section VI draws overall conclusions and concentrates on ways and means to ensure that implementation of the programme of work contributes appropriately to poverty alleviation and sustainable livelihoods.

II. THE MULTI-DIMENSIONAL NATURE OF BIOLOGICAL DIVERSITY, LIVELIHOODS AND POVERTY AND OF THE LINKAGES BETWEEN THEM

A. Dimensions of Biodiversity

5. The term "biological diversity of inland water ecosystems" is multi-faceted. The definition under the Convention on Biological Diversity includes the biological components of biodiversity (populations, species, genomes) and the diversity of the inland water ecosystem itself (including relevant physical and chemical characteristics, landscapes and all related aspects of the services provided by inland water ecosystems). Changes to the natural environment within landscapes (e.g., land use) have significant impacts upon inland waters. Therefore, inland water biodiversity arguably also has a significant terrestrial component (if not by definition, certainly in practice). A common unit for management has been at the river basin scale because of these complexities Added to this is the socio-economic and cultural dimension of inland water biodiversity (including associated traditional knowledge).

6. There are two broad aspects to inland water biodiversity relevant here: (i) *biological resources:* living resources have both direct (exploitation) and indirect (non-exploitive) uses. Direct uses include "fisheries", in the broadest sense, and the provision of timber, fibre, and other construction materials, medicinal uses of biota etc. Indirect uses include such things as tourism and cultural values, but more significantly the value of the living components of biodiversity in supporting other ecosystem goods and services derived from inland water ecosystems (such as nutrient recycling etc.); and (ii) *water resources:* water is essential to sustain biodiversity, moreover, changes in water use, or impacts upon water, affect biodiversity and hence poverty/livelihoods through both direct and indirect changes in use and benefits.

B. Dimensions of poverty

7. Poverty itself is a complex and multi-dimensional phenomenon. The World Bank Development Report (2000/2001) deals with these dimensions under three headings: opportunity, empowerment and security. The Human Development Report 2005 (UNDP) refers to the human poverty index which essentially measures deprivations in the three basic dimensions in the Human Development Index: (i) a long and healthy life (vulnerability to death); (ii) knowledge (exclusion from the world of reading and communications); and (iii) a decent standard of living (lack of access to overall economic provisioning – lack of sustainable access to an improved water source being one indicator for this). The concept of "health poverty" has also variously been included and encompasses both access to health support services and the impacts of other deprivations (e.g. poor nutrition) on health. Both the biological and non biological aspects of inland water biodiversity are clearly related to the first and third of these, and health.

The multitude of living aquatic resources from inland waters which are the products of fisheries (see later) are significantly important for human health and longevity (food and nutrition), particularly the rural poor in developing countries. Lack of access (opportunity) to those resources and empowerment over their exploitation and management contribute to poverty. Declining inland fishery resources promote food insecurity. Likewise, water (as a physical resource itself) has critical linkages with poverty (as introduced briefly above). There are of course many global, international and national initiatives dealing with poverty reduction.

8. It is generally accepted that the dependence of the poor directly upon living biological resources is higher in the least developed countries (Millennium Ecosystem Assessment Synthesis Report: http://www.maweb.org).

Dimensions of livelihoods

9. In the current context a "livelihood" encompasses the ways and means by which a human, or family or group/community, obtains the socio-economic benefits which sustain his/her/their social and economic well-being, including security. In the absence of social services – a livelihood is also the means to avoid poverty. Poverty and livelihoods are different concepts but of course closely linked.

10. "Livelihood" is also a complex and multi-dimensional concept. Livelihood "assets" can be considered in terms of various forms of capital - human, natural, financial, social and physical. These are variously vulnerable to such things as shocks (economic or environmental), trends and seasonality. Livelihood strategies lead to livelihood outcomes but this process is heavily influenced by the vulnerability context and policy and institutional processes. Influence upon and access to livelihoods assets is a critical aspect of livelihood outcomes. Lack of it is a major driver of poverty. Inland water biological diversity is relevant to most forms of livelihood assets – in particular natural, financial and physical capital. It is also highly relevant to vulnerability - for example, food insecurity (as mentioned earlier). Livelihood assets are interdependent – for example a person's (or community) livelihood may appear to depend to a large degree upon financial income from employment – but in times of crisis (e.g., economic collapse, conflict) access to living aquatic and other resources from inland waters may be critical (as a "safety net").

11. A considerable complication of livelihood considerations, in particular for inland waters, is the degree to which assets can be "traded" (economically, socially or politically). Trading can occur within asset types (e.g. a community converts an ecosystem from a wetland for fisheries to land for agriculture – it remains natural capital) or between them (e.g., a community sells the wetland to others – whereby it is converted to financial capital for them, even if it remains a wetland after sale). Within certain limits and conditions, both examples could arguably lead to sustainable livelihood outcomes. However, perhaps the most significant complication for inland waters is that the water itself is an extremely significant livelihood asset but one which can be traded (or appropriated) by those who are external to any particular community in question (even if the community has direct access and local control). The classic example of this is the upstream use of water (for example for hydropower or irrigated agriculture) and its, often negative, consequences on ecosystem services and livelihoods downstream (through for example declining fisheries). It is also feasible that such shifts in the uses of resource assets (water) result in net positive livelihood outcomes (poorer fishers, but more numerous richer farmers or employees in industries). Injecting the issue of "sustainability" into the considerations does not help because policy makers may ask, not unreasonably, "sustainable for whom"? Equity is of course an issue, but one which has been debated for decades, particularly regarding policies for water allocation among users in river basins.

III. INLAND FISHERIES AND AQUACULTURE

12. A very broad interpretation of "fisheries" is required in the current context. It includes the direct exploitation of "wild" living aquatic animal resources from inland waters (including not only fish, but reptiles, amphibians, crustaceans, insects, molluscs and many other miscellaneous taxa; aquatic plants are

also important but rarely included in "fisheries"). These are very much directly biodiversity based activities. For example, the results of a recent study of rice-fields in South East Asia 1/ illustrate that a broad diversity of aquatic plants and animals (approaching 200 species) are frequently accessed and used by villagers, and that fish and other aquatic animals make up the main animal protein sources in peoples' diets. Integrated management of freshwater and wetland resources is necessary to meet the objective of increased rice production whilst maintaining the viability and productivity of the aquatic resources upon which rural livelihoods depend.

13. It is certainly the case that the contribution of living aquatic resources (both captured and cultured) to poverty reduction (or mitigation) and sustainable livelihoods is grossly underestimated globally. Hence the importance of the conservation and sustainable use of this aspect of the biological diversity of inland water ecosystems continues to be seriously under-estimated.

