



**Insight from the 5th World Water Forum
on Securing Water for Food and Ecosystems in Africa**
Report on BOCI Project BO-10-004-003: Water Conventions

Executive Summary

LNV has clearly stated its policy priorities and goals within the framework of Water for Food and Ecosystems (WFE), which aims to improve the sustainable productivity of agriculture in synergy with an invigorated environment. This project provided technical and scientific support to LNV in the preparation of LNV contributions to the 5th World Water Forum in Istanbul, enhanced the post Istanbul activities of LNV and the processing of achievements from the Forum, and enhanced the policy of Water for Food and Ecosystems within RAMSAR and among wetland and agriculture practitioners.

The LNV and Alterra/WUR coordinated sessions in Istanbul included six sessions on the topic “Preserving Natural Ecosystems”, and two side events focusing on the WFE framework and improving agricultural productivity in Africa. Sessions attracted participants representing all sectors and coming from around the world. Through presentations, roundtables, voting, and input via electronic handsets participants discussed and made recommendations on many related topics.

Participants in the 5th World Water Forum in Istanbul concluded that water management must include consideration of ecosystems, for instance by acknowledging and securing the benefits of ‘environmental flows’. Recommendations from Istanbul and content from other international forums such as the CSD that are relevant to securing water for food and ecosystems in Africa will form the basis of the forthcoming Knowledge Compendium from Alterra: Water for Food and Ecosystems in Africa. Initial content for this compendium is included at the end of this report.

Recommendations from Topic 3.3 of the 5th World Water Forum: Preserving Natural Ecosystems

Participants in the 5th World Water Forum produced the following recommendations through plenary discussions, roundtables, and individual responses via electronic handsets. They were discussed and voted upon by participants from around the world representing all major sectors. During attempts to prioritize the recommendations it became apparent that many of the recommendations are complementary to one another, and a clear hierarchy cannot be defined. Many of the recommendations are valuable on their own, yet they should be taken as a whole to comprehend the broader vision for how to ensure ecosystems continue to maintain the quality and quantity of our natural water supply.

Recommendations

- Coordinate land and water management.
- Actions to support water allocation to ecosystems (environmental flows) must be strengthened and implemented more widely.
- Consider payment for ecosystem services as an incentive and instrument to achieve the land and ecosystem management practices desired.
- Increase interdisciplinary research into the interplay between terrestrial ecosystems, landscapes and the water cycle, and operationalize the findings of this research for policy and management on national and local scales.
- Develop sound valuation practices for ecosystem services.
- Functional prioritization of ecosystem services at the landscape scale should guide their maintenance and use in an integrated natural resources management framework, but details of re-arranging ecosystem services and the benefits that are derived from them need to be addressed on a case-by-case basis, and at the local level, in the context of landscape (basin) scale prioritization.
- Perform participatory assessments of the values of ecosystems and conducting of trade-offs.
- Give the rights and responsibilities to enact stewardship over the ecosystem to the stakeholders.
- Increase capacity of local institutions to address the complexities of ecosystem services exploitation.
- Strengthen community-led governance of water resources.
- Perform participatory dialogues to negotiate water allocation among sectors, and support with enabling actions including: (i) building water governance capacity; (ii) monitoring and sharing information and data; and (iii) assessing values of water resources and trade-offs.
- Community-based traditional knowledge should be complemented by and supported with a science knowledgebase.
- Encourage application of environmental flows in development, including: (i) employing multidisciplinary teams within water resources management agencies; (ii) using environmental flow indicators within countries' work to alleviate poverty; (iii) developing financial mechanisms which take environmental requirements into account; and, (iv) enforcing legislation through building water governance capacity.
- We need to: (i) use our available water more efficiently; (ii) stop our wetlands from becoming degraded or lost; and (iii) restore our wetlands that are already degraded.
- Governments need to include water and wetland management in effective strategies for addressing climate change at the national level.

