UNITED
NATIONS

EP

United Nations
Environment
Programme

UNEP (DEPI)/RS.10 /4

Original: ENGLISH

10th Global Meeting of the Regional Seas Conventions and Action Plans

Guayaquil, Ecuador, 25th– 27th November 2008

UNEP ECOSYSTEM MANAGEMENT PROGRAMME

UNEP Ecosystem Management Programme:

An Ecosystem Approach

K0840343 121108

Content

Executive summary

1. The Millennium Ecosystem Assessment analysed 24 ecosystem services – the benefits that people obtain from functioning ecosystems – and found that 15 were in global decline. Humans depend on ecosystem services for many aspects of their well-being (including food, water, health, security and others). The decline in services affects the world's disadvantaged people most strongly, but it also impedes sustainable development globally and, in developing countries, obstructs attainment of the Millennium Development Goals.

2. Responses so far, targeting specific sectors, such as water, agriculture and forests, rather than spatial units of functionally interdependent ecosystems and valuing certain services, such as food and hardwood, while ignoring others notably air quality regulation, water purification and pollination, have largely failed to arrest or reverse the decline in ecosystem service delivery. Ecosystem management, on the other hand, by taking a more holistic view of the links between ecosystem service delivery and human well being, is expected to provide a more effective response.

3. One of the six priorities of the UNEP medium-term strategy for 2010–2013 is that "countries utilize the ecosystem approach to enhance human well-being". Centred on the functioning and resilience of the ecosystems that provide services and equitable access to these services, the UNEP ecosystem management programme endeavours to operationalize the ecosystem approach, with a view to accomplishing the following:

(a) Countries and regions increasingly integrate an ecosystem management approach into development and planning processes;

(b) Countries and regions acquire the capacity to use ecosystem management tools; and

(c) Countries and regions begin to realign their environmental programmes and financing to tackle the degradation of selected priority ecosystem services.

4. The ecosystem management programme is guided by a conceptual framework that has five major interlinked elements: human well-being, indirect and direct drivers of change, ecosystem functioning and ecosystem services. Changes in ecosystem functioning can positively or negatively affect the delivery of ecosystem services. In order to identify entry points for effective interventions it is necessary to understand which direct drivers (e.g., land-use change, invasive species) and which indirect – and more diffuse – drivers (e.g., demography)are affecting ecosystem functioning and how modifying the delivery of ecosystem services can directly affect the various constituents of human well-being.

5. This analysis needs to be carried out on a variety of different scales (local, regional, global) and should differentiate between stakeholders in order to ensure equitable access to ecosystem services. Decisions on the different options for ecosystem use require a trade-off, which takes due account of the relative benefits of all the services for the various dimensions of well-being across the entire stakeholder landscape.

6. Given the mandate conferred upon UNEP, its convening power, its potential to engage with different stakeholders around commonly identified approaches and its capacity to transform these into policy-setting and implementation tools, the ecosystem management programme can be expected to influence development thinking and build capacity for the mainstreaming of the ecosystem approach in development planning. Experience gained by UNEP in the use of integrated management approaches, most often in partnership with other organizations, is a source of additional strength.

7. Given the extent to which ecosystems have become degraded and the implications of that degradation for well-being and sustainable development, in combination with the UNEP mandate and its comparative advantage and partnership potential, 11 of the 15 degraded ecosystem services were considered most relevant and need to be addressed as a priority under the ecosystem management programme. These mainly comprise regulating services (climate, water, natural hazard and disease regulation, water purification and waste treatment), often strongly affected by the overuse of provisioning services. Other United Nations agencies have specific mandates for the main provisioning services but freshwater, energy (especially the emerging issues around biofuel production) and capture fisheries were selected as key services to be targeted by the ecosystem management programme. Of the cultural services, only the recreation and ecotourism service was selected, while, of the supporting services, which underlie the delivery of all the other services but are not directly accessible to people, nutrient cycling and primary production were selected.

8. The selected ecosystem services are however interlinked and cannot therefore be treated in isolation: this might lead to a new form of sectoralization. By dealing with them in bundles of interlinked services and by reversing their decline through improved ecosystem functioning and increased resilience a sustainable contribution can be made to human well-being. For example, by focusing on a restricted set of the key services in a shared watershed, e.g., climate regulation and water regulation through the "reduced emissions from deforestation and degradation" (REDD) approach, additional benefits can be derived from other services such as fresh water (increased dry season flows), fibre, aesthetic values, natural hazard regulation (reduced flood risk), etc. Provided equitable access to these services is guaranteed, these improvements will sustainably contribute to well-being.

9. The conceptual framework that guides the ecosystem management programme allows the identification of five specific entry points for UNEP intervention, aimed at improving the delivery of country or region-specific bundles of the selected key ecosystem services. Each intervention at one of these specific entry points, e.g., capacity-building for improved land management, will require the collaboration of different disciplines and the mobilization or development of specialized expertise coordinated through a single workplan.

10. The current programme document does not identify these specific interventions at the activity level for each of the scales (global, regional, national and local) at which the ecosystem management programme needs to operate for both short-term (through interventions on the direct drivers) and long-term (through interventions on the indirect drivers) gains in ecosystem service delivery for human well-being. The specific interventions will be elaborated through the biennial programme of work and additional planning tools.

I. Introduction

11. One of the six priorities of the UNEP medium-term strategy for 2010–2013 is that "Countries utilize the ecosystem approach to enhance human well-being". Developed through a UNEP-wide process, with inputs from key partner organizations, the present document proposes an ecosystem management programme that operationalizes the ecosystem approach, with a view to accomplishing the following:

(a) Countries and regions increasingly integrate an ecosystem management approach into development and planning processes;

(b) Countries and regions acquire the capacity to use ecosystem management tools; and

(c) Countries and regions begin to realign their environmental programmes and financing to tackle the degradation of selected priority ecosystem services.

12. This programme document expands on the rationale which underlies a more holistic approach to environmental management capable of sustaining the ecosystem service delivery essential for human well-being. Sectoral and biome-based approaches have largely failed to reverse this trend. The ecosystem approach put forward here is guided by a conceptual framework—largely based on the Millennium Ecosystem Assessment—which acknowledges the interdependency of coupled ecological and social systems and recognizes the multi-dimensional aspects of human well-being. Key attributes of the approach are captured in sections on ecosystem services and human well-being, on ecosystem functioning, biodiversity and ecosystem resilience, on multiple scales and stakeholders, on synergies and trade-offs and on equity and distribution.

13. On the basis of the state of and trends in the world's ecosystems, the UNEP mandate and its comparative advantage and partners, the ecosystem management programme identifies the strategic priorities centred on 11 ecosystem services in global decline. By centring on these priority services, not as independent products but in bundles with an emphasis on regulating services (e.g., climate, water and natural hazard regulation), a sharper focus is achieved and the impact of UNEP on the ground maximized within budgetary limits. Even in countries where the priority services are not in decline, attending to them as bundles of interdependent services will enhance ecosystem resilience, thus providing safety nets against unexpected events e.g., climate change, invasive species, natural disasters, etc.

14. The ecosystem management programme illustrates entry points for interventions by UNEP, through a few examples attached to the conceptual framework. Links to the expected accomplishments are clarified, while relations with the other key result areas of the medium-term strategy are briefly explored. The specific UNEP interventions at the activity level will be elaborated though the biennial UNEP programme of work and additional planning tools.

II. Programme rationale

15. The fourth report in the UNEP Global Environment Outlook report series – Environment for Development (GEO-4) (2007) – presents an urgent call to action to tackle global environmental challenges. Climate change, land degradation, water shortage and biodiversity loss are among the most persistent and growing problems faced by today's world, indicating that ecosystem functioning is threatened at a level that increasingly affects human well-being. In comparison to the 1987 baseline (as identified by the Brundtland Commission), progress has been made on some relatively straightforward problems (e.g., ozone depletion and local air pollution), but social demands and practices have resulted in a continuing decline in the world's natural wealth and its associated delivery of benefits –*ecosystem services* (see the box on p. 3 for working definitions).

16. The Millennium Ecosystem Assessment showed that 15 of the 24 ecosystem services that it assessed were in decline. The assessment demonstrated, more clearly than ever before, the importance of functioning ecosystems for sustaining human well-being and concluded that a continuing decline in ecosystem services could be a barrier to the attainment of the Millennium Development Goals in developing countries and to sustainable development for all countries. The links between environment and human well-being are complex, but many constituents of human well-being (income, food, water, shelter, health, energy, etc.) are dependent on the productivity of ecosystems and on access to ecosystem services. Declines in ecosystem services most strongly affect the well-being of the world's

socially disadvantaged and vulnerable people. They are therefore particularly susceptible to ecosystem change. At the same time, any decline in ecosystem services undermines human well-being in all countries, developed and developing alike, and in urban and rural areas equally.

