



UNU-INWEH / UNESCO-MAB-IHP International Workshop

Water and Ecosystems:

Water Resources Management in Diverse Ecosystems and Providing for Human Needs

UNU-INWEH, Hamilton, Canada - 14-16 June 2005

Workshop Report

1. Summary Findings of the Workshop

- a. Human well-being is impacted directly by water supply management and indirectly through effects of these management approaches on the broader range of ecosystem services.
- b. Better management approaches can be developed by using reliable information about the condition of and threats to freshwater ecosystems, as well as their impacts on human well-being. In this respect, ecohydrology can provide useful information about the carrying capacity of freshwater ecosystems. Existing management regimes, like protected areas and biosphere reserves, can also provide useful lessons.
- c. Community participation in water and ecosystem management, through interventions that are in line with local priorities and support local livelihoods, is essential to the successful implementation of improved management approaches.
- d. It is essential to have adequate human and institutional capacity to successfully integrate the demands of water management, ecosystem conservation and poverty reduction. Such capacity is often lacking in most regions and the extent of capacity building required is also not well-known.
- e. As a follow-up to this international workshop on Water and Ecosystems, the formation of an informal international working group will be promoted. Such a "Water-Ecosystem Working Group" could collaborate on key issues through both South-South and North-South partnerships. It could also link up with ongoing and planned activities under two relevant international decades: the International Decade for Action "Water for Life" (2005-2015), and the UN Decade of Education for Sustainable Development (2005-2014).
- f. UNESCO and UNU-INWEH are encouraged to seek resources to further develop projects and initiatives that can contribute to the Water-Ecosystem Working Group.

2. Overview of the Workshop

The United Nations University's International Network on Water, Environment and Health (UNU-INWEH) and UNESCO's Man and Biosphere Programme (MAB) and International Hydrological Programme (IHP) co-organized a three-day workshop in Hamilton, Canada (14-16 June 2005). The workshop was entitled 'Water and Ecosystems: Water Resources Management in Diverse Ecosystems and Providing for Human Needs'. The workshop considered the recent findings of the Millennium Ecosystem Assessment (MA) regarding the decline in health of many of the world's freshwater ecosystems, due to anthropogenic activities and manipulation of watercourses. Such alterations are already affecting the capacity of freshwater ecosystems to provide life supporting water flows, soil conservation and natural habitats for edible fish and other food sources. In light of these observations, scientists are now calling on water managers to further integrate measures for ecosystem conservation with water management approaches.

This workshop had the following objectives:

- Discuss conceptual models of current understanding of water related processes in various ecosystems and their relationship to developmental issues;
- Focus on integrated assessment of water resources, ecosystems, human well-being and ecosystem services;
- Present case studies comprising national or regional-scale evaluations to better understand their needs and challenges;
- Draw conclusions and formulate recommendations on further conceptual development of integrated and comparative approaches in water sciences and management in different ecosystems, particularly considering society's water demands.
- Develop interregional partnerships and collaborative initiatives, focusing on assessment and best practices from different regions of the world.
- Suggest specific actions in specific areas, which are managed under integrated conservation and development schemes, such as World Heritage Sites, Ramsar Sites, Biosphere Reserves or similarly managed areas.

A series of case studies were presented in order to juxtapose experiences of water resources and ecosystem management from around the world. Following the presentation of these case studies, scientists and researchers from 12 countries discussed various approaches to integrated management of water resources and ecosystems.

The report presents a synthesis of the workshop discussions. The full programme for the three days of the workshop and a list of participants are included in the appendix to this report.

