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Sustainable Management of Headwater Resources



Knowledge
Biodiversity
Industry
Hydrology Forestry
Agriculture Geography
Research Nature Tourism
Livelihood Gender Sociology
Energy Culture
Engineering Economy
Security

Introduction

The finite and vital nature of fresh water as a natural resource has long raised concern regarding the socio-economic, political and environmental security of human activities and ecosystem health in watersheds. Better freshwater resources management improves the welfare of poor people and reduces the risk of disasters such as floods, while improved water quality leads to better health and reduced child mortality. Almost 20 per cent of the world's population depend on poor water supplies to meet their daily needs, and much of such water resources are contaminated by disease-bearing organisms and other pollutants. Given the importance of integrated water resources management, the Millennium Development Goals - a set of time-bound and measurable goals and targets for combating various environmental and development problems adopted by heads of state at the United Nations Millennium Summit in September 2000 - include commitments to improve water security and ensure environmental sustainability. Indeed, water today is regarded as a central issue for sustainable development in this new millennium, with the International Year of Freshwater (2003) celebrated at its beginning.

Headwaters are the places where water flow-lines originate and where much groundwater recharge occurs. They are the ultimate source of a great portion of terrestrial fresh water. Technically, these lands are the zero- to first-order catchments on the margins of every river basin. When water qualities and yields change in headwaters, the consequences affect the lands downstream.

Traditionally, headwaters were associated with low levels of human occupation and isolation from major industrial and economic processes. Unfortunately, in the modern era many processes challenge the quantity and quality of water produced by headwater regions. Although located in the highest and most peripheral parts of a watershed, many headwaters today lie at the front lines of human activities including agriculture, logging, mining, road construction, tourism, hydropower generation and water supply. In some regions, a booming economy is sponsoring economic growth and infrastructural developments that threaten biodiversity, unique habitats, valued landscapes and minority cultures found in the watershed.

Among such development activities, conversion of forests into agricultural land in headwater regions is a major source of the problem of headwater degradation. Although improvements are being observed in some parts of the world today, as a whole it is estimated that the world has lost more than 900,000 square kilometres of forest in the past decade. Participants of the World Summit on Sustainable Development (WSSD), held in Johannesburg in September 2002, gave highest priority to the issue of forest conservation and water quality protection. The role of agriculture in deforestation and water pollution is also highlighted in the WEHAB initiative*(and in its Frameworks for "Action on Water and Sanitation" and for "Action on Agriculture."

*The WEHAB initiative was proposed by UN Secretary-General Kofi Annan as a contribution to the preparations for the WSSD, to provide focus and impetus to action in the five key thematic areas of Water, Energy, Health, Agriculture and Biodiversity. These areas are integral to a coherent international approach to the implementation of sustainable development. The initiative is intended to provide a broad view of existing normative and programmatic frameworks in each area to highlight inter-linkages among the sectors, to identify key gaps and challenges, and to highlight areas where further action is needed.

Headwaters also often lie on the margins of national and regional socio-economic systems, and some encompass political boundaries between rival social, cultural and military groups. In such cases, economic and social marginalization of headwater inhabitants may lead to emigration and the collapse of local environmental management and socio-economic systems.

In developing societies, many headwaters have suffered through colonization by peasant farmers who have been displaced from better quality agricultural lands. Agricultural modernization has launched waves of economic migrants into the cultivation of unfamiliar and often unsuitable terrain. In such communities, the struggle for immediate survival has higher priority than any concern for the future or the surrounding environment, even where the skills and resources needed for its management exist. In such cases, the problems of environmental degradation rarely remain in the headwaters. Regions downstream suffer through water and sediment pollution, changes in the hydrological regime, and reduced natural resource supply, which may also lead to social stress and livelihood disruption.

Headwaters today face a variety of problems that affect not only the people residing in the headwater region, but also a greater portion of the population and ecosystems in the associated catchments. Therefore, proper management of headwater resources has become one of the most significant modern challenges for environmental management and development.

Headwater Control Movement

In 1989, the first International Conference on Headwater Control was held in Prague, Czech Republic. This marked the beginning of the "Headwater Control Movement" (HCM), which focuses on improving the recognition and management of headwater-related environmental changes on the ground. The movement has sought, especially at the field scale, to promote better environmental understanding through empirical research, development of improved strategies for environmental reconstruction and conservation, and the design of better environmental management. The movement was initiated in the belief that, if the headwaters of a region are in good condition, then they will transmit few problems downstream. The HCM has been striving towards the integrated management of headwater landscapes, both in their biophysical and social components. The aim is to find an approach that unites the imperatives of environmental restoration and conservation, empowerment of local people in the headwater regions and the regeneration of livelihoods - that is, to facilitate sustainable development of headwaters through policies and institutions that promote appropriate actions.