1 Introduction

Water scarcity is considered to be one of the largest threats for many parts of Africa. Under water scarce conditions reducing the consumption of water and preventing pollution of accessible water resources is essential. Combating water scarcity in both dimensions of quality and quantity is of special relevance for the LNV priority regions (including those in Water Mondiaal). Future LNV policies to address food security in Africa will affect the use, spread and fate of agrochemicals as well. Very little information is available on how this might effect the ecosystem approach (including biodiversity, increased resilience, and multiple-use potential) in land use planning.

LNV has clearly stated its policy priorities and goals within the framework of Water for Food and Ecosystems (WFE), which aims to improve the sustainable productivity of agriculture in synergy with an invigorated environment. The goal is thus to actively promote an ecosystems approach to agriculture, and a productive services approach to ecosystems. This policy is advanced by LNV in both its national and international work and commitments (e.g. FAO/Netherlands conference on Water for Food and Ecosystems, and bilateral WFE initiatives).

In this context LNV contributes to various actions and activities. This BOCI project enhanced the policy of Water for Food and Ecosystems within RAMSAR and among wetland and agriculture practitioners by promoting the sustainable and integrated use of wetland resources while safeguarding agricultural productivity, provided technical and scientific support to LNV in the preparation of LNV contributions to the 5th World Water Forum and enhanced the post Istanbul activities of LNV.

As an active and supporting Contracting Party to the RAMSAR convention, LNV wishes to promote the adoption of the WFE approach within the convention. With this project LNV has provided support to RAMSAR in the development of the agriculture-wetland interactions guidelines. The RAMSAR Secretariat, Scientific and Technical Review Panel, and the parties to the convention are problem owners in that they have called for the development of guidelines on agriculture-wetland interactions through the adoption of resolution VIII.34.

In 2009 LNV, as the main problem owner, expanded the outreach of the work performed on the WFE approach. Successful scientific coordination of Theme 3 of the 5th World Water Forum yielded many policy recommendations, especially in subtopic 3.3 - Preserving Natural Ecosystems – and also through two side events. Additionally, LNV provided leadership and policy inputs dealing with agriculture to the CSD 14. Through these forums policy makers and practitioners in the water, agriculture, and environmental sectors were targeted to promote the LNV policy on WFE with the explicit aim to bring the agriculture, environment and water sectors together through an integrated approach.

The integration and interaction of multi/bi-lateral LNV projects was strengthened through the creation of a brochure highlighting LNV water projects. A compendium on Water for Food and Ecosystems in Africa is being prepared based on the output of the 5th World Water Forum, for which this report will be the base. It will attempt to make the outcomes of relevant forums accessible in order to develop knowledge and tools that can be used for decisions on sustainable development and for future policy.

2 World Water Forum

2-1 Topic 3.3 of the 5th World Water Forum

The World Water Forum is the largest international event in the field of water, and is organized every three years by the World Water Council. The event strives to increase the importance of water on the political agenda and support discussions on solutions to international water issues. The 5th World Water Forum was held in Istanbul in March 2009, and included the theme - Managing and Protecting Water Resources and their Supply Systems to Meet Human and Environmental Needs. Within this theme the topic "Preserving Natural Ecosystems" was coordinated and facilitated by LNV and Alterra/WUR. Six sessions were organized in conjunction with the following organizations, which convened the sessions: UNECE, IUCN, RAMSAR, Wetlands International and the Swiss Federal Office for the Environment.

Recognizing that Earth's ecosystems provide services that are crucial for human well-being, including maintaining the quality and quantity of our natural water supply, sessions addressed the central question: *how can the preservation of natural ecosystems become a principle objective of water management?* Sessions focused more specifically on general policies and strategies in the field of ecosystem protection, regional perspectives and the sharing of benefits from ecosystems, and community-based water management, focusing on local problems and actions in both natural and man-made ecosystems.