3. Keynote Presentations

Keynote presentations addressed the challenge of meeting human needs for water balanced against nature protection. The findings of the recent global assessment of the condition and trends of freshwater ecosystems by the MA, highlighting changes to freshwater ecosystems over the past 50 years of human development were reviewed. Future perspectives on the availability of water to achieve food security and other Millennium Development Goals were presented in light of the current trends in degradation of ecosystem services. Competing demands for water for the extension of irrigated agriculture and water needs for ecosystem health were identified as a key challenge to development. In response to these observations,

the need for integrated management of water and ecosystems was reaffirmed in order to address both the direct and indirect drivers of degradation in freshwater ecosystems. The need for an improved understanding of the conditions and processes occurring within freshwater ecosystems was underscored as an important factor enabling the improved management of ecosystems and the valuation of their services. In this respect, the concept of securing sufficient water for the maintenance of healthy ecosystems was stressed, including the need to ensure ecological interlinkages between freshwater and coastal and marine ecosystems. Furthermore, the availability of scientific information can provide the basis for the development of new techniques in integrated water and ecosystem management. For example, ecohydrological management approaches, balancing biotic and abiotic factors such as water levels and biodiversity or nutrient levels, can increase the carrying capacity of ecosystems.

4. Case study presentations and discussion

The purpose of the case studies is to provide diverse examples of integrated water resources management from around the world, in which efforts are made to achieve a balance between ecosystem needs and human water consumption. The following regions and sites were selected for case study development at a series of scales:

- Amazon Region: Amazon river basin
- Gulf Region: Dryland water management
- East African Region: Lake Victoria
- China: Hengshui Hu Lake
- Europe: Guadiana Estuary
- India: rivers of Gujurat State
- Canada: Saint John River

These case studies provided a conceptual overview of existing research in each location. They highlighted progress in monitoring and information collection, as well as in institutional and legislative capacity development. The workshop discussions sought to identify transferable generic lessons from each case, as well as to highlight contrasts and comparisons between differing regional and resource contexts.

The first observation to be drawn from the case studies was that although a wide disparity in per capita water availability could be identified within the case studies, this did not correspond with levels of access. Water management capacity was concluded to play a significant role in ensuring access to clean freshwater. In many regions, such capacity is scarce. For example, in the Brazilian Amazon, there is estimated to be only one Ibama officer (the federal agency to control illegal deforestation) per 14,000 km² and deforestation continues at the expense of freshwater quality.

Although a general correlation between household wealth and access to water was identified, national levels of economic development did not ensure even access, nor, in the case of the richer Gulf countries, did they lead to the improved availability of data on freshwater ecosystems. A number of small-scale models for successful capacity building were identified within the case studies. The potential for scaling up these successes and transferring them at the policy level was raised during the discussions.

5. Overview of Discussion Sessions

Discussion sessions focused on approaches to ecosystem conservation and water supply, through the development and use of science for policy-making and institutional development. Thematic presentations drew on experiences in the development and implementation of integrated management approaches in Turkey, Mexico, the Andes and Canada, and sought to identify generic principles for best practices. A focus on the relationship between socio-economic development and interventions in water and ecosystem management was introduced into a discussion session focusing on water resources management for poverty reduction. A state of the art framework for characterizing human water needs for poverty reduction with ecological sustainability in water management, developed by the Poverty Environment Partnership was presented. Water quality issues, generally not fully assessed within global freshwater assessments such as the MA due to lack of data, were highlighted as particularly relevant to human and ecosystem health and water needs. In an example presented from the Andes, climate change, land use in headwater areas, increasing human demand for water, impaired water quality and water regulation were identified as important factors impacting the availability of water to be taken into consideration within debates on water allocation. Finally, workshop participants were called upon in the discussions to consider the challenges in terms of human capacity development that would be necessary in order to implement best practices in water and ecosystem management in developing countries.

6. Findings of the Workshop Discussions

6.1 Human well-being is impacted directly by water supply management and indirectly through effects of these management approaches on the broader range of ecosystem services.

There is a growing recognition that the provision of water supply for drinking and sanitation achieves reductions in poverty through improved health and productivity. In addition, the availability of water is essential to the achievement of many of the Millennium Development Goals, including the eradication of extreme poverty and hunger through improved food production. However, without careful management, increases in water extractions for human development can come at the expense of water needed to sustain ecological systems. The pressures placed on freshwater ecosystems can affect their ability to continue to provide services such as clean water supplies, waste assimilation, climate regulation, and the maintenance of fertile soils, vegetative cover and species diversity.