14. A recent review of inland fisheries statistics for South East Asia undertaken by the FAO, 2/ widely regarded as applicable to other regions, concluded that current statistics are not reliable. Apart from being generally inaccurate, they do not adequately address issues related to poverty, livelihoods or biodiversity. This is a significant constraint to improved planning. 3/ However, there are copious numbers of national and regional case-studies which clearly indicate the significant importance of living inland aquatic resources to poverty alleviation and sustainable livelihoods and the widespread underestimation of this importance in many policy and planning fora. 4/ For example, the FAO has reviewed the contribution of inland fisheries to global food security 5/ concluding that they arguably rival the importance of marine fisheries in this respect and that their importance increases amongst the lowest income countries and most under-privileged and vulnerable communities.

15. Further examples of the importance of fisheries are provided in the Annex.

16. A recent review of the relationships between inland fisheries and livelihoods 6 concludes that they make an important but often neglected contribution to rural livelihoods in developing countries.

17. There are major differences between inland and marine fisheries and the neglect of these often clouds policy and management analysis: for inland fisheries relevant points are (i) the major threat is the reduction in ecosystem services (e.g., pollution, habitat loss and degradation) and not overexploitation (although that does occur and can be locally significant); (ii) the bulk of the catch is taken by small scale fisheries, that is, participation in the fishery, per unit of product, is far higher; and "by catch" is not an issue (in terms of being a significant proportion of the resources taken) since practically everything caught

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1/ Meusch, E., Yhoung-Aree, J., Friend, R. & Funge-Smith, S.J. 2003. The role and nutritionalvalue of aquatic resources in the livelihoods of rural people – a participatory assessment inAttapeu Province, Lao PDR. FAO Regional Office Asia and the Pacific, Bangkok, Thailand, Publication No. 2003/11, pp. 34. A more detailed description and analysis of the role of biodiversity in rice-based ecosystems is available from the FAO: Halwart, M., Bartley, D (eds.). 2005. Aquatic biodiversity in rice-based ecosystems. tudies and reports from Cambodia, China, Lao People's Democratic Republic and Viet Nam. [CD-ROM]. Rome, FAO.

2/ Coates, D. 2002. Inland capture fishery statistics for South-east Asia: current status and information needs. Food and Agriculture Organization of the United Nations, Regional Office for Asia-Pacific, Bangkok, Thailand. RAP Publication 2002/11. 115 p.

3/ Relevant statistics are difficult to gather on this subject. The FAO is well aware of this problem and continues to try to improve the quality and relevance of its data.

4/ This subject warrants a more detailed review but its outcomes relate more to the scale of importance of living inland aquatic resources as opposed to actual linkages with poverty/livelihoods.

5/ Coates, D. (1995). Inland capture fisheries and enhancement: status, constraints and prospects for food security. Report of the International Conference on the Sustainable Contribution of Fisheries to Food Security. Kyoto, Japan, 4-9 December 1995. Government of Japan. Document # KC/ FI/95/TECH/3. 85p. Food and Agriculture Organization of the United Nations, Rome.

6/ Smith, L. E. D., Khoa, N. S. and K. Lorenzen. 2005. Livelihood functions of inland fisheries: policy implications in developing countries. *Water Policy* 7: 359-383.

is used (ref. aforementioned FAO report on food security). For the marine fisheries sector things are very much reversed.

18. Traditional and local knowledge is also intimately linked to the subject of sustainable livelihoods in fisheries, as for many other relationships between the well-being of local communities and their environment. Not only does the depth and diversity of knowledge reflect the diversity of the resources exploited, it is also an essential element for survival.

19. The importance of living aquatic resources (inland fisheries and aquaculture, and the biodiversity upon which these depend) is easily illustrated. They are simply essential to sustained well-being of many communities in many areas. However, the role of inland fisheries and aquaculture to future poverty reduction and sustainable livelihoods is far from clear. There are many complicating factors.

20. One such factor is that many people who depend directly upon these resources do so because they are already poor. For many, fishing is often an occupation of last resort (although not for all – but those who generate reasonable income from fisheries are no longer poor). There are limits to the sustainable use (exploitation) of these resources. Importantly, poverty itself is widely regarded as a driver of this unsustainable use. 7/ The subject of the extent to which fisheries can reduce poverty is widely debated and many fisheries policies in fact focus on trying to reduce dependency of the poor on fishery resources. Achieving that requires alternative livelihood options. But until those options are viable the fishery resources must be sustained or poverty becomes more extreme and creating livelihood options generally involves increasing alternative uses of water. The resources upon which fisheries depend (e.g., the habitat used to produce the fish, and more so the water itself) can be used to reduce poverty and create improved livelihoods in other ways than supporting fisheries. For example, wetlands can be converted to agricultural use, water can be used to generate power. This subject is addressed in more detail in the next section.

21. Neither are the relationships much clearer for aquaculture. Aquaculture does not necessarily benefit the poor, and in many cases does not help the extreme poor. Aquaculture requires assets – in particular rights or access to land (or water) and capital, even in modest amounts. The extreme poor have none of these (by definition).

22. That inland fisheries and aquaculture are important to extreme poverty mitigation in many areas is clear. But poverty reduction is different. The fundamental issue is equity of the poor in livelihood benefits that can be derived from managed changes to ecosystem services provided by the biological diversity of inland waters.

IV. ECOSYSTEM SERVICES PROVIDED BY INLAND WATERS – A FRAMEWORK FOR CONSIDERING LINKAGES

23. Linkages between the conservation and sustainable use of inland water biodiversity and poverty reduction and sustainable livelihoods need to be viewed from the perspective of the ecosystem services that inland waters provide to humans and how these can be managed to achieve poverty reduction and sustainable livelihood outcomes. The services provided by inland water ecosystems, and some linkages between these and poverty/sustainable livelihoods, are shown in the annex. Water, and the biological diversity it supports or is associated with it, is the basis of all these ecosystem services (annex).

24. At the local scale the importance of each ecosystem service type depends upon the stakeholders in question. To some extent these services are inter-changeable (tradable). For example, the regulating service provided by an intact river in mitigating catastrophic floods can be traded through hydrological engineering to divert water to irrigated agriculture (which increases food provision), and cultural and supporting services of natural ecosystems and landscapes may be lost in the process.

7/ It is worth noting that this aspect of inland fisheries differs considerably from marine (ocean) fisheries where over-exploitation by the already affluent, fueled by government subsidies, is the main driver of unsustainable use. Coastal fisheries generally have a mix of these two drivers.