Key Questions

Topic 3.3 of the 5th World Water Forum – Preserving Natural Ecosystems

Each of the six Topic 3.3 sessions addressed key questions related to the central question of how the preservation of natural ecosystems can become a central goal of land and water management. The key questions were:

- When changing the paradigm "water for nature" to "nature for water", which policies-provisions will ensure the sustainable use and protection of ecosystems?
- How can IWRM plans, national forest programs, biodiversity strategies and land-use planning be linked to ensure sustainable water management and supply of drinking water? Which are the gaps and obstacles?
- What is key to successful use of economic instruments such as PES?
- Are PES a balanced tool to implement IWRM/MDG's and sustainable development?
- How can rural and (peri-)urban livelihoods benefit from sharing responsibility to preserve ecosystems for water and life?
- What solutions and actions can ensure equitable sharing of water resources that will conserve ecosystems and support people?
- Why are ecosystem services key to different sectors?
- What is needed to coordinate benefit-sharing between sectors?
- How does maintaining flows benefit livelihoods and human well-being?
- How does maintaining flows benefit agriculture, industry, energy and the domestic supply sectors?
- What is the reasonable balance between development and conservation of ecosystems to maintain provisioning, cultural, supporting and regulating services?
- What are the practical strategies and policies for preventing the contraction of wetlands?

Interactive sessions were organized to allow innovative ideas and recommendations to come forward. The sessions attracted participants representing all sectors and coming from around the world. Through presentations, roundtables, voting, and individual input via electronic handsets participants discussed and made recommendations on many aspects of how to preserve natural ecosystems and the services they provide. A list of the statements and recommendations that came out of Topic 3.3 are included in Annex I.

Ecosystem services are the processes by which the environment produces resources that we often take for granted such as clean water, timber, and habitat for fisheries, and pollination of native and agricultural plants. Whether we find ourselves in the city or a rural area, the ecosystems in which humans live provide goods and services that are very familiar to us.

Ecosystems provide “services” that:

- moderate weather extremes and their impacts
- disperse seeds
- mitigate drought and floods
- protect people from the sun’s harmful ultraviolet rays
- cycle and move nutrients
- protect stream and river channels and coastal shores from erosion
- detoxify and decompose wastes
- control agricultural pests
- maintain biodiversity
- generate and preserve soils and renew their fertility
- contribute to climate stability
- purify the air and water
- regulate disease carrying organisms
- pollinate crops and natural vegetation

ESA fact sheet "Ecosystem Services"

Participants concluded that water management must include consideration of ecosystems, for instance by discussing the benefits of ‘environmental flows’. For appropriate water management it is necessary to make a plan for allocation of water based on adequate data and information - this should not be limited to a specific region (e.g. deltas), but should encompass the entire river basin. If available data is insufficient it has to be made available or collected in a well designed monitoring program.

“**Environmental flows** describe the quantity, quality and timing of water flows required to sustain freshwater and estuarine ecosystems and the human livelihoods and well-being that depend on these ecosystems”.

Swedish Water House, 2009. Securing Water for Ecosystems and Human Well-being: The Importance of Environmental Flows

It has to be realized that a river basin often includes multiple administrative areas. This is obvious if it is a trans-boundary river, but even within countries different provinces may have different ideas on development of the area and collection of data. Awareness at the level of 1) local farmer and other locals, 2) water using industries

(small and large scale) and 3) administration at different levels has to be supported by the activities in the basin.

Lakes and wetlands contain a very large part of the surface freshwater. They have a role as a buffer, but also in improving the water quality due to self purifying properties and sedimentation of (contaminated) suspended particles. In general wetlands provides ecosystem services and should be well managed. Terrestrial ecosystems also fulfill functions in the water cycle.

More generally, there is a strong link between poverty and management of water and there is an urgent need to improve water governance. It was recognized that incorporating new scientific knowledge and data are important, but that it has to be complemented with community-based traditional knowledge.

2-2 Side Events at the 5th World Water Forum

Two side events were hosted at the 5th World Water Forum that promoted the WFE framework. The side event “Partnerships for Water for Food and Ecosystems” highlighted achievements and impact made during LNV WFE projects, and included presentations from Alterra and partners in LNV projects in Ethiopia, Vietnam and South Africa. A second side event “Strengthening Agricultural Productivity in Africa” discussed improving agricultural productivity within the WFE approach within Africa.