Many headwater regions in the world share a variety of common problems, such as soil, forest and water resource degradation, and pollution by various external agencies and poor management structures. Therefore, through the HCM, attempts have been made to exchange knowledge and experiences from different headwater regions in the world in order to attain better management. For this purpose, a series of conferences has been held, and conference proceedings and publications prepared for the dissemination of the most up-to-date information on headwater resources management. In the International Year of Mountains (2002), the United Nations University, which has



Farm deforested hills, Choluteca, Honduras

worked on sustainable mountain development over a quarter century, joined hands with the movement for sustainable management of headwater resources. Since many headwater regions are found in mountainous areas while providing valuable freshwater supply to the ecosystems and human communities in the extended basins, discussions on better management of headwater regions have been valuable contributions to both the International Year of Mountains 2002 as well as the following International Year of Freshwater 2003.

Major International Conferences on Headwater Control:

- Prague (Czech Republic) 1989
- Prague (Czech Republic) 1992
- Delhi (India) 1995
- Meran (Italy) 1998
- Nairobi (Kenya) 2002
- Bergen (Norway) 2005
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HCM is a field-oriented grassroots movement that explores the role of the environmental professionals in promoting the welfare of the environment and its inhabitants. It differs from most research networks in its attempts to link practitioners, researchers and policy makers from different backgrounds and disciplines in a common cause: the search for self-sustainable watershed management. This also provides a unique collaborative environment for governmental and non-governmental organizations as well as international organizations (including some UN agencies) sharing similar goals. The current project on "Sustainable Management of Headwater Resources," jointly facilitated by the United Nations University (UNU), the International Association on Headwater Control (IAHC) and the World Association of Soil and Water Conservation (WASWC), is a project stimulated by the HCM that aims to give further impetus to this movement.

Objectives

Headwater control links naturally with several other themes in the broad field of sustainable development, including water resources management, mountain research, forest and agricultural hydrology, rural development, and soil and water conservation. This inter-linked nature of the issue necessitates a thoroughly integrated research, institutional and policy-building as well as management approach.

Research

The project is devoted to practical, long-term action researches oriented to comprehensive, integrated and sustainable development of headwater and highland areas. Each research

project aims to combine environmental and economic sustainability. The researches deal with the key economic problems of the target region, be it steep-land agriculture in Honduras, reclamation of coal-mine land in Wales, the management of freshwater in the Himalayas, or preserving water resource quality in the context of transboundary air pollution as in Central Europe. Studies are also conducted on freshwater resources management in the mountainous parts of Africa, Latin America and Central Asia, and restoration of the environmental and economic bases of rural communities in the war-torn Balkan States.

Institutional development

It is recognized that headwater management is often dominated by inappropriately defined institutional frameworks oriented to the extraction of particular resources for the benefit of outsiders. Frequently, this style of lopsided management also creates problems that are transmitted downstream, sometimes even to the same outsiders, through changes in the quality of water for their own use and population inflow from the headwater regions to urban areas. Teams of experts involved in the current project aim to help local communities take control of the management of their own environment and economic activities, by promoting the development of community-based, environmentally informed and holistic local management regimes.

Empowerment

A key objective of headwater control is the "uplift of all," as stated in Gandhian principles. As mentioned above, the headwater management project aims at aiding local communities to build self-sustaining local systems for the management of their own livelihoods and environment, including biodiversity, natural resources, cultural icons and the services their lands provide to outside communities and habitats.

International Conferences

The most recent conference on headwater control was the International Conference on Sustainable Management of Headwater Resources, held from 5-8 September 2002 in Nairobi, Kenya. The conference provided an international forum for discussions focusing on the interdisciplinary aspects of scientific and applied water resources management. The aim was to link and share perspectives from non-governmental organizations, community-based organizations, research scientists, hazard-risk experts, land management practitioners and policy makers, and to contribute to the promotion, development and evaluation of land management strategies suited to sustainable development of headwater regions. The conference participants, gathered from various parts of the world (especially Africa and South Asia), discussed problems caused by land degradation, natural hazards and development processes, and considered feasible land management, environmental protection and landscape regeneration practices and policies.

The conference resulted in the Nairobi Headwater Declaration, one of the earliest contributions to the International Year of Freshwater 2003 (see next page). Future meetings and projects are being planned with the initiative from UNU, IAHC and WASWC, which plan to continue making a long-term commitment to the issue of sustainable management of headwater resources.