For example, in water abundant areas, water is easily polluted by discharges from human activities and livestock, and dams interrupt the flow of most large rivers, altering fish habitats and upsetting nutrient balances downstream. In dryland areas such as the Gulf countries, overgrazing has removed plant cover, impairing the ability of natural systems to circulate and retain water from rainfall. This leads to further water shortages, land degradation and loss of productive capacity.

The Millennium Ecosystem Assessment endeavored to assess the extent of the degradation of ecosystems around the globe. While the available data on the extent of the existing damage to ecosystem health was found to be incomplete, a clear observation was made regarding the disproportionate impact of the degradation of freshwater ecosystems on the lives of the poor, who are most often dependent on environmental services for their health, livelihood security and protection of their homes.

6.2 Better management approaches can be developed by using reliable information about the condition of and threats to freshwater ecosystems, as well as their impacts on human well-being.

At the watershed level, the interacting processes and balances amongst plant species, climate and water flows regulate the carrying capacity of freshwater ecosystems to withstand human induced alterations. In traditional societies, inherited management systems incorporate many generations of experience in protecting these balances. In response to new human demands for ecosystem services, scientists use experimentation and data on freshwater ecosystem processes to protect and extend the carrying capacities of ecosystems. Innovative approaches to management, such as ecohydrology, focus on understanding and manipulating the interplays between hydrology and biota. These techniques enable managers to control nutrient and pollutant loads in freshwaters and to regulate catchment hydrology. Such approaches can come at low costs, for example, allocating water in support of ecosystem functions, protecting water sources and conserving wetlands instead of installing water treatment plants, reforestation upstream areas instead of building new dams and flood barriers, recapturing nutrients from agrochemical runoff instead of applying more chemicals, and restoring the value of degraded land and water through phyto-remediation techniques and the rehabilitation of biodiversity.

Managers and scientists in protected areas and biosphere reserves can work with communities to apply such techniques to improve both the availability of economically valuable species and supplies of clean freshwater. Examples of the use of such management approaches, particularly for nutrient regulation, were presented from the Hengshui Lake in China, Lake Naivasha, Kenya, the Pilica River, Poland and the Grand River, Canada. Similar approaches may complement the development of basic infrastructure to provide water treatment and sanitation systems in developing countries, if applied and maintained at the appropriate scale by small communities. These approaches rely on the use of adaptive management techniques, community participation and the use of collected data on environmental processes.

6.3 Community participation in water and ecosystem management, through interventions that are in line with local priorities and support local livelihoods, is essential to the successful implementation of improved management approaches.

Many examples of successful community management at local scales were presented, from traditional water management practices in the Gulf, to the specialized knowledge of fishing communities in Asia. Examples of new developments community participation in data generation also demonstrated considerable potential, with examples presented from Ontario and the Andes. Volunteer data generated at the local scale through work with schools has already provided the basis for improved environmental management and policy development in the Waterloo region, Canada. NGOs and research groups can be effective in developing such activities with community groups, bringing scientific credibility, and a policy-oriented vocabulary to support the findings of community-based studies.

Experiences from the Australian outback to the prairies of Canada have demonstrated that an essential element is the development of trust between the community and researchers. Direct benefits to local livelihoods are widely seen as the key to adult community participation. In the GAP project (Turkey) a combination of incentives from different sectors of management, including subsidies and farm livelihood issues, encouraged farmer participation in community management meetings. Direct financial support for upstream community participation from downstream industries and dam users has enabled approaches to combat deforestation in Guatemala. Community-based approaches to data collection can create the basis for the development of such effective ecosystem management approaches, however, in order to

develop a comprehensive knowledge of freshwater ecosystems, community volunteerism eventually needs to be replaced by a regulatory framework, a mandate to report, and a budget to maintain reporting.

6.4 It is essential to have adequate human and institutional capacity to successfully integrate the demands of water management, ecosystem conservation and poverty reduction. Such capacity is often lacking in most regions and the extent of capacity building required is also not well-known.