17. The traditional sectoral approach to natural system management has largely been ineffective in maintaining ecosystem productivity and biological diversity, in stopping habitat fragmentation and in halting the overall decline in ecosystem services critical for human well-being. Impacts can be felt in agriculture, forestry and fisheries and in lowered ecosystem resilience to natural and human-caused disasters resulting in increased suffering and loss of life.

18. In spite of these overall trends, there are success stories in various settings in which environmental management interventions have enhanced ecosystem processes, improved human well-being and reduced poverty.[1] Many of these successes are related to a shift from the sectoral approach to a more holistic, integrated and systematic way of dealing with issues (e.g., integrated water resources management, land-use management and integrated coastal zone management) and to stronger participation of the full range of stakeholders, including at the grassroots level, in planning and management. The success of these approaches can be traced back to the ecosystem approach underlying these various management strategies, which focuses on functional relationships and processes within and between ecosystems and acknowledges the links with social processes.

Working definitions

*An **ecosystem** is a dynamic complex of plant, animal, and microorganism communities and the nonliving environment interacting as a functional unit. Humans are an integral part of ecosystems. Ecosystems vary enormously in size; a temporary pond in a tree hollow and an ocean basin can both be ecosystems.*

*The **ecosystem approach** is a strategy for the integrated management of land, water and living resources that provides sustainable delivery of ecosystem services in an equitable way.*

***Ecosystem services** are the benefits that people obtain from ecosystems. These include provisioning services such as food and water; regulating services such as regulation of floods, drought, land degradation, and disease; supporting services such as soil formation and nutrient cycling; and cultural services such as recreational, spiritual, religious and other non-material benefits.*

***Ecosystem resilience** is the level of disturbance that an ecosystem can undergo without crossing a threshold to a situation with different structure or outputs. Resilience depends on ecological dynamics as well as the organizational and institutional capacity to understand, manage and respond to these dynamics.*

***Human well-being** is the freedom of choice and action to achieve basic material for a good life, health, good social relations and security. Well-being is at the opposite end of a continuum from poverty, a pronounced deprivation in well-being.*

Sources: Convention on Biological Diversity, Millennium Ecosystem Assessment

19. Ecosystem thinking is complex, but the continuing clarification of its terminology, the availability of economic tools for the valuation of ecosystem services and an increasing body of successful case studies (e.g., CBD/SBSTTA 12)[2] call for a wider application of the ecosystem approach. The major challenge is mainstreaming the ecosystem approach into development planning and policy practices. For example, notwithstanding obvious interlinkages among forest cover, agricultural practices, natural wetlands and freshwater flow regimes, each of these tend to be addressed by separate programmatic approaches, from different institutions and with insufficient integration. As a consequence, both the quantity and the quality of available water are often inadequate for human well-being and ecosystem functioning.

1 Kerr et al., 2002, "Watershed Development Projects in India: an evaluation", International Food Policy Research Institute, Washington; World Resources Institute, 2005, "World Resources 2005", chapter 5, Village by village : recovering Fiji's coastal fisheries.

2 At its twelfth meeting, held in Paris, in July 2007, the Subsidiary Body on Scientific, Technical and Technological Advice of the Convention on Biological Diversity conducted a detailed review of the application of the ecosystem approach. See www.cbd.int/doc/meeting.aspx?mtg=SBSTTA-12. Case studies are available in a source book.

III. UNEP strategic approach to ecosystem management

20. Halting the decline in ecosystem services highlighted by the Millennium Ecosystem Assessment requires a radical shift in thinking about environmental management. The traditional sectoral and biome-based approaches to environmental policy setting and implementation have had limited success for a number of reasons:

(a) Efforts to halt the decline in ecosystem services were seen primarily as conservation-driven and considered as irrelevant to development thinking;

(b) The interdependence of ecosystem services and the multidimensionality of human well-being were largely ignored;

(c) The different temporal and spatial scales at which the drivers of change and the declines in ecosystem services operate were rarely considered;

(d) The fact that declines in ecosystem services affect different social groups in different ways was not acknowledged; and

(e) Trade-offs among ecosystem services and the determinants of well-being were not explicitly considered.

21. By taking a more holistic view of the links between ecosystem services and human well-being, the ecosystem management programme proposed in this strategy can help narrow many of the gaps identified above. The programme moves away from sectorally defined units to units defined in ecological terms and analyses the natural, social and economic impacts and stressors on these units. It relies on collaborative decision-making by all relevant stakeholders and users that may, and often do, have different values, conflicting interests and capacities to understand and manage these systems.

22. Central to the proposed ecosystem management programme are the *functioning* and the *resilience* of the ecosystems that provide the services and *equitable access* to the services. Ecosystems can continue to function in less desirable states (i.e., decline in delivery of ecosystem services lowered human well-being). By building ecosystem resilience, however, the chances of this are reduced. Equitable access is a prerequisite as – by and large – an increase in human well-being often obscures decreased well-being in the disadvantaged.

23. The ecosystem management programme is guided by a conceptual framework based on the Millennium Ecosystem Assessment. A brief description of the conceptual framework and its main elements is provided below, followed by a presentation of its key attributes.

A. Conceptual framework of the ecosystem management programme

24. The ecosystem management programme conceptual framework provides a simplified schematic representation of the complex relationships between natural and social systems, seen through the lens of ecosystem services and human well-being. The millennium ecosystem assessment conceptual framework, which has four main elements (constituents and determinants of human well-being; indirect drivers; direct drivers; and ecosystem services) provides a good starting point for the ecosystem management programme (see figure 1). A direct driver (e.g., pollution from the increased use of fertilizer) unequivocally influences ecosystem processes (eutrophication, algal blooms, hypoxia) and can therefore be identified and measured with some accuracy. An indirect driver (e.g., demography) operates more diffusely by altering one or more direct drivers. For example, an expanding population may increase demand for land (land-use change), leading to more consumption of wild foods (resource extraction) and more intensive agriculture (external inputs like fertilizers), require more transport to and within sprawling cities (emissions), result in experiments with fast growing alien organisms in an attempt to increase productivity for people and for goods (modification and movement of organisms), etc.

25. Under the UNEP ecosystem management programme, the functioning aspect of ecosystems, critical to the sustainable supply of ecosystem services, is made more explicit by inserting a new box in the Millennium Ecosystem Assessment framework between direct drivers and ecosystem services. This box, labelled “ecosystem functioning”, describes the interaction among the various ecosystem components which produce ecosystem services.