25. The Millennium Ecosystem Assessment Conceptual Framework of interactions between biodiversity, ecosystem services, human well-being, and drivers of change (threats) frames the subject in question in the broader picture of global human development and the environment, and linkages between them. The Millennium Ecosystem Assessment (MA) should be consulted for a much more detailed discussion of such an approach and its implications.

26. Because of the multi-dimensional nature of these subjects, and the complex inter-relationships between them (as above), the practical application of the approach to inland water biological diversity is by no means easy. But to be effective the approach must include clear understanding of, *inter alia*, the following: (i) the broader concept of "inland water biological diversity" and the relationships between its sub-components; (ii) realistic valuations of services provided by inland water ecosystems, using transparent, agreed and appropriate valuation approaches and criteria, including accurate estimations of what services inland water ecosystems currently provide, to who and how; 8/ and under what conditions and with what tradeoffs; (iii) realistic projections for sustainable poverty and livelihood outcomes for changes in the generation and allocation of inland water ecosystem services; (iv) minimum levels of biodiversity that must be maintained in order to sustain ecosystem options; 9/ and (v) transparent, equitable and participatory decision making frameworks – particularly regarding trade-offs between ecosystem services.

27. Whilst real conflicts may occur between different uses of water or components of inland water ecosystems, and hence between different stakeholders groups, the conservation and sustainable use of biodiversity and poverty reduction/sustainable livelihoods are by no means incompatible. Rather than focussing on addressing conflict, a wiser approach would be to seek synergies – or win-win outcomes. For example, maintaining good water quality will benefit fisheries in addition to sustaining drinking water supply. Maintaining the ecological function of wetlands contributes to sustainable fisheries, nutrient recycling and mitigation against the impacts of natural and human-induced disasters. Neither are agriculture and fisheries/aquaculture incompatible. There are ways of incorporating fisheries/aquaculture considerations into agriculture systems, and thereby improving net biodiversity and poverty outcomes (see later).

28. What is clear is that sector based management, without a holistic vision, is unlikely to lead to effective and sustainable poverty reduction.

V. SOME EXISTING INITIATIVES AND INFORMATION

29. Some relevant on-going activities are selected here only to illustrate that required ways and means to ensure that implementation of this programme of work contributes appropriately to poverty alleviation and sustainable livelihoods centre largely on integrating relevant biodiversity issues into on-going initiatives.

Water use in agriculture

30. The objective of the FAO/Netherlands International Conference on Water for Food and Ecosystems (The Hague, 31 January – 4 February 2005) (http://www.fao.org/ag/wfe2005/) was to help governments identify management practices, practical lessons learned and the necessary enabling environments that lead to sustainable water use at the river-basin level and the harmonization of food

8/ Discussion of valuation approaches for wetlands is available in: Barbier, E. B., Acreman, M. and D. Knowler. 1997. Economic valuation of wetlands: a guide for policy makers and planners. Ramsar Convention Bureau. Gland, Switzerland. An update and further links are provided in: Lambert, A. 2003. Economic valuation of wetlands: an important component of wetland management strategies at the river basin scale. http:///www.ramsar.org/features/features_econ_val1.htm. The Ramsar STRP is currently elaborating approaches to give improved attention to non-formal economic valuations, including for social and cultural services. It should be noted that costs and benefits scenarios for interventions, or non intervention options, are desirable and goes beyond "valuation". Valuation contributes to scenario building.

9/ A working definition of this might be the level below which we no longer have the option to convert inland water ecosystems to alternative uses (including restoration to original states).

production and ecosystem management with a view to implementing already internationally agreed commitments. The outcomes of the conference provided a direct input to the CSD-13, which had a focus on water issues. In addition it will help to implement working programmes under international conventions, including the Convention on Biological Diversity, 10/ the Ramsar Convention, as well as the Plan of Implementation of the WSSD (Johannesburg 2002).

31. The Consultative Group on Agricultural Research (CGIAR) is currently undertaking a comprehensive assessment (CA) of water management in agriculture (http://www.iwmi.cgiar.org/assessment/). This includes a chapter which reviews extensively the contribution of inland capture fisheries and freshwater aquaculture to water productivity, including poverty and livelihood aspects and prospects for sustained or improved ecosystem services provided by this sector. 11/ The CA examines in depth the cross-cutting issues of poverty and gender in water management in agriculture. The main challenge of the CA is to provide supporting evidence for critical state-of-the-art issues regarding interactions of poverty and agricultural water management practices over the past 50 years, as well as current challenges, potential solutions and response options. A section of the assessment deals specifically with poverty (http://www.iwmi.cgiar.org/assessment/Synthesis/poverty.htm). The Secretariats of the Ramsar Convention and of the Convention on Biological Diversity, in addition to the FAO and others, are partners in this initiative.

Wetlands, poverty and livelihoods

32. Wetlands 12/ are generally very productive ecosystems that play a crucial role in the water cycle and are considered to be disproportionately important for both biodiversity conservation and for food security and other livelihood support functions, particularly for the poor. Although "fisheries" are a major benefit of wetlands they are but one component of a multitude of services such systems provide. Many poor rely on wetlands for food, water, construction materials and other necessities. Wetlands also act as transport corridors and provide protection against flood, drought and saltwater intrusion – all crucial environmental services important for food and other security (see also table 1). Although wetlands do not necessarily provide a way out of poverty, the degradation of wetlands leads to increased poverty, particularly amongst the rural poor. In addition, poverty is a major driver of wetland degradation and loss. Experience has shown that solutions to wetland degradation and over-exploitation must be based on a thorough understanding of how wetlands contribute to people's livelihood strategies.

33. Wetlands International has a working group on wetlands and livelihoods (www.wetlands.org) and a wetlands and poverty reduction project which aims to reduce poverty in wetland areas through integrated environmental and poverty alleviation initiatives (www.wetlands.org/wiseUse/WPRPfactsheet.pdf). This includes a focus on the values of wetlands for environmental and food security, and their potential for poverty reduction. The objectives of the working group are to: strengthen the understanding of the dynamic relationship between poverty and wetlands, highlight priorities for strategic intervention in regard of the contribution of wetlands to poverty reduction and promote new partnerships between the poverty reduction and conservation organizations and the wider water resources management community.

34. The World Wide Fund for Nature (WWF) is also very active in this field and has, for example, recently produced an economic analysis of the livelihood impacts of freshwater conservation initiatives. 13/ The four case-studies included clearly showed that the availability and functioning of

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10/ An address from the Executive Secretary to the conference noted that the initiative represented an excellent example of implementation of the programme of work on the biological diversity of inland water ecosystems by addressing a number of its key areas and activities.