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Nairobi "Headwater" Declaration for the International Year of Freshwater 2003*

We, the participants in the International Conference on Sustainable Management of Headwater Resources, held in Nairobi (Kenya) on 5-8 September 2002,

1. Acknowledging with gratitude the United Nations General Assembly Resolution No. 55/196 to declare the year 2003 as the International Year of Freshwater, thus drawing the world's attention to the need to foster sustainable development and management of freshwaters;
2. Noting the outcome of the recent World Summit on Sustainable Development in Johannesburg 2002, where commitments were made "to increase access to clean water and proper sanitation, to increase access to energy services, to improve health conditions and agriculture, particularly in drylands, and to better protect the world's biodiversity and ecosystems";
3. Recognizing that headwater regions are sensitive environments, source areas for both surface and groundwater resources, and lands that affect the quality of freshwater supplies;
4. Keeping in mind that headwater regions lie at the margins of both watersheds and, often, social and economic systems;
5. Recognizing also the critical environmental functions of headwater regions and their importance for the livelihoods of both their inhabitants and those who inhabit lands downstream as evoked in Chapter 18 "Protection of the quality and supply of freshwater resources: application of integrated approaches to the development, management, and use of water resources" of Agenda 21 adapted at the United Nations Conference on Environment and Development (1992), and also as stipulated in its Chapter 13 entitled "Managing fragile ecosystems: sustainable mountain development";
6. Affirming our concern to mitigate the consequences of the increasing human impact in headwater regions caused by competing demands for water, forestry, agriculture, energy production, tourism, transport and urban development, which continue to affect the environment adversely,

not least with respect to the provision of clean water supplies and the maintenance of other hydrological functions;

7. Noting with further concern that policies can impair, seriously and inadvertently, the course of headwater resources management, and that this can create problems downstream for the quality, quantity and distribution of available freshwater resources;
8. Recognizing that sustainable management of headwater regions needs a holistic, integrated approach which respects the needs of all stakeholders in the regions, values and empowers the headwater inhabitants, and which recognizes their central role in the stewardship of headwater systems;
9. Affirming that the sensitive and scientific management of natural resources, supported by improved access to the high quality data required is essential for fostering development that is not only sustainable, but ideally self sustaining;
10. Conscious that unsustainable management has negative impacts on the health, productivity, social and economic welfare and ecosystems of headwater regions;
11. Aware of the increasing demand for potable waters that will be required for human health, welfare and well-being, and of the crucial role that headwater regions will play in meeting this demand;
12. Conscious also of the potential negative interactions between the inhabitants of headwater regions and those downstream, including coastal areas, caused by competition for the limited resources available in the regions, and aware also that headwater areas accommodate and provide for livelihood of a large number of populations, whose activities and resources consumption may have significant effects on the well-being of those who live downstream;

Declare that:

13. Sustainable development should be the baseline for all environmental policy, planning, management practice, education and law in headwater regions;

14. UN agencies should continue their work with all stakeholders to appraise their situations, to identify gaps in knowledge, needs and constraints, and to support them in their efforts to resolve their problems and undertake practical action towards more self-sustaining and environmentally sensitive development;

15. An 'international commission' for headwater management should be established in order to provide direction and continuity for headwater issues and to create an awareness of headwater concerns at governmental level;

16. Priority should be given to the creation of new management structures at all levels, which should be designed to improve the coordination, cooperation and empowerment of all stakeholders of headwater regions, not least to enhance the participation of women, disadvantaged social groups and minority communities, and to tap and develop the full spectrum of local indigenous knowledge relating to watershed planning and management;

17. Greater effort should be devoted to the refinement of methods for generating and sharing the appropriate and reliable information needed for environmental research, planning and management and also for the transfer of appropriate low cost technologies, especially with respect to 'cushioning' the impacts of environmental hazards for human populations;

18. Greater attention needs to be paid to the special roles and hydrological functions of headwater wetlands and peat lands, which should be a special focus for future headwater workshops, and also to the impacts of anthropogenic processes on watershed functions in headwater regions;

19. The quality of life for the inhabitants of headwater regions should become a primary concern, including the basic needs for a healthy environment and the regeneration of degraded headwater habitats where required;

20. Greater attention should be paid to applied environmental education aimed at building capacity for headwater management and changing social attitudes against wasteful and polluting uses of headwater resources;

21. NGOs (community-based non-governmental organizations devoted to environmental and/or social uplift) should be empowered to play a greater role in the planning, regeneration and management of headwater habitats, by promoting more efficient mechanisms for financial support for effective NGOs;

22. Greater attention should be given to management of headwaters in arid and semi-arid lands, especially with respect to groundwater management and improved accessibility of potable waters to headwater inhabitants, while one of the main focuses should be to reduce the time wasted in carrying water to households from distant water sources;

23. Attention should also be paid to alternative measures that would reduce the dependence of downstream areas on the resources of headwater areas, including reducing wastage and increasing the efficiency of resource utilization, not least of water;

24. The equitable distribution and use of headwater resources remain a major concern, and planning and management of headwater regions needs to be integrated within the broader framework of watershed management that addresses the concerns of both headwater inhabitants and those downstream, including those living in coastal areas.