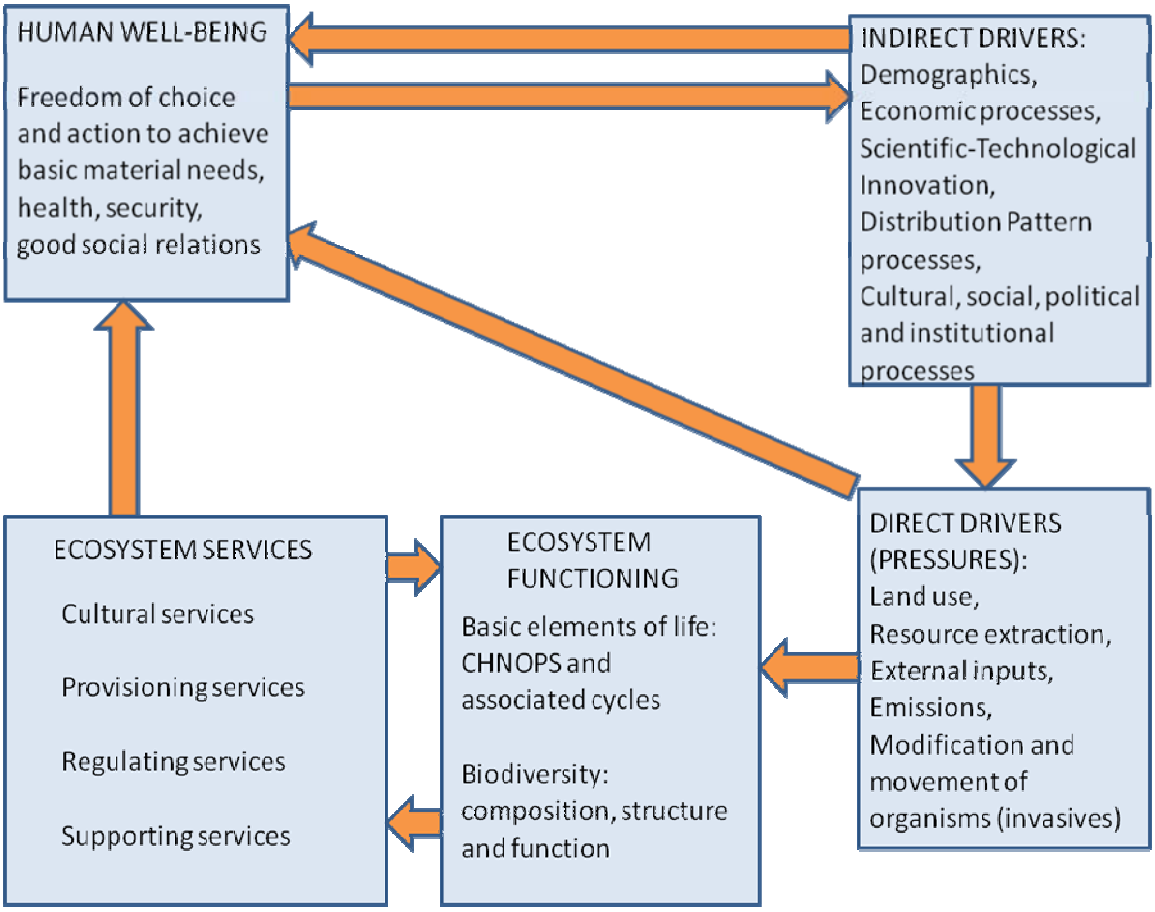

Figure 1. Schematic representation of the conceptual framework of the ecosystem management programme

Addressing the drivers of ecosystem change

To design interventions that can positively influence a sustained supply of ecosystem services, it is essential to understand the factors that cause the changes in ecosystem functioning (i.e., the indirect and the direct drivers). These often operate synergistically; e.g., the price increase of fossil fuels (an economic process) boosts the demand for biofuels, which causes changes in land-use cover through deforestation, increases greenhouse gas emissions through the drainage of peat marshes, enhances the use of agrochemicals and augments the likelihood of establishment of invasive species. A long-term intervention could be to reduce the demand for fossil fuel by changing consumer and producer behaviour. Technological progress – e.g., out-of-soil production of biofuels (algal culture in containers) in arid zones – may directly contribute to human well-being (the diagonal arrow) and indirectly through improved ecosystem service delivery (less pressure). Other short-term improvements can come in the form of policies directly affecting such direct drivers as habitat change, invasive species and pollution

26. As shown in the box above, observed or projected changes in ecosystem functioning affecting ecosystem services and human well-being can be analysed by running them through the conceptual framework and identifying entry points for interventions that will capture positive impacts and reduce negative ones.

27. As is the case with the Millennium Ecosystem Assessment, ecosystem services feature prominently in the conceptual framework of the ecosystem management programme. Focusing on ecosystem services has several advantages:

(a) They provide direct entry points into the economic and human development process;

(b) Investment in ecosystems is investment in development infrastructure with clear links to human development and poverty reduction;

(c) They provide a transparent framework for undertaking trade-off analysis between gains and losses in ecosystem services and the constituents of well-being;

(d) They permit the attainment of quick benefits through cost-effective pathways, e.g., improved water provision and quality through improved catchment management;

(e) They incorporate biodiversity as a working system (e.g., bacteria in water purification) and not as individual species (often perceived as a conservation driven agenda); and

(f) They introduce the notion of value for regulating and cultural services normally not included in economic analysis.

B. B. Key attributes of the conceptual framework

28. There are a number of key attributes of the ecosystem management programme framework which differentiate it from other management approaches:

(a) The ecosystem is perceived as a holistic living system that provides a multitude of services essential for the sustainability of life and human well-being, not as a resource base to be exploited purely for income generation;

(b) Environmental policies (previously perceived primarily as conservation policies) are brought into the realm of development-oriented strategies through the linkages between biodiversity, ecosystem functioning and ecosystem services;

(c) The ecosystem management programme reaches across different spatial, temporal and social scales;

(d) The ecosystem management programme explicitly acknowledges the existence of synergies and trade-offs when making decisions on the use of ecosystem services; and

(e) The ecosystem management programme recognizes that a sustainable supply of ecosystem services does not in itself imply improvement of human well-being and reduction of poverty. To achieve these there is a need for mechanisms to ensure the fair and equitable access to ecosystem services across all stakeholders.

1. Ecosystem services and human well-being

29. Traditionally, human well-being was linked to the amount of money required to purchase an essential basket of goods and services on the basis of nutritional content and the price of food, shelter, clothing, etc. Households with a per capita income or expenditure below the accepted minimum in any country were considered to be poverty-stricken. The Millennium Ecosystem Assessment demonstrated, however, that human well-being is multidimensional and that other constituents are as important as income: people also place high value on security, health, social relations and the freedom of choice and action. Moreover, many of these constituents can be directly influenced by the regulating, supporting and cultural ecosystem services, and not only by the provisioning services that lie at the heart of income and livelihoods. The ecosystem management programme recognizes that decisions affecting ecosystem use therefore need explicitly to take these complex relationships into account.

2. Ecosystem functioning, biodiversity and ecosystem resilience

30. There are two components necessary for proper ecosystem functioning – the basic chemical elements of life (CHNOPS)[3] and biodiversity (flora, fauna and micro-organisms). The CHNOPS are incorporated into biological materials through cellular activity (e.g., photosynthesis) and released, recycled and transferred in various forms through the ecosystems (water cycle, nutrient cycle, etc.). Biodiversity is defined as the natural variety and variability among living organisms, the ecological complexes in which they naturally occur, and the ways in which they interact with one another and with the physical environment. Biodiversity therefore has different components, such as genes and species, and attributes, such as composition, structure and function, each of which is differentially affected by

3 CHNOPS – carbon, hydrogen, nitrogen, oxygen, phosphorous and sulphur, the six most abundant elements of the natural system. These elements are transformed and transferred by ecosystems in various biogeochemical cycles. Human intervention perturbs the cycles, thus affecting the delivery of ecosystem services.

various types and intensities of human use. It is the functional aspect that provides the link to the ecosystem services on which human well-being ultimately depends.

31. Obviously, the demands that society exerts on, in particular, the provisioning services (e.g., through deforestation for agriculture or aquaculture), can negatively affect biodiversity, thus directly undermining the functioning of ecosystems and the delivery of the services themselves. In addition, there is established but incomplete evidence that reductions in biodiversity reduce ecosystem resilience. These effects may not be immediately apparent because of the existence of thresholds and because of the time-lag and distance which seemingly disconnect human interventions and their impacts.

3. Multiple scales and stakeholders

32. Ecosystems operate, and are measured and observed, at a variety of spatial, temporal and social scales. For example, some ecosystem services, such as fresh-water provision, tend to operate more locally and are observed over shorter time-scales than those which are more regional or global in extent, such as climate regulation. Drivers of change which include political, economic and social processes also exhibit a variety of characteristic spatial scales (e.g., intercontinental food shipping vs. local subsistence farming). Given the multi-scale nature of ecological and human processes, the ecosystem management programme will work at a variety of scales, from global to regional, national and local.

33. Stakeholders, and their needs, will vary depending on the scale in question. For instance, the stakeholders relevant to managing a transboundary river-basin would include national and subnational government agencies, while those involved in managing a local wetland would be local agencies and community groups. Thus a multi-scale approach will directly contribute to decision-making for improved ecosystem management at the most relevant levels.

4. Trade-offs and synergies

34. The supply of ecosystem services depends on the functioning nature of ecosystems which, in turn, depends on the balanced use of the various ecosystem services. For example, overuse of the fibre (timber) provisioning service of a forest ecosystem will reduce the level of water regulation, water purification and erosion regulation services, among others. The extraction of timber may in the short term produce a stream of income which will generate increased material well-being, but the decline in the regulating services will reduce security and health, as well as the longer-term functioning of the ecosystem.

35. The continued decline in ecosystem services is partly attributable to limited knowledge about the total value of all ecosystem services provided by a specific ecosystem. Thus some services are overused at the expense of others whose values are not considered in the cost-benefit or trade-off analysis. On the positive side there is a potential for synergies: e.g., investing in shade-grown coffee not only produces high-quality coffee but also conserves biodiversity, which in turn enhances pollination services and increases productivity.

5. Equity and distribution

36. Relationships between ecosystem services and the constituents of well-being are context-specific and differ across various social groups, in accordance with culture, gender, income, social status, geographic location, knowledge (modern and traditional), age, etc. In trade-off analyses, this stakeholder differentiation is rarely acknowledged. Moreover, individual net benefits accruing from ecosystem use options can be significantly different from their social net benefits. Aiming at an increase in aggregate social welfare is insufficient. Equity and fairness should explicitly guide the access to and use of ecosystem services. The ecosystem management programme emphasizes that, unless equity and fairness issues are explicitly addressed, response strategies have a high likelihood of failing to meet the objectives of reversing ecosystem services decline and improving ecosystem resilience and social well-being.