Political will is an essential element in the development of and maintenance of institutional capacity. In many freshwater systems, jurisdictional boundaries as well as sectoral interests can block integration between distinct agendas for socioeconomic development on the one hand (eg WEHAB), and water resources management across sectors on the other. In recent years, the conflicting priorities of the sectoral approaches to water supply and sanitation without consideration of ecosystem health has led to problems such as pollution by arsenic and fluoride, over-extraction of groundwater and salinization of water supplies.

In some cases, institutional development and integration of agendas is driven by extreme events, eg natural disasters that demonstrate the need for this approach. For example, in Ontario, floods on the Grand River led to the creation of a relatively powerful conservation agency. In other countries, such as South Africa, Sri Lanka, Turkey, political regime changes and conflicts have led to the development of new integrated management structures and policies that focus on the management needs of freshwater ecosystems.

In the absence of such extreme events, institutional change can be driven by the science community from the bottom up through the development and sharing of environmental data. For example, the success of the Mekong River Commission in improving management approaches can be attributed to its focus on information analysis and sharing between management communities. In South Africa, the need to develop, understand and analyse information has provided the force for new institutional development. On the Saint John River, Canada, persistent independent efforts by researchers led to the eventual remodeling of the Department of Environment sampling programme. Where scientists can influence the policy development process, such transformations can happen quickly, as in the case of the development of the Canadian Agricultural Policy Framework, which includes provision for early identification of environmental problems.

Essential capacity for water and ecosystem management includes human capacity within official management regimes, as well as universities, NGOs and community groups. In all of the case studies presented at the workshop, this capacity was considered to be underdeveloped to some degree, although some successes were noted in Lake Victoria, and the Saint John River (Canada).

Immediate outputs

Consensus statement identifying research priorities

The summary findings from the workshop are included at the beginning of this report. These findings will be published in the workshop report, and will form the basis for follow-up activities.

Book of collected papers from the workshop

The development of a book of selected papers, including the case studies from the workshop is being undertaken by UNU-INWEH, based on the presentations and recommendations made during the workshop. Based on the final contents, this book may be used as a resource for distribution at 4WWF, and to provide the basis for possible input on capacity building needs to the 2nd World Water Development Report.

Strategy for development of future activities

Discussions of the potential for development of a water ecosystem network focused on the opportunities for an informal network to support the transfer of small scale models for research capacity building, including direct exchanges of experiences between researchers, scaling up of best practices, and science to policy transfers. This network will focus on South-South partnerships, as well as the wider mobilization of the international research community and coordination with ongoing initiatives. UNU-INWEH and UNESCO invite participants to submit comments regarding the outline below for the strategic development of network activities.

1. Working with grassroots practitioners

Enabling point to point exchanges between researchers and knowledge-providers through research meetings and publications focusing on:

- identification of best practices in the use of environmental data collection for management approaches including ecohydrological or low-cost, community managed solutions
- development of structured analyses of applicability, including socio-economic benefits, valuation of ecosystem services and effects on policy
- dissemination of results to research and policy making communities

2. Institutional-level study of water and ecosystem management

Building on recommendations from case study presenters and in partnership with local research institutions:

- develop conclusions from workshop case studies regarding capacity development needs, including further development and testing of the hypothesis raised during the workshop that environmental data generation and sharing for scientific research and analysis can drive institutional development
- develop a research project including further coordinated desk studies and expert consultation to elaborate a typological overview of existing human capacity for management of freshwater ecosystems in selected regions, including critical identification of gaps, and the role of research institutions filling these by working with local communities and centres of knowledge
- collaborate with regionally-based experts to explore the wider development of findings through collaborative survey design and administration process

3. Developing an understanding of policy level linkages with science

Drawing conclusions from experiences and observations gained within the two previous elements

- maintain a strategic overview of how to systematize the scaling up from the small-scale capacity building and research interventions to achieve institutional changes

- demonstrate to the international development community that the practical application of science and exchange of science-based knowledge can produce results.
- contribute conclusions to inform global assessments