3 RAMSAR Guidelines

As an active and supporting Contracting Party to the RAMSAR convention, LNV has promoted the adoption of the WFE approach within the convention. With this project LNV has supported RAMSAR in the development of agriculture-wetland interactions guidelines. The target group for the RAMSAR guidelines are the RAMSAR convention and its constituents, which include environmental ministries and wetland/natural resources managers. The guidelines were developed in close liaison with the RAMSAR conference of parties (COP10) and the Scientific and Technical Review Panel. Partnership with FAO and CGIAR ensured relevance of the guidelines to the agricultural sector.

4 WFE Compendium

A compendium on Water for Food and Ecosystems in Africa is being prepared based on the output of the 5th World Water Forum. One of the forum themes - Managing and Protecting Water Resources and their Supply Systems to Meet Human and Environmental Needs - was a very broad one that this compendium will attempt to make accessible in order to develop knowledge and tools that can be used for decisions on sustainable development and for future policy. This section includes

further information that will be included in the compendium, relating to important international developments, forums, and goals.

4-1 Commission on Sustainable Development (CSD)

On the level of Governments and United Nations, the Commission on Sustainable Development (CSD) shares visions on topics of fundamental importance to our economies, societies and to the future of sustainable development: agriculture, rural development, land, drought, desertification, specially related to the development needs of Africa. Agriculture adapted to climate change plays an important role in sustainable development. Agriculture and water are closely linked. There are many competing claims on water. Worldwide agriculture consumes 70% of all fresh water withdrawals. In response to the decreasing availability of water in many regions, there is a need for better water management. For the CSD it is important to manage sustainably competing uses of water and land resources. This includes: Support the implementation of sustainable and efficient water resources development and management schemes, including integrated water resources management within each country, and, where appropriate, through international cooperation, and improve irrigation efficiencies, ground water and on-farm soil, and water management practices, including for drinking water to overcome water shortages, improve water quality, and enhance food security.

This has to be reached by strengthening of the knowledge base and by information-sharing on drought, water stress and drought risk management. It is necessary to enhance the resilience of communities to drought. Preferable in combination with the support of appropriate traditional practices and local knowledge concerning land use, water management and agricultural activities. The equitable and sustainable use has to be assured, as well as integrated management and development, of national and shared water resources in Africa, in accordance with existing international agreements and national priorities has to be promoted.

4-2 Millennium Development Goals

In the year 2000, world leaders set far-sighted goals to free a major portion of humanity from the shackles of extreme poverty, hunger, illiteracy and disease. They established targets for achieving gender equality and the empowerment of women, environmental sustainability and a global partnership for development. They defined 8 goals:

1. Eradicate extreme poverty and hunger
2. Achieve universal primary education
3. Promote gender equality and empower women
4. Reduce child mortality
5. Improve maternal health
6. Combat HIV/AIDS, malaria, and other diseases
7. Ensure environmental sustainability
8. Develop a global partnership for development

Water obviously plays an important role in food production (goal 1), and environmental sustainability (goal 7), but it is also critical in health issues (goals 4, 5 and 6) and in creating conditions that support the education and empowerment of women (goals 2 and 3).

4-3 Challenges for Africa

The Alliance for Green Revolution in Africa (AGRA) is working to achieve a uniquely African Green Revolution: one that puts smallholder farmers first while protecting biodiversity, promoting sustainability and advancing equity. The chair Kofi Annan has stressed this at the opening of the Academic Year of Wageningen UR on September 1, 2008. Although problems in Africa are known AGRA creates a positive atmosphere and in such an atmosphere innovations are better challenged. In our approach we want to develop a broad and integrated approach in order to overcome problems on water scarcity and to design a sustainable system.

4.3.1 Energy and Climate

Developments in Europe and North-America in the 20th century have given a high standard of living and a high certainty of supply of the essentials for life; food, water and a clean environment. However, it is now realized that the global north has been using quantities of the fossil fuels coal, oil and gas that have been damaging to both local environments and the global climate, and that cannot be sustained due to their limited availability. The end of the 20th century brought the knowledge that the carbon dioxide emissions of fossil fuel use have a large effect on our climate. Sustainability must therefore be combined with renewable, non-fossil fuel energy sources.