IV. UNEP mandate, comparative advantage and partners

37. The Millennium Ecosystem Assessment has, in an innovative and far-reaching way, brought into prominence the links between ecosystem services and human well-being. For maximum impact, this concerted international effort needs to be operationalized at the country level through the ecosystem approach. The Global Strategy for follow-up to the Millennium Ecosystem Assessment provides a unique opportunity for UNEP to take a leadership role in promoting the ecosystem approach. Many current UNEP activities already implicitly or explicitly use aspects of an ecosystems approach. These

include assessment and economic analysis, national planning, transboundary management, restoration, market-based solutions (e.g., carbon trading), dealing with invasive species, etc. That said, however, no common goals or objectives have been set and coordination is weak at best.

1. Mandate[4]

38. Pursuant to the mandate conferred upon it by United Nations General Assembly resolution 2997 and various decisions of the UNEP Governing Council and other international forums, UNEP is called upon to keep the world's environmental situation under review and to advise on and promote collaborative programmes on the environment. Many UNEP Governing Council decisions are specifically relevant to ecosystems management. These can broadly be categorized into five areas:

(a) Strengthening scientific understanding of ecosystems functions;

(b) Assessment and review of ecosystems and their functions;

(c) Development of policy and law relating to ecosystem management;

(d) Management of various ecosystems (freshwater, coastal, arid, Arctic, etc.);

(e) Social and economic aspects within the management of ecosystems.

39. In addition to these five categories, UNEP has been requested to consider the interlinkages between various environmental issues, such as freshwater, forestry and land degradation, and to build capacity in matters related to the environment, including the impacts of trade and economics on the environment.

2. Comparative advantage

40. UNEP has catalysed several successful approaches for the management of freshwater, terrestrial, and coastal and marine systems to halt the degradation of and even improve resilience in these systems. These approaches include the Global Environmental Monitoring System (GEMS); integrated coastal zone management, applied through the Regional Seas Programme; and integrated water resource management. These approaches can easily be expressed in terms of ecosystem service delivery and need to be mainstreamed into development thinking through advocacy, capacity-building, technology support, policy development support, the setting of standards, the development of regulatory and legal frameworks and other undertakings, all based on sound scientific knowledge of ecosystem functioning and a continuous assessment of ecosystem status.

41. Improved ecosystem management in all countries is needed to ensure the optimal functioning of ecosystems for the delivery of ecosystem services critical for human well-being and sustainable development. UNEP also recognizes that ecosystems have intrinsic values independent of these human benefits.

42. The broad areas of the comparative advantage of UNEP are its:

(a) Convening power;

(b) Potential to engage with different stakeholders around commonly identified approaches to innovative solutions based on a solid scientific foundation and comprehensive information; and

(c) Capacity to transform these into policy-setting and implementation tools.

43. UNEP has significant strength through its normative role at various levels. The Bali Strategic Plan for Technology Support and Capacity-building requests UNEP to get more involved in capacity-building at various levels, including the national level. Other United Nations organizations may have more specific development mandates, and may often be more people-oriented, but the UNEP mandate is complementary as it addresses the same issues from an environmental viewpoint. UNEP can influence the development world by emphasizing the links between functioning and resilient ecosystems and their delivery of a sustainable flow of a bundle of ecosystem services for human well-being and by making the need for equitable sharing of these benefits explicit. *No other United Nations organization has as clear a comparative advantage or mandate in this regard.* In relation to ecosystem management, UNEP is strong on convening Governments, on policy, on partnership processes and on regional consultation.

4 See annex I for a more complete listing and detail.

UNEP strives to improve internal coordination, participatory processes, country presence and continuity and intends to get stronger bottom-up input from its regional offices.

44. The United Nations "delivering as one" mechanism offers opportunities for the integration of environment in the development process down to country level through the linkages with the Millennium Development Goals. Additional opportunities are provided by:

(a) The multi-stakeholder-driven global strategy for follow-up to the Millennium Ecosystem Assessment in three focal areas: building the knowledge base; transfer of knowledge; and tools for policy implementation, outreach and dissemination;

(b) The potential and relevance of ecosystem management for the implementation of multilateral environment agreements; and

(c) The high political profile of climate change and disaster risk management.

45. Even though UNEP does not currently have a comprehensive ecosystem management approach, it does have several existing and emerging areas of work that capture various aspects of ecosystem management. These programmes and initiatives (see www.unep.org) will provide some of the building blocks of the UNEP ecosystem management programme. They include:

(a) UNEP Water Policy and Strategy – integrated water resources management

(b) Global Environmental Monitoring System (GEMS)

(c) GEF Ecosystems Programme

(d) Great Apes Survival Partnership

(e) UNEP Forests Strategy

(f) Global Programme of Action for the Protection of the Marine Environment from Land-based Activities

(g) Mountain ecosystems

(h) Coral Reef Programme

(i) UNEP Land and Soil Strategy

(j) Land Degradation Assessment in Drylands (LADA)

(k) Ecosystems Programme of the Convention on Biological Diversity

(l) Poverty and Environment Initiative

(m) Economics of ecosystem services, including ecosystem valuation and pro-poor payment for ecosystem services

(n) Regional Seas Programme – integrated coastal zone management

(o) Large marine ecosystems

(p) World Conservation Monitoring Centre (WCMC) ecosystem programme

46. Experience gained by UNEP in the areas listed above exemplify the Programme's specific comparative advantage in terms of developing a comprehensive ecosystem management programme. Many of these programmes are long-standing flagship programmes, such as the Regional Seas Programme and GEMS/Water. Other newer initiatives, such as the Poverty and Environment Initiative, Sustainable Production and Consumption and coral reef assessment and management, have already shown promising results through using integrated approaches to promote environment for development. To enhance their impact it is necessary to bring these successful building blocks together into a single comprehensive ecosystem management programme.

3. Partners

47. From the above, it is clear that UNEP has a strong mandate, an unmistakable comparative advantage and strong existing programmes related to ecosystems management. Its strength also comes, however, from partnerships. Other United Nations bodies, civil society and non-governmental organizations, bilateral and multilateral donors and aid agencies, national Governments and regional authorities all play crucial roles in existing UNEP programmes. Likewise, it is not the intention of

UNEP to be a sole player in the field of ecosystems management. The capacity of UNEP, like that of any other organization, is limited by human and financial resources. As such, it will continue to seek partnership arrangements with sister agencies and organizations and to build on existing innovative work to further the objectives of this ecosystem management programme and to ensure maximum complementarity.

V. Key ecosystem services

48. The UNEP medium-term strategy provides the overall organizational framework for the ecosystem management programme.[5]

49. In pursuit of the objective that "countries utilize the ecosystem approach to enhance human well-being", the UNEP ecosystem management programme will be based on the approach described in detail in section 2 above, with an emphasis on the importance of ecosystem service delivery for human well-being. Central to the proposed ecosystem management programme are the functioning and the resilience of the ecosystems that provide the services and the equitable access to the services. In order to maximize the impacts and outcomes of the expected accomplishments, for a given level of available human and financial resources, the programme needs to focus on a number of carefully selected ecosystem services.

50. As noted above in section 1, "Programme rationale", the Millennium Ecosystem Assessment findings show that 15 out of 24 assessed ecosystem services are degraded or used unsustainably. The degradation of ecosystem services causes significant harm to people, particularly the poor, as it represents a reduction in the benefits that ecosystems provide for human well-being. This degradation is therefore also a barrier to achieving the Millennium Development Goals.

51. Based on an analysis of these 15 degraded ecosystem services and the mandate and comparative advantage of UNEP, 11 services were identified as most relevant and as those which need to be given priority under the ecosystem management programme. The specific criteria used for prioritization included the seriousness of the current state of degradation and the implications for human well-being and sustainable development; the strengths of UNEP in terms of its existing programmatic activities and expertise; the extent to which other agencies are already working on the issues; partnerships which can be developed and expanded as part of the programme; and the potential synergies and future opportunities for UNEP in areas of emerging importance.

52. Six ecosystem services were identified as most in need of intervention: climate regulation; water regulation; natural hazard regulation; energy; freshwater; and nutrient cycling. Another five were identified at a second tier of priority: water purification and waste treatment; disease regulation; capture fisheries; primary production; and recreation and ecotourism.

53. Figure 2 presents these services in schematic form, mapped according to the ecosystem service categories (*regulating, provisioning, supporting* and *cultural* services) established by the Millennium Ecosystem Assessment, and graded from the highest priority at the centre to lesser priority at the margins.