11/ Comprehensive Assessment of Water Management in Agriculture. Chapter – Fisheries. International Water Management Institute, Colombo, Sri Lanka (In press – anticipated to be launched mid-2006).

12/ The Ramsar interpretation of the term "wetland" is used here which essentially includes all inland water ecosystem types – including rivers, lakes and groundwater, permanent or temporary – whether natural or artificial.

13/ Schuyt, K. 2005. Freshwater and Poverty Reduction – Serving People, Saving Nature. WWF International, Zeist, The Netherlands. 36p.

freshwater ecosystems have significant impact on the livelihoods, health and food and other security of the poor, and that not only are livelihood improvements of the poor possible and likely as a result of improved freshwater resource management, but that the improvements are received across gender, age and disabled groups. This example in particular shows that a detailed analysis of the facts can often show that the idea that wetlands (and their fisheries and other services) can always be traded for better economic returns can be mis-guided.

35. The Ramsar Convention on Wetlands, its Secretariat and International Organization Partners, have, of course, explored the relationships between wetlands, poverty and livelihoods in considerable detail (and Wetlands International are a major partner). Ramsar COP8, document 7 (www.ramsar.org/cop8/cop8_doc_07_e.htm), for example, discusses in detail the relevance of the report of the Secretary General on the results of the World Summit on Sustainable Development, and the Johannesburg Plan of Implementation, of relevance to the Convention on Wetlands. This includes how the Convention should and can position itself as a tool for poverty reduction in relation to wetland conservation and sustainable use. The ninth meeting of the Contracting Parties to the Ramsar Convention (COP9) had as its theme "Wetlands and water: supporting life, supporting livelihoods". Ramsar COP9 considered the subject of wetlands and poverty reduction in more detail in resolution IX.14 which notes the relevance of a number of decisions of the Conference of the Contracting Parties to the Ramsar Convention, with cross-referencing to decisions of the Convention on Biological Diversity; the relevance of the Ramsar Convention as an element in the delivery of the internationally agreed development strategies; the findings of the Millennium Ecosystem Assessment; and urges Parties to take or support a number of actions which address the needs for, and linkages between, wetlands, poverty and sustainable livelihoods related issues Four case studies were also used to illustrate linkages between wetlands, poverty and livelihoods. (http://www.ramsar.org/cop9_dr15_e_anx.htm). Ramsar Resolution IX.9 also notes the important linkages between wetlands, poverty and livelihoods in terms of the role of intact, healthy wetlands in natural disaster prevention, mitigation and adaptation. The Ramsar series of Handbooks for the Wise Use of Wetlands also represents a significant source of further information on, and management guidelines for the management of, relevant subjects – particularly Handbook Number 1 on the *Wise use of wetlands* (http://www.ramsar.org/lib/lib_handbooks_e.htm).

36. World Wetlands Day (2 February 2006) had as its theme "In the face of poverty…..wetlands are lifelines" (www.ramsar.org).

Global assessments and initiatives

37. The MA has of course reviewed in considerable detail the general linkages between biodiversity, poverty and sustainable livelihoods. In particular the key messages in its wetlands and water synthesis report (Ramsar Convention) address the subject in more detail than can be presented here. In addition the Second Global Biodiversity Outlook reviews related relationships. The findings of these assessments are presented for the more general consideration of the eighth meeting of the Conference of the Parties through SBSTTA recommendation XI/4 and in document UNEP/CBD/COP/8/12 respectively.

38. There are many other global, regional or national assessments or initiatives that deal directly or indirectly with the subject in question. Some of these are directly related to water and/or the biological diversity of inland water ecosystems, others have indirect linkages to the subject in question through threats to inland water biological diversity and hence poverty and livelihoods (for example, practically all activities related to agriculture, those causing water pollution or other forms of wetland degradation, health and sanitation relating to water use etc.). Some of these address the relevant context (poverty-livelihoods) and needs for the sustainable use of inland water ecosystems well, others are lacking in this respect.

VI. SUMMARY AND WAYS AND MEANS TO ENSURE THE PROGRAMME OF WORK CONTRIBUTES TO POVERTY ALLEVIATION AND SUSTAINABLE LIVELIHOODS

39. The synthesis chapter of the Ramsar Convention in the MA (Wetlands and Water Synthesis) undertook an analysis of the indicative trade-offs in approaches to achieve the Millennium Development Goals. It looked at the implications for the future delivery of ecosystem services of different strategic policy options for the achievement of intergovernmental environmental commitments – carbon mitigation (Kyoto Protocol), the poverty and hunger Millennium Development Goals, and environmental conventions concerned with water and ecosystems (Ramsar and CBD). Although the actual trade-offs may differ in specific locations, in general overall progress is likely to be less when any of the goals are addressed in isolation than when they are addressed jointly. In the current context, this implies that focussing on the objective of the conservation and sustainable use of inland water biological diversity, in isolation, will not necessarily lead to maximising the achievement of human development targets (poverty reduction and sustainable livelihoods). But neither will focussing on development targets in isolation.

40. Clearly the linkages between the biological diversity of inland water ecosystems, poverty and livelihoods are very complex. The tradability of water (between various ecosystem services) allows policy makers and managers to manipulate the biodiversity for the benefit (or perceived benefit) of particular stakeholder groups. Simple solutions to this problem are not available, and simplistic policy making processes have mismanaged ecosystem services, and will continue to do so, for inland waters. For example, policies which place intensified agriculture as the priority (involving increased use of water and escalating impacts on water and wetland quality) may well benefit some stakeholder groups but livelihoods of people who depend upon water downstream may well be degraded. Conversely, policies which place the sustainable use of living aquatic resources (e.g., livelihoods benefits of fisheries) as the priority may well deny other groups of critical ecosystem services (e.g., increased food supply, water for drinking and sanitation in urban areas). Sector-based planning for inland waters typically results in mismanagement of inland water resources.