Sustainable development is development with a low input of CO₂-producing energy. Other energy sources have to be involved. For Africa, the sun will be an important source. In this phase of Africa's development choices can be made and with the proper choices future generations will benefit.

Sustainable development “meets the needs of the present without compromising the ability of future generations to meet their own needs.”
The Brundtland Commission, 1987. The Brundtland Report: Our Common Future.

4.3.2 Contamination

It should be realized that water scarcity is not only meaning too less water, but also too dirty water. In the 60th of last century it was recognized in the northern countries that all developments had increased water pollution and that water quality in several of the large catchment areas had become too bad to make direct use of the water possible. As a reaction a lot of money had been invested in sewage treatment plants to purify the waste water. This approach was successful and it is possible again to talk about ecological potential of surface water (EU-Water Framework Directive).

Although sanitation is an very important subject, it is not to be expected that sewage treatment plant will be soon present all over most African countries on the short term

In making future plans, it will be necessary to take into account present and future sources that may contaminate the water. Management of waste is a challenge to improve reuse and to reduce the wasting of energy and resources.

4.3.3 Nutrients

Besides water agriculture needs nutrients. For most farmers nutrients are very expensive, especially if these have to be imported. It is therefore important to use nutrients that are already in the system. This is a normal procedure if life stock is involved. Manure is considered as a valuable source. Nutrients are also present in waste and waste water. Waste can be used as a source for soil improvers like compost and waste water can be used for irrigation. Precondition are that persistent contaminants are absent and also that pathogens do not survive. It is not easy to do this on a correct way, but can be considered as a challenge. If organic and industrial waste can be kept separated, less energy is necessary for cleaning and waste becomes reusable.

4.3.4 Green and blue water

Green water available as rainwater is a continuous source of new and clean water (Rockström et al, 2009). The amount however is limited in countries suffering from water scarcity. The distribution and the intensity of rainfall does not always fulfill the needs of crops and often disappears by surface runn-off. Green water has to be stored in the system and made applicable for use during the growing season.

5 Wageningen and Africa

‘To explore the potential of nature to improve the quality of life’ That is the mission of Wageningen UR (University and Research Centre). Within the domain of ‘healthy food and living environment’, we work around the globe doing research for government agencies and the private sector.

The world faces huge water and food challenges in view of increasing pressures by population growth, the global climate change and socio-economical developments (urbanization, changes in diets and lifestyle, etc.). This requires a fundamental rethinking of the conceptual framework of land and water management. In dealing with water issues, the general focus has been on supply and demand management of surface water and groundwater resources (referred to as “blue water” resources). This approach does not sufficiently acknowledge the role of rainfall as the ultimate water resource. The fate of rainfall is principally determined by land use. It should thus be recognized that the availability and quality of surface water and groundwater resources, and their spatio-temporal variability, primarily depends on land use and land management. Spatial planning and land management are, therefore, crucial for water management, especially in arid and semi-arid zones, where the (exploitable) groundwater and surface water generally represent a small percentage of the rainfall. Spatial planning and land management should primarily focus on (commercial) forestry, agriculture and town planning, as these land uses are largely manageable. Agriculture and forestry can be regarded as the world’s principal “rainfall processing industries”.

In Africa Wageningen UR cooperates with:

- The Regional Universities Forum for Capacity Building in Agriculture (RUFORUM)
- Forum for Agricultural Research in Africa (FARA)
- South-Africa:
 - University of Pretoria
 - Agricultural Research Council (ARC) of South Africa
 - Council of Scientific & Industrial Research (CSIR)
- Kenya: University of Nairobi
 - Kenya Agricultural Research Institute
- Ethiopia:
 - Jimma University (JU)
 - Ethiopian Institute of Agricultural Research (EIAR)
- Uganda:
 - Makerere University
 - National Agricultural Research Organisation (NARO)
- Ghana:
 - Council for Scientific and Industrial Research
 - University of Ghana
 - Kwame Nkrumah – University of Science and Technology (KNUST)
- Benin:
 - Université Nationale du Bénin

Within the research of water, the most important principal is the Ministry of Agriculture Nature and Food Quality (LNV). For LNV it is important to sustain water and the environment as the resource base, it is critical to recognize agriculture as an agro-ecosystem that generates food and ecosystem services, rather than to consider merely the food production function.