5 Links with other key result areas of the medium-term strategy are listed in annex II.

UNEP selection of key ecosystem services

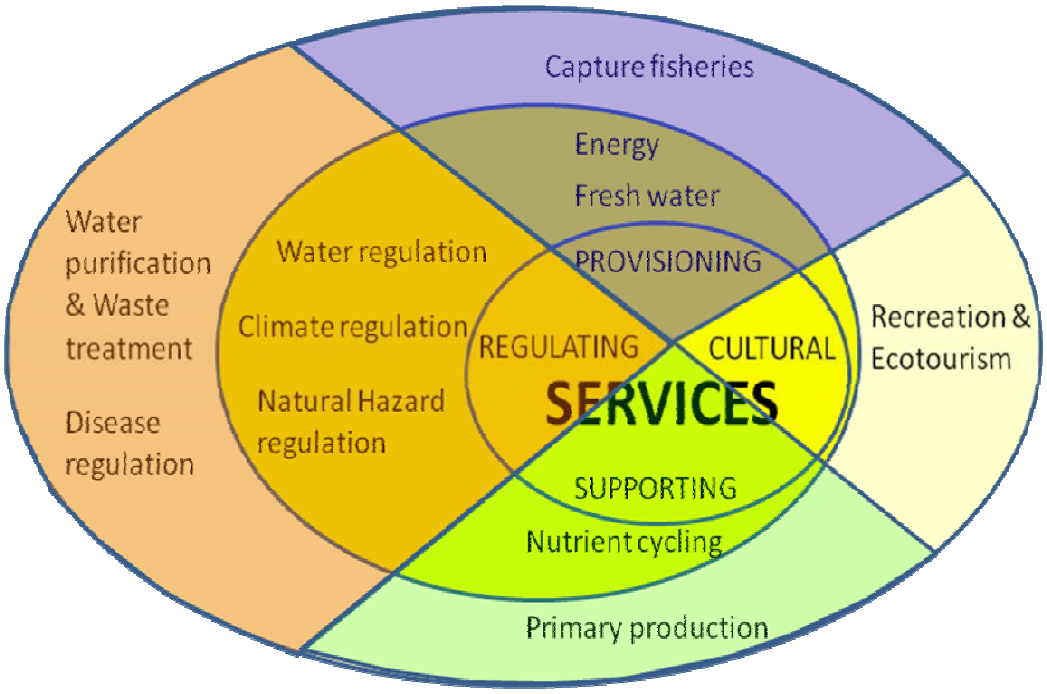

Fig. 2. Schematic representation of the ecosystem services selected by UNEP, as categorized in the Millennium Ecosystem Assessment *(regulating, provisioning, supporting* and *cultural* services).

54. This diagram shows the different level of emphasis accorded by UNEP to the various service categories: the strongest emphasis is placed on regulating services (three high and two lower priority services), the next strongest on provisioning services (two high and one lower priority), followed by supporting services (one high and one lower priority) and the lowest on cultural services (one lower priority). Among these services, water-related services constitute a distinct sub-cluster, cross-cutting between regulating (water regulation and water purification and waste treatment) and provisioning services (fresh water and capture fisheries).

55. In focusing on ecosystem services, it is essential to consider the *bundle of services* (see the box at the end of this section) provided by ecosystems, rather than to focus on individual services and to risk subdividing them into further sectors. Every ecosystem provides a whole range of services, and human activities often result in a modification in the particular bundle, or combination, of services provided. For example, a natural forest ecosystem provides a high level of carbon sequestration, in addition to regulating local climate and stream flow regimes, supporting a high level of biodiversity, and providing for the material, cultural and spiritual needs of indigenous forest communities which dwell within such a forest. If this forest is converted to a cultivated ecosystem, it will provide a rather different bundle of services, typically comprising large quantities of food and fibre, while supporting lower levels of carbon sequestration and biodiversity, and a different set of aesthetic and cultural values, depending on the particular farming system chosen.

56. Decision-makers are thus faced with choices among different bundles of services. Increases in the provisioning services of food, aquaculture and fibre generally come at the expense of reducing the regulating services of water regulation, flood protection, pollination and water purification, among others. With its primary focus on regulating services, the ecosystem management programme will approach the problem holistically and influence other services which have an impact, either through synergy or trade-off, on the selected high-priority ecosystem services.

57. The optimal choice, where feasible, would be to maximize the entire suite of services obtained from a given ecosystem, in a sustainable manner. For example, in a shared watershed, focusing on some of the core ecosystem services through the “reduced emissions from deforestation and degradation” (REDD) approach can result in additional benefits for other services in both natural and modified ecosystems. Such related services include *provisioning* services such as fibre, genetic resources, natural medicines, ornamental resources and fresh water; *cultural* services such as spiritual and aesthetic and traditional knowledge systems; and *regulating* services such as air, climate and water regulation, water

purification, disease and pest regulation, pollination and natural hazard regulation. Provided equitable access to these services is guaranteed, these improvements in delivery will directly contribute to poverty alleviation and improved human well-being for all.

58. The 11 ecosystem services identified for UNEP attention and action at the global level are described below. Understandably, the package of services in decline that need attention will probably differ from country to country and region to region.

1. Regulating services

59. These are the benefits obtained from the regulation of ecosystem processes, including:

(a) *Climate regulation*: healthy ecosystems are important regulators of climate and air quality, but they are also strongly affected by overexploitation and habitat degradation;

(b) *Natural hazard regulation*: healthy ecosystems provide protection from extreme events. Natural disaster and post-conflict response is another key result area of the medium-term strategy, with strong linkages to ecosystem management;

(c) *Water regulation*: healthy terrestrial ecosystems are the major source of accessible, renewable fresh water (in itself a top priority provisioning service) but water scarcity is increasingly affecting human well-being;

(d) *Water purification and waste treatment* are facilitated by healthy ecosystems, notably natural wetlands for the elimination of excess nutrients, sediment loads and pathogens detrimental to human health;

(e) *Disease regulation*: healthy ecosystems play a vital role, the importance of which is now being increasingly understood, in the prevention and attenuation of infectious diseases of humans and non-human primates.

2. Provisioning services

60. These are the products obtained from ecosystems, including:

(a) *Freshwater*: the well-being of both ecosystems and humans is strongly dependent on this vital ecosystem service, increasingly affected by excessive demand and detrimental land-use changes;

(b) *Energy*: this ecosystem service did not appear as such in the Millennium Ecosystem Assessment, but as “biomass energy”. The increased production of biofuels to replace such fossil fuels as wood and charcoal, of particular importance to poor people, has provoked keen debate about the potential impacts of this production on ecosystem and human well-being. Hydropower as a low-carbon energy source is dependent on freshwater-related ecosystem services (provided, for example, by dams) and can also have major impacts on upstream and downstream ecosystems;

(c) *Capture fisheries*: marine and freshwater fisheries are in decline, in spite of increasing demand. Fish protein is of particular importance to poor people. Overfishing is the main issue, but healthy aquatic ecosystems can positively affect the supply side of the equation.

3. Supporting services

61. Supporting services are necessary for the production of all other ecosystem services. They differ from provisioning, regulating, and cultural services in that their impacts on people are either indirect or occur over a very long time, whereas changes in the other categories have relatively direct and short-term impacts on people. These include:

(a) *Nutrient cycling*: healthy ecosystems have a large capacity to absorb, retain and recycle nutrients. In simplified low-diversity agricultural landscapes this capacity is much reduced. Many parts of the world suffer from either inadequate or overabundant nutrients;

(b) *Primary production*: without this supporting service, life as we know it is simply not possible. Although what is referred to as “net primary production” seems to be on the increase, at least in terrestrial ecosystems, it is not yet known whether there any limits to this increase and what the risk of collapse under increasing pressure from climate change and other drivers is unknown.

4. Cultural services

62. These are the non-material benefits that people obtain from ecosystems through spiritual enrichment, cognitive development, reflection, recreation, and aesthetic experiences, including:

(a) *Recreation and ecotourism*: healthy ecosystems that express these cultural values are an increasingly important economic resource which, if arrangements are made to give poor people access to it, can go beyond providing a mere aesthetic experience for the privileged, and help alleviate poverty and improve human well-being.

Bundling of ecosystem services

One ecosystem service (e.g., freshwater provisioning) is not delivered in isolation from others. The Millennium Ecosystem Assessment demonstrated the interdependencies among ecosystem services and it is because of these inter-dependencies that we know that overuse of one ecosystem service may leads to a decline in other ecosystem services as well. It is therefore essential that the ecosystem management approach ensures that interdependent ecosystem services are identified and an ecosystem-specific analysis then revolves around this bundled set of ecosystem services rather than individual services. Focusing on individual services without understanding these interlinkages (i.e., the "bundle" notion) could cause management interventions to be limited to specific sectors rather than integrated in scope.