41. No poverty alleviation is possible without water. The significant inter-linkages between poverty and the state of the environment, including those between poverty and the shortage of water, are getting increased recognition, but insufficient consideration is being given to the fact that protecting ecosystems directly or indirectly related to water is the key to sustainable development. The sustainable management of water resources, specifically in relation to the World Summit on Sustainable Development, requires a holistic ecosystem based approach and this subject is discussed in more detail elsewhere. 14/

42. The MA conceptual framework (http://www.maweb.org/documents/conceptual.framework.ppt) is an excellent tool for improved planning and policy development in this respect. Linkages between inland water biodiversity, poverty and livelihoods can be considered in terms of livelihoods being supported by a range of services provided by inland water ecosystems and "poverty reduction" is in fact a goal achieved by increasing livelihood benefits to particular target groups by reallocating those services through appropriate development. The policy making process must include full awareness of the ecological linkages between different ecosystem services provided by inland waters and the livelihood outcomes of various policy and management options (which result through ecological linkages between ecosystem services but are greatly influenced by social and cultural factors). It is essential that there is a thorough understanding of how the various stakeholder groups, in particular the poor, depend upon inland water biodiversity. One area where awareness is often seriously lacking relates to dependency upon living aquatic resources in inland waters ("fisheries" in its broadest context). An important tool to promote improved planning and management, and to enhance equity in livelihoods benefits from inland water biodiversity, is effective and meaningful stakeholder participation in policy development, planning and

14/ Swiss Agency for the Environment, Forests and Landscape (SAEL), the Bureau of the Convention on Wetlands (Ramsar, 1971) and WWF August 2002. Sustainable management of water resources: the need for a holistic ecosystem approach. www.ramsar.org/wssd_side_paper.htm

management. Eventually, trade-off decisions have to be made and it is essential to have accurate and meaningful valuations of ecosystem services provided, and to whom, especially those that include non-market benefits.

43. There are very many global, regional, national and local initiatives that deal directly with the subject in question. Many of these include comprehensive and effective attention to the needs, many address them in part, but others fall well short. However, the most pressing need of all is to raise full awareness of the issues and solutions amongst those who have impacts upon inland water biodiversity but their planning and management currently do not take this fully into account. Major constraints to achieving progress are often the institutional and governance arrangements at national level and below, which often work against integrated (cross-sectoral) holistic planning (see the MA for further discussion).

44. Poverty alleviation and sustainable livelihoods are referred to explicitly in the programme of work on the biological diversity of inland water ecosystems (decision VII/4 and annex) only in paragraph 25 (see introduction). In addition, paragraph 8 recommends that the Strategic Plan of the Convention on Biological Diversity and the Plan of Implementation of the World Summit on Sustainable Development should guide the implementation of the revised programme of work on inland water biological diversity (which *de facto* links it to poverty and livelihoods).

45. In terms of ways and means to achieve this, paragraph 10 urges Parties, other Governments and organizations to incorporate the objectives and relevant activities of the programme of work in their biodiversity strategies and action plans, wetland policies and strategies, and the integrated water resources management and water efficiency plans being developed, by 2005, 15/ in line with paragraph 25 of the Plan of Implementation of the World Summit on Sustainable Development, and to implement them and further promote coordination and cooperation between national actors responsible for inland water ecosystems and biological diversity. An issue with the latter statement is it is not always clear which actors are responsible, although there are many that have an impact.

46. Paragraph 11 recognizes the presence of inland water ecosystems within agricultural lands, forests, dry and sub-humid lands, and mountains, 16/ and the ecological connectedness between inland waters, estuaries and inshore coastal areas and, accordingly, encourages Parties, other Governments and organizations to ensure cross-referencing to, and coherence with, the other thematic programmes of work while implementing this programme of work.

47. Paragraph 26 requests the Executive Secretary to compile, in collaboration with relevant organizations and experts, existing information and disseminate it in a format that is useful to policy makers, recognizing that comprehensive information about the function of inland water ecosystems is invaluable to land and resource managers for planning, evaluating and executing plans and programmes - emphasis should be put on assessment of, and research on, factors that affect ecosystem functions, the valuation of ecosystem functions, and remedial actions to restore ecosystem functions.

48. Several goals in the programme of work also address measures to achieve the objective in question including: Goal 1.1 (To integrate the conservation and sustainable use of biological diversity into all relevant sectors of water-resource and river-basin management, taking into account the ecosystem approach); Goal 2.1 (To promote the integration of conservation and sustainable use of the biological diversity of inland water ecosystems into relevant sectoral and cross-sectoral plans, programmes, policies and legislation); and Goal 3.1 (To develop an improved understanding of the biodiversity found in inland water ecosystems, how these systems function, their ecosystem goods and services and the values they can provide).

15/ IWMI plans are to be initiated by 2005 also.

16/ It is noted that this terminology inadequately addresses the impacts of terrestrial biomes and activities on inland waters as subsequent terminology on connectedness refers only to downstream ecosystems.

49. Additionally, several other decisions of the convention draw attention to the linkages between poverty, livelihoods and biodiversity, in particular decision VII/32 (the programme of work of the convention and the Millennium Development Goals - which includes several general activities to achieve this). Although further emphasis on poverty and livelihood issues could be usefully added to these decisions, they form an adequate basis for addressing them. The issue relates more to one of implementation.

50. Major drivers of biodiversity loss in inland waters arise through the activities of the sectors (in particular agriculture since this is the main *ex-situ* use of water). There is likely a need for further awareness raising of both the needs and response options (and available tools) amongst the multitude of stakeholders involved if poverty and livelihoods aspects of inland water biodiversity are to be properly addressed across all programme areas. There is also a multitude of ongoing initiatives and programmes that are attempting to address these needs, and many that provide good and workable solutions. Proposals on "ways and means" should therefore focus on the identification of information gaps and, if necessary, filling them. More importantly, there is an urgent requirement for a strategy that will enhance the prospects of the major stakeholders (drivers of change) fully incorporating relevant considerations into their policies and management activities, and to promote appropriate institutional and governance mechanisms to enable this to occur (SBSTTA recommendation XI/9, paras. 6 and 8, identify ways to contribute to these needs).

51. The classification of inland waters as defined by the Ramsar Convention can help Parties identify key issues that are a priority for physical planning, agricultural development, water treatment, supply and sewerage disposal. For example, in a major wetland type (peatlands) the key issue is maintaining the water table high enough to prevent oxidation and loss of soil. Many livelihood benefits of peatlands are sustainable, such as hunting, limited farming in saturated conditions, and harvest of vegetation, only if appropriate water balance is maintained. On river floodplains, which can be extremely productive and have enormous livelihood benefits, a key issue is maintaining ecological connectivity and near natural flood regimes. A break down of wetland types to develop key messages for management priorities for mainstreaming livelihoods for each would enable Parties to better target appropriate policy and management responses.

52. A major area in which progress can be made is for Parties, as appropriate, in their review of, and implementation of existing, NBSAPs to pay particular attention to ensuring appropriate and effective linkages between the biological diversity of inland water ecosystems, in particular in relation to water use and planning, and their Poverty Reduction Strategy Papers, and associated implementation activities.