The ministry of LNV is active in the Consultative Group on International Agricultural Research (CGIAR), which group issued the Comprehensive Assessment of Water Management in Agriculture in 2007. African projects within this program are:

- Ethiopian Central Rift Valley. Ecosystems for water, food and economic development in the Ethiopian Central Rift Valley.
- Baviaanskloof Mega Reserve, South Africa. The main objective of the project is to conserve the biodiversity in a more sustainable way, by optimizing water use for ecosystems, agriculture and domestic use, in such a way that rural livelihoods are also improved.

In the climate program projects are not directly related to a country or continent, but global. Projects having impact on Africa are:

- NeWater: New Approaches to Adaptive Water Management under Uncertainty. NeWater aims to develop expertise to ensure that water management becomes climate-resistant, so that the effects of climate change can be properly estimated and that flexible water management is established, which takes account of the consequences of climate change. The research also focuses on the social, economic, spatial, policy, and organisational adaptations that are required in relation to climate change.

- ADAM: Adaptation and Mitigation Strategies The aim of ADAM is to develop an instrument with which the various policy options regarding mitigation and adaptation can be evaluated in terms of effectiveness and costs: the Policy Assessment Framework.
- Measuring the turbulent atmosphere. The research will contribute to understanding the turbulent atmosphere and how it affects the transport of greenhouse gasses. In addition, the measurements are intended to improve model calculations and the interpretation of satellite images.
- Carbopeat. Carbon, climate and people in tropical peat swamp forests Carbopeat promotes a better understanding and awareness of the interactions between carbon, climate and people in tropical peat swamp forests.

Present projects in Africa on water are:

- Egyptian-Dutch Advisory Panel. The Egyptian-Dutch Advisory Panel on Water Management started in 1976 as bilateral cooperation on land drainage after the completion of the High Aswan Dam. Since then a strong partnership has evolved between Egypt and the Netherlands involving cooperation between ministries and other organizations in both countries.
- Eutrophication or exploitation as threat for fisheries? Ecosystem change in Lake Victoria
- Managing Africa's trans-boundary waters by trans-boundary land management
- Reducing risks of pesticides in Ethiopia. Joint collaborative project on pesticide registration and post registration
- Water for Food and Ecosystems in the Baviaanskloof Mega Reserve Support sustainable development and management of land and water resources to conserve biodiversity and to improve rural livelihoods in the Baviaanskloof Mega Reserve.
- WIBIS: Coping with Competing Claims on Water in the Incomati Basin through Interactive Science. The WIBIS project is aimed at supporting inter-sectoral and inter-state (transboundary) policy development and sustainable (wise) use of the Incomati basin water. The project supports ongoing regional initiatives and projects, such as the PRIMA project (Progressive Realisation of the IncoMaputo Agreement).
- An African approach for Risk Reduction of Obsolete Pesticides
- Agroparks - an innovative design approach for metropolitan areas general

Wageningen-UR organizes specific courses related to water and climate.

- Climate change adaptation in agriculture and natural resources management The course will be conducted at Addis Ababa, University (HoA-REC).
- In 2010 the 49th International Course on Land Drainage (ICLD) will be organized.
- International Training of Trainers on wetland management

6 Follow-up Activities

It is necessary to have the knowledge developed available to those who can implement it. We will do this in a Knowledge Compendium. Scientists in Wageningen and Africa will be asked to write chapters on the following subjects. The chapters will be general, giving a vision on the subject. Specific projects will be used as illustrations. The target group is international active LNV-employees, such as Agricultural Attaches and their counterparts in Africa.