Bundling of ecosystem services is a complex task. It can be argued that all ecosystem services are interdependent and therefore isolating one for special focus makes little sense. Studies have shown, however, that there are varying degrees of interdependence and the ones that need to be targeted are those with strong interlinkages. The ecosystem management programme is to follow this approach and to begin by identifying the priority ecosystem service or services under stress. Bundling will then be a process of mapping of strong interdependent ecosystem services. The final bundle of ecosystem services that emerges will have a high level of interdependence and clear implications for human well-being and poverty reduction for developing countries.

Advantages of bundling are:

(a) Reducing trade-offs that could occur across ecosystem services and promoting synergies;

(b) The potential for reducing the high transaction costs that could derive from establishing response strategies for multiple ecosystem services;

(c) The potential to reap multiple dividends if sustainable use of one ecosystem service leads to the conservation of other services. Bundling may offer opportunities for multilateral environmental agreements to work together to achieve their respective objectives;

(d) Bundling will also reduce the risk of initiatives failing because of the diversification of responses to multiple drivers.

VI. UNEP entry points

63. Central to the ecosystem management programme are the *functioning* and the *resilience* of the ecosystems that provide the services and *equitable access* to the services. A range of different factors influence the process of attaining the ultimate goal of human well-being through ecosystem services. These include indirect drivers, such as political and institutional processes, and direct drivers, such as climate change, over-exploitation and habitat degradation. Due attention must be given to these drivers if ecosystem functioning and resilience are to be maintained.

64. Figure 3 illustrates the links between UNEP capacity and the conceptual framework explained in more detail in figure 2. Each of the numbered boxes within the figure represents different entry points for UNEP – where UNEP will work with partners to exert a positive influence on the processes in order to meet the overall objective. These five entry points include influencing the indirect drivers (entry points 1 and 2); influencing the direct drivers (entry points 3 and 4); and ensuring equity (entry point 5):

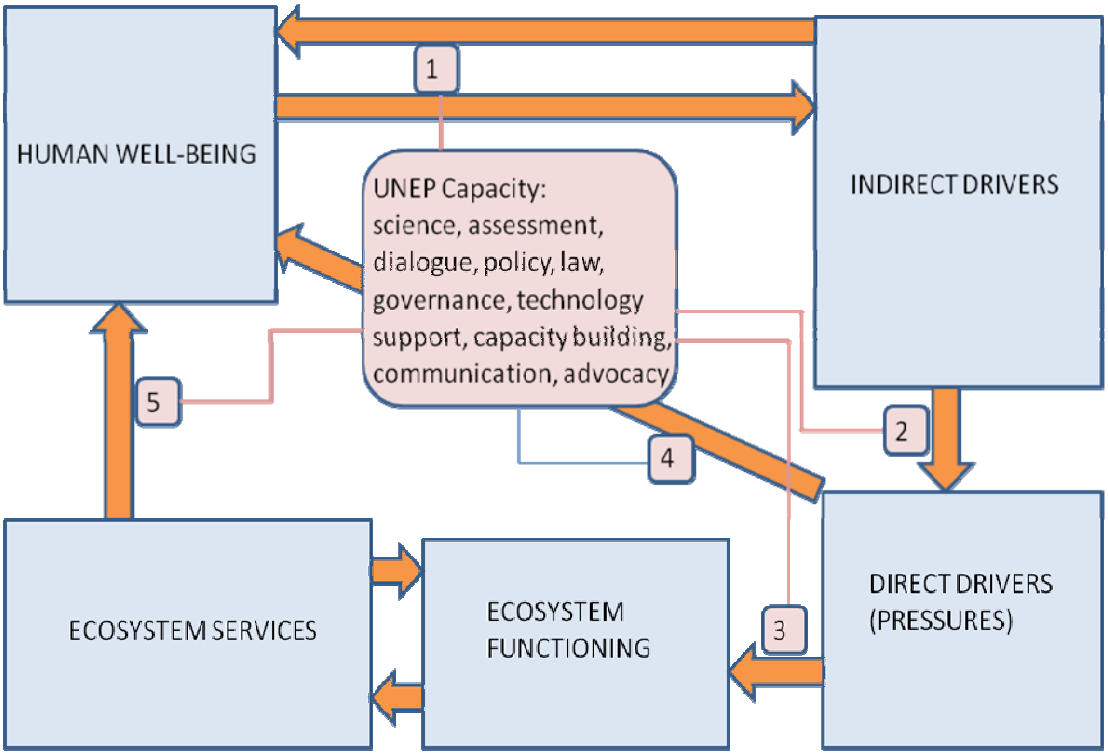

Fig. 3. Simplified representation of the conceptual framework. The numbered boxes provide the strategic entry points for the ecosystem management programme.

65. UNEP can provide specialized expertise to look at these entry points from different disciplines. These include:

(c) Assessment and monitoring (e.g., indicators, research and access to knowledge);

(d) Risk management;

(e) Management tools (e.g., conservation and protection, restoration, sustainable management, legislation, certification);

(f) Ecosystem economics (e.g., payments for ecosystem services, incentives and financing mechanisms, valuation, equity and fairness principles);

(g) Governance (e.g., international agreements, legislation, policies); and

(h) Capacity-building and technology support.

66. Each of these disciplines can be used singly or in conjunction at any or all of the various entry points to address each of the key ecosystem services (see section 4). As such, UNEP as a whole will develop an organization-wide, interdisciplinary workplan geared towards supporting a given ecosystem service or bundle of services. This is further elaborated in section 7 below.

Bundled water regulatory and freshwater provisioning services

Water regulation and *fresh water provision* have been identified as a priority ecosystem services critical to human well-being and currently in decline. They also provide a natural bundle of services (although, depending on the ecosystem assessed, various other services could be included in the same bundle). Various aquatic and terrestrial ecosystems play significant roles here, by providing for water resource protection and maintenance through proper ecosystem functioning.

Certain *direct drivers*, however, such as *overexploitation* and *habitat degradation* inhibit proper ecosystem functioning and thus degrade the ecosystem services. In this case, UNEP intervention would come at various entry points. Starting with box 3 (see figure 3), UNEP would provide *capacity-building and technical support* for improved *land management, sustainable forest management,* and *integrated water resources management* to minimize the impacts of these two drivers.

At the same time, *indirect drivers* such as weak institutions and poor understanding and use of the economy of ecosystem services exacerbate the impact of the direct drivers. UNEP intervention would therefore come at box 5 and include institutional capacity-building, knowledge management systems, technology innovation and payment for ecosystem services. UNEP may also choose to act at box 1. At this entry point, UNEP may include activities for *dialogue* and *advocacy* for sustainable consumption and production to reduce the impact of the indirect drivers on water regulation.

Such actions should lead towards *changes in legal and policy frameworks*. In some ecosystems (high evaporation, low infiltration) rainwater collection can offer a means of improving human well-being by ensuring a safe supply of water for domestic, small livestock and market gardening use with a much lower impact on the ecosystem than the construction of dams. Such an intervention would come under box 4.

67. By the interventions listed above the improved water regulation will increase delivery of the water supply ecosystem service. But increased water supply does not automatically imply improved well-being. High prices or other barriers can limit access to water for socially disadvantaged and vulnerable groups. Therefore, interventions at box 5 would ensure that the rights, opportunities and entitlements of all stakeholders to water are protected and enforced.

68. In summary, in order to check the decline in water regulating services and unsustainable supply of water, UNEP could take multidisciplinary action at all five entry points (figure 3, boxes 1, 2, 3, 4 and 5) and, along with its partners, collectively tackle the problem in an integrated way.

69. The approach in this particular example requires a thorough knowledge and analysis of the issue of water regulation and supply and the various impacts on it. In such an analysis, each UNEP division can identify its potential contribution at each entry point and outline areas for collaboration. Inputs from the regional offices can help to articulate this at regional and subregional levels and help set spatial intervention areas with particular opportunities (e.g., a shared watershed). This collectively would provide a UNEP workplan to deal with the water regulating service.

VII. From programme to results

70. The UNEP medium-term strategy provides the overall objective for the ecosystem management programme. This objective, together with the anticipated results-based accomplishments of the programme, is described in the box below.