We therefore call upon UNU, UNESCO, UN-HABITAT, FAO, UNEP, UNDP and other concerned international and national organizations, governments of both developed and developing countries, corporations and NGOs, to facilitate headwater research, monitoring, capacity-building, self-sustaining sustainable development, and better management of the headwater environments, and to help create linkages and synergies in this regard among environmental managers, scientists, communities, policy/decision-makers, practitioners and the general public.

*This conference, which took place from 5-8 September 2002 at the United States International University - Africa in Nairobi, Kenya, was jointly organized by the United Nations University, Tokyo, Japan, UNESCO-Nairobi, the United Nations Centre for Human Settlements (UN-HABITAT), the United Nations Environment Programme (UNEP), USIU and Kenyatta University, Nairobi, Kenya, in collaboration with International Association on Headwater Control (IAHC); International Association on Hydrological Sciences (IAHS); World Association for Soil and Water Conservation (WASWC).



Glacier headwaters in Banff National Park,
Alberta, Canada



Headwater directly feeding into farmlands
in Nagano Prefecture, Central Japan

Collaborating Organizations

This project is run jointly by the following three core organizations with support from a number of other international organizations, academic research institutions and experts in various parts of the world, especially Europe, Asia and Africa.



Photos courtesy of Martin Haigh, Hiroshi Kanatani
and Josef Vadovič

United Nations University (UNU)

UNU is an organ of the United Nations established by the General Assembly in 1973. Its objective is to form an international community of scholars engaged in research, advanced training and the dissemination of knowledge related to the pressing global problems of human survival, development and welfare. Its activities focus mainly on peace and conflict resolution, environment and sustainable development in the changing world, and science and technology in relation to these issues. As a think-tank of the UN system, the University operates a worldwide network of research and post-graduate training centres, with its planning and coordinating headquarters in Tokyo, Japan.

Contact: Dr. Libor Jansky
Senior Academic Programme Officer
Environment and Sustainable Development Programme
United Nations University, 5-53-70, Jingumae, Shibuya-ku,
Tokyo 150-8925, Japan
Tel: +81-3-3499-2811, Fax: +81-3-3499-2828
E-mail: Jansky@hq.unu.edu
URL: <http://www.unu.edu/>

International Association on Headwater Control (IAHC)

IAHC emerged from an ad hoc coordinating group of non-governmental professional associations that linked several small groups with a shared interest in the practical implementation of sustainable environmental management in upland and headwater areas. IAHC plays a major role in coordination of the Headwater Control Movement, initiated in 1989, implementing and leading the projects in partnership on environmental rehabilitation of headwater catchments and lakes deteriorated by extensive human impacts, and in organizing the International Conferences on Headwater Control. It is a registered organization in Prague since 1997.

Contact: Dr. Josef Křeček
IAHC Co-chair
Jungmanova 11, CZ-110 00 Prague 1, Czech Republic
c/o Department of Hydrology, Faculty of Civil Engineering
Czech Technical University
Thakurova 7, CZ-166 29 Prague 6, Czech Republic
Tel: +420-2-6121-3080, Fax: +420-2-2494-9118
E-mail: kreckek@cesnet.cz

World Association of Soil and Water Conservation (WASWC), Europe

WASWC is an international non-government organization of professionals and informed laypersons dedicated to promoting sustainable use of the earth's soil and water resources. WASWC provides a forum through which soil conservationists can be kept up to date on worldwide developments in their field, obtain information and contact people working on similar problems. WASWC has a worldwide network of some 500 members, eight vice-presidents representing major regions of the world and a governing council of five officers who are presently located in four different countries.

Contact: Prof. Martin Haigh
WASWC Vice-President for Europe and IAHC Co-chair
c/o Department of Geography, Oxford Brookes University, Oxford, UK
Tel: +44-1865-483950, Fax: +44-1865-483937
E-mail: mhaigh@brookes.ac.uk
URL: <http://www.landhusbandry.cwc.net/abwaswc.htm>