53. The ongoing work of the Ramsar Convention, its Secretariat, Scientific and Technical Review Panel, international organization partners and other stakeholders, on wetlands and poverty is a very relevant opportunity to achieve the further contribution of the programme of work to poverty alleviation and sustainable livelihoods. In particular, the inputs to, and outcomes of, the ninth meeting of the Contracting Parties to the Ramsar Convention have made substantial progress in highlighting the linkages between poverty and wetlands and clearly signalled the importance of that Convention, including as the lead implementing partner for wetlands under the Convention on Biological Diversity, in contributing towards the achievement of human development targets. Resolution IX.14, paragraph 11, of the Ramsar Convention instructs its Scientific and Technical Review Panel to develop guidelines for the implementation of that resolution. The Executive Secretary will invite that panel to also consider in its deliberations, *inter alia:* (i) an effective communication strategy which will enable existing and future relevant guidance to be delivered to and adopted by the key stakeholders, across all relevant sectors, that undertake interventions that have an impact on the biological diversity of inland water ecosystems, including water, and (ii) relevant policy and management guidance for key wetland types. The Executive Secretary will also i*nvite* the Ramsar Convention, its Secretariat, international organization partners and Scientific and Technical Review Panel, and other stakeholders, as appropriate, to transmit useful guidance and tools to the Secretariat of the Convention on Biological Diversity for the information of SBSTTA, and Parties to the Convention on Biological Diversity that are not Parties to the Ramsar Convention.

54. The Executive Secretary will also to continue to: (i) work in relevant partnership with the Ramsar Secretariat, its international organization partners and all other relevant organizations, where feasible, in order to continue to draw attention to the provisions of the Convention on Biological Diversity in their work and to assist progress towards shared objectives and goals, and (ii) to continue to work directly with the Scientific and Technical Review Panel on relevant subjects in the context of the joint programme of work between the two Conventions (as, and if, subsequently revised); and seek voluntary contributions from donors, international organizations and other bodies to assist progress in the implementation of the programme of work on the biological diversity of inland water ecosystems in the context of the achievement of human development targets paying particular attention to, *inter alia*, the provision of guidance, tools and capacity building to assist Parties from developing countries, countries with economies in transition and small island developing States amongst them.

Annex

SOME LINKAGES BETWEEN THE CONSERVATION AND SUSTAINABLE USE OF INLAND WATER BIOLOGICAL DIVERSITY AND POVERTY REDUCTION AND SUSTAINABLE LIVELIHOODS USING THE FRAMEWORK OF ECOSYSTEM SERVICES PROVIDED BY INLAND WATERS (AS PER THE MILLENNIUM ECOSYSTEM ASSESSMENT)

Ecosystem Service provided	**Some examples of the services provided**	**Examples of linkages to poverty reduction and sustainable livelihoods**	**Some directly relevant MDGs(G) and Targets (T)**
Provisioning services:			
Food	Production of fish, wild game, fruits, grains, etc.	Direct consumption of foods to support livelihoods. Trading of foodstuffs for income generation. Food is of course very relevant to poverty and livelihoods. The biological resources derived from inland waters are very important in many areas particularly for poor rural communities. The dependency of people on this resource is generally seriously underestimated.	G1, T1, T2 G4, T5 G5, T6
Fish and fishery products are particularly important ecosystem services derived from inland waters. Inland fisheries are of particular importance in developing countries as they are sometimes the primary source of animal protein to which rural communities have access. For example, people in Cambodia obtain about 60-80% of their total animal protein from the fishery in Tonle Sap and associated floodplains; in Malawi, 70-75 % of the total animal protein for both urban and rural low-income families comes from inland fisheries. A large proportion of the recorded inland fisheries catch comes from developing countries, and the actual catch is thought to be several times the official 2001 figure of 8.7 million tons, as much of the inland catch is underreported. An estimated 2 million tons of fish and other aquatic animals are consumed annually in the lower Mekong Basin alone, with 1.5 million tons originating from natural wetlands and 240,000 tons from reservoirs; the total value of the catch is about $1.2 billion. In Africa, fishing and harvesting of aquatic plants from the large floodplains and swamps associated with major lakes are a significant source of subsistence and income for local communities. Furthermore, as floodwaters recede, floodplains become available for agriculture (both crops and livestock grazing).			
*Fresh water**	Storage and retention of water for domestic, industrial and agricultural use	Access to clean potable water is an indicator of human development. Deprivation of freshwater is an indicator of poverty.	G4, T5 G5, T6 G7, T 10, T11
The principal supply of renewable fresh water for human use comes from an array of inland ecosystem types, including lakes, rivers, swamps, and shallow groundwater aquifers. The renewable resource base expressed as long-term mean runoff has been estimated to fall between 33,500 and 47,000 km^3 per year. By one estimate one-third of global renewable water supply is accessible to humans, when taking into account both its physical proximity to population and its variation over time, such as when flood waves pass uncaptured on their way to the ocean. Inland waters and mountains provide water to two thirds of the global population and that within drylands to one-third. Inland wetlands serve twelve times as many people downstream through river corridors as they do through locally-derived runoff. *Groundwater*. Groundwater, often recharged through wetlands, plays an important role in water supply, providing drinking water to an estimated 1.5 to 3 billion people. It also serves as the source water for 40% of industrial use and 20% of irrigation. Despite its importance, groundwater has often not been sufficiently supported through appropriate pricing and management action. *Reservoirs.* Another important water supply is represented by the widespread construction of artificial impoundments that stabilize river flow. Today, approximately 45,000 large dams (more than 15 meters in height, or more than 5 meters and holding 3 million cubic meters) and possibly 800,000 smaller dams have been built for municipal, industrial, hydropower, agricultural and recreational water supply, and for flood control. Recent estimates place the volume of water trapped behind documented dams at 6,000 to 7,000 cubic kilometers. Although reservoirs provide significant benefits to people with access to the services they provide, their construction and management regimes can often significantly reduce other ecosystem services downstream, particularly fisheries. **Water scarcity and declining access to fresh water is a globally significant and accelerating problem for 1-2 billion people worldwide, leading to reductions in food production, human health, and economic development**. With population growth and the overexploitation and contamination of water resources, the gap between available water and water demand is increasing in many parts of the world. Scarcity of water will affect all businesses either directly or indirectly, just as increases in the price of petroleum impact the state			