UNEP medium-term strategy for 2010–2013
Thematic priority 3: Ecosystem management

Objective: Countries use the ecosystem approach to enhance human well-being

Expected accomplishments:

- Countries and regions increasingly integrate an ecosystem management approach into development and planning processes
- Countries and regions have the capacity to use ecosystem management tools
- Countries and regions begin to realign their environmental programmes and financing to halt the degradation of selected priority ecosystem services

71. To this point, the current document provides the overall framework and strategic directions for the UNEP ecosystem management programme, but does not give specific details on how UNEP will realign itself for implementation, nor does it explain the implementation itself.

72. As with the other five thematic priority areas outlined in the UNEP medium-term strategy, ecosystem management is a cross-cutting priority which will require the engagement of all UNEP divisions. The biennial strategic framework for UNEP for 2010–2011, and subsequently for 2012–2013, will identify more specific expected accomplishments, indicators of achievement and means of verification for the ecosystem management programme. In addition, it may be anticipated that the outputs in the biennial programmes of work established under the respective strategic frameworks be built around support to the UNEP selection of 11 services (see section 5: Key ecosystem services) and elaborated under each of the five strategic entry points (figure 3).

73. These five strategic entry points therefore provide opportunities for UNEP to engage with stakeholders at global, regional and national levels to promote an ecosystem approach to environmental management. The following paragraphs provide a brief explanation of these five points and some examples of existing or potential UNEP interventions that could be applied under each.

74. It is proposed that an interdivisional process should be followed which further refines the priority interventions on the selected ecosystem services on the basis of the entry points provided above, setting realistic and coherent thematic and geographic priorities. This process should operate at the different scales (global, regional, national and local) for each intervention and distinguish between interventions that are expected to achieve short-term or long-term results. At the current stage of programme development such detail cannot be fully provided within the scope of the present document, but some potential response types are provided below under each of the strategic entry points. It should be understood that each priority ecosystem service will require responses under different entry points and that these should all be integrated. The examples provided are therefore illustrative rather than comprehensive. Further guidance can be found in the companion document on operationalizing the UNEP ecosystem management programme.

A. UNEP interventions

1. Targeting indirect drivers: entry points 1 and 2

75. In the interaction space between human well-being and indirect drivers there are many challenges that could be grouped together as those which “influence social choices” to reduce the impacts of those indirect drivers on ecosystem services. Achieving the expected outcomes of the proposed ecosystem management programme will require an overhaul of environmental governance at all levels. Governments will need to commit themselves to common goals on the priority ecosystem services, either globally (e.g., climate regulation) or for a specific geographic area (e.g., shared watersheds). Within countries, the ecosystem approach will need to be extensively integrated into sustainable development plans at the local level (e.g., integrated coastal zone management).

76. For example, a prerequisite for the attainment of tangible results on the disease regulation ecosystem service will be wide-ranging awareness and improved understanding of the conceptual framework underlying the ecosystem management programme and its links to this specific service: e.g., the reduced costs in vector control that can be achieved by maintaining functioning ecosystems

(interlinked gallery forest, hedgerows and indigenous forest patches, etc.) throughout agricultural landscapes. Given the complexity of the interactions between society and ecosystems and the considerable gaps in the knowledge base, this is a major challenge that will need to be tackled through an integrated response combining science, assessment, advocacy, etc., and resulting in improved legal and policy frameworks, together with changes in social and cultural attitudes (e.g., consumption and production).

77. At the same time, they are also opportunities upstream from the direct drivers opportunities to influence the indirect drivers through improved capacity in institutions. For example, in respect of recreation and ecotourism, previous UNEP responses undertaken in partnership with the World Tourism Organization have already achieved considerable awareness and changes in policy. The institutional capacity for effective implementation remains generally low, however, in particular in the area of economic valuation and carbon equivalents of the various alternatives to specific tourism development options. UNEP can contribute to capacity-building in the application of these tools.

2. Mitigating direct drivers: entry points 3 and 4

78. UNEP must invest in making practical tools available to minimize or otherwise mitigate the impacts of direct ecosystem drivers on ecosystem functioning. Direct ecosystem drivers include: habitat change, climate change, invasive species, over-exploitation, and pollution. Each of these has a direct impact on the ability of an ecosystem to function properly, thus adversely affecting the delivery of ecosystem services. Accordingly, UNEP will identify existing programmes – and identify new ones – to apply towards their mitigation. These tools will take a holistic approach to multiple drivers and bundles of ecosystem services (see section 5), as appropriate.

79. For example, governance frameworks such as integrated coastal area management and initiatives promoted through the Global Programme of Action for the Protection of the Marine environment from Land-based Activities can help in dealing with marine habitat degradation and pollution drivers, and projects implemented under the REDD initiative can target the climate change driver. Such management tools are dependent upon a clear scientific understanding of the state of ecosystem functioning (i.e., ecosystem health) and the impacts of these drivers. As such, the assessment of ecosystems is a key analytical management tool. Likewise, the monitoring of systems once governance structures are in place will make it clear whether or not progress is being made and what adjustments need to be undertaken.

80. At entry point 4 there is the opportunity, for example, to target the direct drivers with an immediate impact on human well-being, without any additional stress on ecosystem functioning. For example, where energy ecosystem services are concerned, UNEP can play a role in the analysis of the science base underlying the different types of biofuel production, analyse their impacts, evaluate possible incentives for their production and promote those that would have minimal impact on ecosystem functioning. Developments in this area are very rapid and decision makers at present often do not have the tools to make informed decisions on which direction to take. The example of out-of-soil biofuel production in arid zones, where most of the inputs (water, nutrients, etc.) are internally recycled has already been touched on under section 3.1, on the conceptual framework of the ecosystem management programme

3. Equitable access to ecosytem services

81. A sustainable supply of ecosystem services does not automatically imply that all stakeholders will have equal access to these ecosystem services for their well-being. The interventions at the other entry points target the indirect and direct drivers, with a view to improving efficiency and effectiveness in ensuring the resiliency and functioning of ecosystems, and their delivery of a range of ecosystem services. Interventions at this entry point on the other hand focus attention on equitable access to ecosystem services and ensure that there are some principles of justice and moral imperatives that govern access to the various ecosystem services – thus a key link to poverty reduction and overall national development.

82. Access to ecosystem services can be looked from three levels. The first level covers critical life-supporting ecosystem services like water, safety from natural hazards like floods and storms and other services, which are essentially public social goods. Every individual should have access to these ecosystem services and therefore these services often fall under the rights and freedoms of individuals. The design of institutional mechanisms to ensure the protection of these ecological rights is still an emerging area in many countries (both developed and developing) and needs further development. The second level covers entitlements to ecosystem services. The institutions that need to be in place to help individuals to transform ecosystem services into material welfare include markets, payments for

ecosystem services and other financial mechanisms. These are also still evolving and need considerably more support to ensure that they are equally accessible to all stakeholders.

83. The final level relates to ownership of ecosystem services. The institutions covering ownership of ecosystem services – the natural capital producing these ecosystem services – are the most advanced, but also the most inequitable. Institutions overseeing property rights are still based on the power of the market and little consideration is given to the social and welfare status of individuals. This is especially so in the case of public good type ecosystem services. The challenge for UNEP is to facilitate development of guidelines and of institutional capacities to address these three areas in a coordinated and synergistic manner.

B. Implementation modalities: support to global, regional and national stakeholders

84. Given the five strategic entry points noted above, this section provides general guidance to UNEP on how this work will be made effective on the ground. The medium-term strategy already provides some general guidance for all the priority areas of UNEP. Specifically, chapters 4 and 5 of the strategy note the general implementing framework of the Bali Strategic Plan on Technology Support and Capacity-building, alongside other institutional mechanisms such as gender responsiveness. The details of these may be found in the medium-term strategy and are therefore not reproduced here. Additional implementation modalities specific to the ecosystem management programme are still necessary, however, for interdivisional coordination and adequate implementation of the ecosystem management programme.

85. To achieve the overall objective and expected accomplishments noted above, UNEP will engage in work at the global, regional, national and local levels. For example, what is needed to maintain the water regulating service at a global scale may be more limited to dialogue, awareness, advocacy, etc., whereas at a local scale the actions will be more directed towards capacity-building in assessment and management tools. This will include both standard-setting and regulatory work and capacity-building and technology support – based on the mandate and comparative advantage of UNEP, specifically through existing programmes (see section 4 above).

1. Global level

86. Managing natural resources at the level of ecological units, rather than by following a sectoral approach, will require new technical tools, along with capacity-building to enhance the integration of existing management systems. There are a significant number of tools already developed and used by UNEP and its partners that can be put into a so-called “toolbox” for ecosystem management. That said, however, the planning process noted above will identify more specific needs. As such, where tools appear to be missing, UNEP can develop or source these tools for inclusion. For example, despite the multiple tools available for integrated water resource management, such as the IWRM toolbox of the Global Water Partnership, linking integrated water resource management to the regulating service of water purification and waste treatment as well as work in forests and land, may require the development of additional guidelines. Such guidelines will be developed at the global level and should cover all the 11 priority ecosystem services in decline (see section 5 above).