- The concept of Water Productivity and its implication to future planning
- Hydrological variability
- Impact of climate variability on predicting food production potentials
- Shifting the focus, from water resources to food security
- Modern production systems in Africa and related needs for adapted water management
- Rainfall harvesting techniques
- Drainage
- The role of early warning and coping strategies
- Environmental risk assessment and future deterioration of water resources. Make also a link with food quality and safety (possibilities for export)
- safe use of pesticides for agriculture, include use of pesticides for malaria and locust control
- salinity and salt tolerance crops, water stress/salinity Egypt
- Multi use systems in Africa
- Reuse of (partly) purified water, including sludge application to improve soil fertility
- Ecological value of dry river systems
- The Land, Water and ECOSystem Management Approach: a focus on rainfall
- Knowledge brokerage

Annex I: Statements and Recommendations from Topic 3.3 of the 5th World Water Forum

Statements

1. There is a widening gap between available water and water demand.
2. Terrestrial ecosystems fulfill essential functions in the water cycle and provide ecosystem services of great benefit for water management.
3. The links between land-cover and the water cycle are at present not sufficiently well understood. This lack of understanding hampers the development of innovative and cost-effective land and water management strategies.
4. There is a divide between wetland ecosystem knowledge and management and water management planning and decision-making.
5. Sustainable utilization of ecosystem services may represent a cost-effective strategy with multiple benefits for land, water and climate compared with investments in structural measures. Cost-effectiveness is achieved in particular when several sectors recognize the benefits so that the investments can be shared.
6. Ecosystem services are difficult to value. As a result, the value of ecosystems is not sufficiently accounted for in economic trade-offs underlying policy and management decisions, resulting in further ecosystem degradation.
7. Payment for ecosystem services can be an important incentive and instrument to achieve desired land and ecosystem management practices.
8. There is a skewing towards preserving provisioning services at the cost of other ecosystem services.
9. Poverty reduction needs healthy rivers.
10. The poor depend heavily on ecosystem services, which act as the GDP of the poor. As a consequence, competition for ecosystem services may create tension among different stakeholders.
11. Resolving conflicting needs for water resources demands political commitment as well as leadership that champions the use of participatory dialogues to negotiate water allocation among sectors.
12. There is an urgent need to improve water governance: continuing with “business as usual” is not an option.

Recommendations

1. Coordinate land and water management.
2. Actions to support water allocation to ecosystems must be strengthened and implemented more widely.
3. Consider payment for ecosystem services as an incentive and instrument to achieve the land and ecosystem management practices desired.

4. Increase interdisciplinary research into the interplay between terrestrial ecosystems, landscapes and the water cycle, and operationalize the findings of this research for policy and management on national and local scales.
5. Develop sound valuation practices for ecosystem services.
6. Functional prioritization of ecosystem services at the landscape scale should guide their maintenance and use in an integrated natural resources management framework, but details of re-arranging ecosystem services and the benefits that are derived from them need to be addressed on a case-by-case basis, and at the local level, in the context of landscape (basin) scale prioritization.
7. Perform participatory assessments of the values of ecosystems and conducting of trade-offs.
8. Give the rights and responsibilities to enact stewardship over the ecosystem to the stakeholders.
9. Increase capacity of local institutions to address the complexities of ecosystem services exploitation.
10. Strengthen community-led governance of water resources.
11. Perform participatory dialogues to negotiate water allocation among sectors, and support with enabling actions including: (i) building water governance capacity; (ii) monitoring and sharing information and data; and (iii) assessing values of water resources and trade-offs.
12. Community-based traditional knowledge should be complemented by and supported with a science knowledgebase.
13. Encourage application of environmental flows in development, including: (i) employing multidisciplinary teams within water resources management agencies; (ii) using environmental flow indicators within countries' work to alleviate poverty; (iii) developing financial mechanisms which take environmental requirements into account; and, (iv) enforcing legislation through building water governance capacity.
14. We need to: (i) use our available water more efficiently; (ii) stop our wetlands from becoming degraded or lost; and (iii) restore our wetlands that are already degraded.
15. Governments need to include water and wetland management in effective strategies for addressing climate change at the national level.