Ecosystem Service provided	Some examples of the services provided	Examples of linkages to poverty reduction and sustainable livelihoods	Some directly relevant MDGs(G) and Targets (T)
of the global economy. Governments will be called upon to allocate supplies and adjudicate water rights. This will require trade offs between different ecosystem services provided by inland waters.			
Fibre & Fuel	Production of logs, fuel wood, peat, fodder	As for food. Provisioning of shelter and energy, including trading in fibre and fuel.	G1, T1 G4, T5 G5, T6
Biochemical	Extraction of medicines and other materials from biota	Direct use of local and traditional medicines by poor communities. Potential provision of new commercial drugs to treat diseases.	G6, T8 G8, T17
Genetic materials	Genes for resistance to plant pathogens, ornamental species, etc.	Contributions of inland water biological resources to sustainable agriculture, forestry and fisheries. Adaptation to climate change. Improved varieties for the benefit of poor communities.	G1, T1, T2 G4, T5 G5, T6
Regulating services:			
Climate regulation	Source of and sink for greenhouse gases; influence local and regional temperature, precipitation, and other climatic processes.	Poor communities are particularly vulnerable to climate change. The impacts of human-induced extreme climatic events are a significant driver of poverty and vulnerability. Poorly managed peatlands, for example, are a major source of carbon emissions.	Most
Inland water ecosystems play an important role in the regulation of global climate by sequestering and releasing significant amounts of carbon. Inland water systems play two critical, but contrasting roles in mitigating the effects of climate change: the regulation of greenhouse gases (especially carbon dioxide); and the physical buffering of climate change impacts. Inland water systems have been identified as significant storehouses (sinks) of carbon as well as sources of carbon dioxide (e.g., boreal peatlands), as net sources of carbon sequestration in sediments, and as transporters of carbon to the sea. Although covering an estimated 3-4% of the world's land area, peatlands are estimated to hold 540 Gt of carbon, representing about 1.5% of the total estimated global carbon storage and about 25-30% of that contained in terrestrial vegetation and soils. Inland waters also contribute to the regulation of local climate. Climate change impacts the poorest and most vulnerable sections of society and is a significant threat to sustainable livelihoods amongst them. Sustaining the climate regulation services provided by inland water ecosystems is a critical requirement for mitigating the impacts of climate change on the poor.			
Water regulation (hydrological flows)	Groundwater recharge/discharge	Unsustainable groundwater use is a significant driver of poverty	Most
	Wetland hydrological functioning	Impacts most other ecosystem services and therefore most other linkages with poverty/livelihoods	
Inland water ecosystems have a significant influence on the water (hydrological) cycle and hence the supply of water for people and the many uses they make of water, including for irrigation, energy, and transport. The water cycle is the movement of water between all parts of Earth in its different forms (vapour, liquid, and solid) and throughout the broader biophysical environment (atmospheric, marine, terrestrial, aquatic, and subterranean). Water resources, via water itself, are linked to all aspects of this broader environment. **The global water cycle plays a fundamental role in supporting inland water ecosystems, while at the same time these ecosystems have a significant influence on the hydrological cycle itself**. Wetlands can either increase or decrease particular components of the water cycle. Although there is insufficient information on wetland hydrology to fully meet the needs of decision-makers, there is a progressive decline in the investment in generating new hydrological data or enhancing the quality of existing information at global, national, and local levels, particularly in developing countries.			

Ecosystem Service provided	Some examples of the services provided	Examples of linkages to poverty reduction and sustainable livelihoods	Some directly relevant MDGs(G) and Targets (T)
Maintenance of the key hydrological services performed by inland water ecosystems enables them to continue to deliver a wide range of critical and important (regulatory and provisioning) ecological services to humans. Historically, it is well-established that the maintenance, protection, and even restoration of inland waters have often been encouraged because of the manifold hydrological services they perform. However, while some of these hydrological services, such as water storage, flood attenuation, and the augmentation of dry season flows, are likely to be seen as favourable for human well-being, others that are essential to maintain ecological character (such as flooding and evaporation from wetland vegetation) may complicate water management efforts aimed at balancing differing needs between cities, navigation, agriculture, and wetlands. **Maintaining the hydrological regime of inland waters and its natural variability are necessary to maintain the ecological characteristics of the ecosystem including its biodiversity**. Hydrological regime and topography are generally the most important determinants of the establishment and maintenance of specific types of inland water ecosystem processes, creating the unique physicochemical conditions that make wetlands different from both deepwater aquatic systems and well-drained terrestrial systems. Hydrological conditions affect numerous abiotic factors, including nutrient availability, soil anerobiosis, and salinity in both coastal and inland wetlands, which in turn determine the biota that establish in a wetland. These biotic components can alter the hydrology and other physicochemical features of the wetland. Changes in hydrology therefore impact biodiversity, and the livelihoods which it supports. But changes in hydrology are often justified in terms of contributing to poverty reduction (e.g., diverting water to irrigated agriculture). Relationships are therefore complex, as are the outcomes for poverty.			
Water purification and waste treatment	Retention, recovery and removal of excess nutrients and other pollutants	Sustainable water resources for agriculture, drinking and sanitation. Reductions in pollutants mitigate toxic effects on poor communities.	Most
Inland water ecosystems provide an important service by treating and detoxifying a variety of waste products. Water flowing through a wetland area may be considerably cleaner upon its exit from a wetland. Some wetlands have been found to reduce the concentration of nitrate by 90%. Some artificially constructed wetlands have been developed specifically to treat nitrogen-rich sewage effluents. Metals and many organic compounds may be adsorbed to the sediments (that is, accumulated on the surface of the sediments) in the wetlands. The relatively slow passage of water through wetlands provides time for pathogens to lose their viability or be eaten by other organisms in the wetland ecosystems. Organic chemicals and metals may adsorb to the wetland sediments so that the concentrations in the water exiting the wetland are reduced. However, the wetlands can become a "hot-spot" of contamination - these wastes can build up to high enough concentrations to have detrimental effects on the wetland functions. Unfortunately the threshold between where loadings are tolerated and where they will do damage to wetlands is not easily determined. Vegetation along the edge of Lake Victoria, East Africa, was found to retain 60-92% of phosphorus. In West Bengal, India, water hyacinth is used to remove heavy metals, and other aquatic plants remove grease and oil, enabling members of a fishermen's cooperative to harvest one ton of fish per day from ponds that receive 23 million litres of polluted water daily from both industrial and domestic sources. However, excessive loads of domestic sewage or industrial effluent can degrade inland waters, with a loss of both biota and services. The costs of reversing damages to waste-degraded ecosystems are typically large; in some cases rehabilitation is effectively impossible. Declines in water quality particularly affect the poor and vulnerable who are often the most directly reliant upon untreated water. Global nitrate level in freshwaters is one indicator of progress towards the 2010 target.			
Erosion regulation	Retention of soils and sediments	Contributes to sustainable agriculture and food security for the rural poor.	G1, T1, T2 G4, T5, G5, T6
Where erosion has increased as a consequence of wide-scale vegetation clearing, many shallow water bodies have trapped high levels of sediment that would otherwise be transported downstream and deposited in coastal areas or on nearby reefs to the detriment of sustainable livelihoods in those regions.			
Natural hazard regulation	Flood control, storm protection	Poor communities are extremely vulnerable to natural (and human induced) hazards.	Most