87. In addition, advocacy for the ecosystems approach will require promoting the approach at international forums, explaining its advantages for development and the recruitment of additional partners in this work.

2. Regional level

88. Just as with water basins, ecological units do not have political boundaries. Accordingly, the transboundary management of natural resources is necessary to maintain ecosystem functioning and delivery of ecosystem services.

89. Building in first instance on existing transboundary commissions and authorities (e.g., transboundary water resources authorities), UNEP will work with countries in a regional or subregional context to maximize the delivery of ecosystem services. This will include assessment to identify bundles of shared ecosystem services relevant to the region or subregion. As per section 5, UNEP has identified 11 priority services for the ecosystem management programme. Different regions have different needs and may have priorities within the eleven most relevant to the development of their particular region or subregion. This will require a transboundary assessment of the most relevant ecosystem services.

90. Once the regional or subregional ecosystem services have been identified, UNEP could assist in identifying the needs of the particular region or subregion, so as to enable the development and implementation of a shared action plan. This may include institutional and technical capacity-building, advocacy, communications, region specific norms, legal mechanisms, etc. The Regional Seas Programme of UNEP provides a good example here, integrating assessment processes, management tools and governance for a common ecosystem in the marine environment.

3. National and local level

91. At the national level, UNEP will work with ministries of environment, planning and finance to promote the overall incorporation of the ecosystem approach as detailed in the UNEP programme into national development planning. At this level, a primary vehicle for promotion will be made available through the UNDP-UNEP Poverty-Environment Initiative under its expanded framework.

92. At a technical level, and within the overall development framework, UNEP will provide technical support and guidance to countries in assessing and identifying the ecosystem services that are of national priority (out of the 11 identified in the present programme document). As with the regional approach above, UNEP, by following these assessments, will help countries to design national ecosystem management programmes that can be used to guide work at the ecosystem level (i.e., local level).

93. As per the example of the water regulating and freshwater provisioning bundle in section 6 above, with UNEP assistance, countries will develop cohesive workplans such that each of their identified priority ecosystem services are dealt with through coordinated action across sectors. Such workplans will require information on specific direct and indirect drivers of ecosystem change; dialogue with partners and users (i.e., stakeholders) of ecosystem services, including transboundary ecosystem stakeholders depending on scale; development of potential scenarios; and finally interdisciplinary and intersectoral action plans designed for a specific ecosystem service.

94. Once these workplans are developed and the various tools are applied, it will be necessary to monitor for shifts towards improved ecosystem resilience and an improvement in the delivery of ecosystem services. Once again, the medium-term strategy (chapter 6) provides the broad framework for this, but specific indicators for monitoring results of the ecosystem management programme will still need to be developed and measured.

Annex I

UNEP mandates relevant to ecosystem management

A. Strengthening scientific understanding of ecosystems functions

UNEP has been requested to "strengthen and expand its research…" on the environment and to include "social and economic factors affecting the environment…." in the research. This research is to facilitate an efficient sustainable management of the environment. These mandates are found in Governing Council decisions 20/19, 21/14, 22/1 and 22/2.

B. Assessment and review of ecosystems and their functions

There are several Governing Council decisions that request UNEP to analyse the state of the global environment and assess global and regional environmental trends, to provide early warning information on environmental changes and threats and to assess the impact of social and economic factors on the environment. The Governing Council decisions also welcome and request UNEP to continue with and strengthen its assessment of marine and coastal ecosystems those threatened by desertification, and also of the environment in general in Africa. These decisions include: 19/1, 20/19, 20/25, 20/27, 21/1, 21/14, 21/28, 22/1, 22/16 and 23/6.

C. Development of policy and law in relation to ecosystem management

UNEP has been requested in many Governing Council decisions to work on the development of policy and law in relation to environmental matters. The decisions request that the development of policies and legislation be based on assessments and social and economic relationships and that UNEP provide "policy advice based on the best scientific and technical capabilities available". UNEP shall also "promote the transfer of … regulatory frameworks and economic instruments," to provide for the sustainable management of the environment, e.g., for the development of mechanisms for payment for ecosystem services. These decisions include: 19/1, 19/20, 20/19, 21/14, 22/9 and 23/10.

D. Management of ecosystems by biome

There are several Governing Council decisions that request UNEP to work for the sustainable management and protection of biomes, specifically:

(a) Freshwater: to work on integrated management of freshwater (19/14, 20/25, 22/2);

(b) Marine and coastal environments: several requests to work on the protection of marine and coastal environments focusing on land-based sources of pollution and integrated coastal area management (19/14, 20/19, 21/28);

(c) Semi-arid and arid environments: UNEP shall "develop and implement land-degradation projects in accordance with the action plan on land degradation" (21/1);

(d) Arctic environments: provide for the sustainable development of the arctic and for continued assessment of the Arctic (22/11);

(e) River basin: UNEP has two strong mandates for the conduct of "…activities aimed at promoting integrated management and sustainable development of coastal and associated river basins" and "integrated river basin, watershed and groundwater management" (20/19, 22/2);

(f) Forests and land management: UNEP has been requested to strengthen its land resource management and soil conservation work and to use its expertise in environmental issues to support forest processes (21/1, 21/2, 22/5);

(g) Small island environments: "Promote and facilitate integrated island management programmes … encompassing the totality of the terrestrial environment" (20/19).

In addition to these specific biomes, by decision 20/19 the Governing Council requests UNEP to promote "measures for improved protection of endangered aquatic species, fragile ecosystems, habitats and other ecologically sensitive areas, and for restoration of damaged systems and areas, as well as pursuing the establishment of new and the expansion of existing specially protected areas".

E. Social and economic aspects within the management of ecosystems

UNEP has several requests flowing from Governing Council decisions relating to the financial and social aspects of the management and use of the environment, e.g., "to develop guiding principles for sustainable tourism" and "to develop and undertake activities in promoting more sustainable production and consumption patterns in industry". The mandates also request UNEP to develop market-based incentives for sustainable production and consumption (20/19, 21/14, 22/9, 22/10, 23/10).

In addition to these five categories, UNEP has been requested to consider the interlinkages between various environmental issues, namely, those between freshwater, forestry and land degradation, and to build capacity in matters relating to the environment, including the impacts of trade and economics on the environment (20/27, 21/14, 22/1, 22/2, 22/5, 22/8, 22/9, 22/10, 22/16, 23/6 and 23/10).

In addition to the above-listed mandates for these five categories, there are additional mandates that should also be considered, including in the areas of chemicals, climate and gender.

Annex II

Links with other key result areas of the medium-term strategy

UNEP is now reorganizing its subprogramme areas for the period 2010–2013, shifting from a divisional to a thematic approach. Ecosystem management is the third such priority area, or the new subprogramme 3 of UNEP. The other five priority areas are also being defined or refined and should and do have key linkages with the ecosystems management subprogramme.

The following summarizes the linkages between ecosystem management and the other priority areas:

1. **Climate change**: ecosystem management has a crucial role to play in mitigation through improved land use and reduced deforestation. The same is true for adaptation (e.g., coping with sea-level rise will require improved ecosystem management of coral reefs, mangroves and coastal areas to increase resilience). Similarly, prevention of and coping with more extreme flood events will require securing catchment forests and reforestation along drainage lines. Healthier, more resilient ecosystems will facilitate the control of pests that have new opportunities because of the extension of their growing season, etc.

2. **Environmental governance**: success stories of ecosystem management can help in shaping a response to the cultural, social, political and institutional processes that govern the drivers. Effective governance at multiple scales is essential for effective ecosystem management.

3. **Hazardous substances:** the reduction of hazardous substances (e.g., through SAICM) will improve ecosystem health. Conversely, ecosystem management can strengthen the regulating services that clean air and water.

4. **Natural disasters and post-conflict response:** the prevention and mitigation of natural disasters by strengthening natural barriers (e.g., coral reefs, mangroves, and forests), restoration and recovery operations in post-crisis areas benefit from an ecosystem approach. Healthy productive ecosystems also reduce competition for natural resources, often a causal factor of conflict.

5. **Resource efficiency:** ecosystem management, by pointing out interlinkages, constraints, opportunities and risks of irreversible change linked to drivers and pressures (e.g., overexploitation, land-use change and external inputs) on ecosystem integrity, can contribute to setting the priorities and analysing potential impacts of interventions under different scenarios. Internalizing environmental costs and removing perverse subsidies can also be expected to improve ecosystem health.