Ecosystem Service provided	Some examples of the services provided	Examples of linkages to poverty reduction and sustainable livelihoods	Some directly relevant MDGs(G) and Targets (T)
Inland water ecosystems, such as their floodplains, lakes, and reservoirs help to attenuate floods. Flood attenuation potential can be estimated by the "residence time" of water in rivers, lakes, reservoirs, and soils. Residence time is defined as the time taken for water falling as precipitation to pass through a system: the longer the residence time, the larger the buffering capacity to attenuate peak flood events. Larger rivers (such as the Congo and the Amazon) have a greater attenuation capacity than smaller rivers. Nearly 2 billion people live in areas with a residence time of one year or less and are thus located in areas of high flood risk with low attenuation potential. Most of these people live in northern South America, highly populated regions of northern India and South East Asia, Central Europe, and the Southwest coast of Africa. Large and extreme flood events have high costs both in terms of human life, and expenditure on mitigation and recovery measures. However, floods also play an important role in maintaining the productivity of inland water ecosystems (and agriculture in floodplains) since they transport dissolved or suspended sediments and nutrients to the floodplains. The presence of a natural flood regime thus contributes to the livelihoods of millions of people, particularly those who depend on floodplains for flood recession agriculture and pasturage and for fish production. A number of regions in the world have been seriously affected by severe fires in wetlands, especially peatlands, and such fires and associated smoke-haze affect the lives of millions of people and cause major environmental, social, and economic impacts. The negative impacts associated with natural phenomena may also be exacerbated by different human activities such as drainage. Wetlands can continue to deliver their many benefits/services, including, *inter alia*, water retention and purification, groundwater recharge, and the provision of water, food and fiber for people and for the maintenance of global biological diversity, and this need is particularly high in a post-disaster phase. Resolution IX/9 of the Contracting Parties to the Ramsar Convention, for example, urges Contracting Parties to maintain or restore Ramsar sites, other wetlands, and associated ecosystems to reduce their vulnerability to natural disasters in accordance with their natural hydrological regimes, bearing in mind the Convention's guidance to assist with restoration of ecological systems affected by natural disasters, in order to ensure that they can continue to deliver their full range of ecosystem benefits/services for people and for biological diversity; supports the expansion of measures being undertaken in different regions of the world to protect and rehabilitate peatlands to reduce the risk of fires and to provide water supply in times of drought; encourages Contracting Parties and River Basin Authorities to ensure that wetland ecosystems are managed and restored, as part of contingency planning, in order to mitigate the impacts of natural phenomena such as floods, provide resilience against drought in arid and semi-arid areas, and contribute to wider strategies aimed at mitigating climate change and desertification and thus reduce the incidence or magnitude of natural phenomena induced or enhanced by such change; encourages Contracting Parties to establish multi-hazard analyses that define areas suitable for development and appropriate contingency planning that recognizes pre-disaster measures for impact prevention and minimization involving wise wetland management; and calls upon Contracting Parties and others to work together urgently to promote and to actively support the recovery of coastal wetlands and associated community livelihoods in countries affected by the Indian Ocean Tsunami of December 2004 as well as the reduction of the vulnerabilities of coastal communities and wetlands through various means; and requests the development of materials that highlight lessons learned from around the globe with regard to appropriate pre-disaster measures for impact prevention and minimization through contingency planning involving wise wetland management.			
Pollination	Habitat for pollinators	Inland water dependent pollinators contribute to sustainable agriculture and food security for the rural poor.	G1, T1, T2
Cultural services:			
Spiritual & Inspirational	Source of inspiration and cultural heritage/identity.	Many religions attach spiritual and religious values to aspects of wetland ecosystems. Religion is one source of social and community stability. Loss of cultural identity can lead to social unrest and livelihood insecurity.	most
Although spiritual and inspirational services do not provide physical benefits for the livelihoods of the poor, the maintenance of these cultural services contributes significantly to social adhesion, identity, and "social capital" which all contribute to sustainable livelihoods. Social and cultural security is essential for sustainable livelihoods. Such services are therefore relevant to most if not all the MDGs and their targets.			
Recreational	Opportunities for recreational activities	Revenue from recreational activities (undertaken by the more affluent), e.g., recreational fisheries, accruing to poor communities. "Recreation" is also important for poor communities by providing relaxation and social cohesion. Inland waters often provide zero-cost recreational activities for poor communities (e.g, fishing, swimming).	most
Inland water ecosystems are important tourism destinations because of their aesthetics value and the high diversity of the animal and plant life they contain. In some locations tourism plays a major part in supporting rural economies, although there are often great disparities between access to, and involvement in such activities. Recreational fishing can generate considerable income. The negative effects of recreation and tourism are particularly noticeable when they introduce inequities and do not support and develop local economies,			

Ecosystem Service provided	Some examples of the services provided	Examples of linkages to poverty reduction and sustainable livelihoods	Some directly relevant MDGs(G) and Targets (T)
and especially where the resources that support the recreation and tourism are degraded and consequently provide reduced services to local communities.			
Aesthetic	Many people find beauty or aesthetic value in aspects of wetland ecosystems	As for spiritual and inspirational.	most
Educational	Opportunities for formal and informal education and training	The value of traditional and local knowledge of the biological diversity of inland water ecosystems for long-term human well being, particularly for sustainable agriculture, forestry and fisheries. Knowledge required to achieve food security (e.g., how to exploit biological resources in times of crisis). (An example is provided in Annex 2).	most
Supporting services:			
Soil formation	Sediment retention and accumulation of organic matter	Sustainable agriculture (and food security) for the rural poor.	G1, T1, T2
Nutrient cycling	Storage, recycling, processing and acquisition of nutrients	Sustainable goods and services (e.g., food, fibre, construction materials) for the poor. Also related linkages to the provision of clean drinking water and sanitation (recycling human wastes). See also under water purification and waste treatment.	G4, T5 G5, T6 G7, T 10, T11

***** While freshwater was treated as a provisioning service within the Millennium Ecosystem Assessment it is recognised that it is also regarded as a regulating sectors.
