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The Swiss Agency for the Environment, Forests and Landscape (SAEFL), the Bureau of the Convention on Wetlands (Ramsar, Iran, 1971) and the World Wide Fund for Nature (WWF)

Sustainable Management of Water Resources: The Need for a Holistic Ecosystem Approach

Running out of Freshwater or Maintaining Freshwater through an Ecosystem Based Approach – An Easy Choice

Updated October 2002

'If we fail to protect forests and wetlands, if we do not manage soils with precaution,water will disappear. We can build all the water pipes and treatment plants we want, there will be nothing to drain or to clean!'

Philippe Roch
Director of the Swiss Agency for the Environment, Forests and Landscape

Partnership between Switzerland, Ramsar, WWF'
and
other potential interested partners based on the Policy Paper:

Guiding operational Principles for the implementation of the Ecosystem Approach

The ecosystem approach is the conservation and the sustainable use of ecosystems such as wetlands, forests and sustainably managed soils which capture, filter, store and distribute water.

- Taking into consideration the protection of ecosystems through conservation and sustainable land-use for any project/investment in the field of water resources.

- Basing any action on this ecosystem approach, the framework of which might be transboundary depending upon the type of river/lake basin concerned.

- Focusing on a holistic and multidisciplinary (inter-ministerial) approach within or between countries while favoring decentralization for local ownership, implemented through a national water agency or a transboundary river/lake basin organization.

- Using a two-fold approach that 1) works with a selected group of existing 'international basin organizations' and 2) supports the establishment of new 'International Basin Organizations'. Lessons learned from existing basin organizations may be applied or used as models for the latter.

- Focusing on forests and wetlands, considering as a priority Ramsar sites (sustainable management and/or designation) and associated ecosystems, as a basis for deciding on allocation of support and resources on a river/lake basin scale.

- Providing regular information exchanges and progress reports – if possible back to back with other related meetings such as Ramsar COPs, Biodiversity Convention COPs, World Water Fora, etc. – including representatives of international basin organizations (both existing and coming into being).

- Maximizing opportunities for public awareness, participation in decision-making and outreach through communication strategies to achieve the goal of the partnership.

Summary

The world is enduring a serious water crisis. Its cause is essentially the unsustainable management of water resources and the destruction of ecosystems such as forests, wetlands and soils which capture, filter, store and distribute water. A holistic river/lake basin and ecosystem approach is the response to managing water resources sustainably. A better evaluation and recognition of the values and functions of water-related ecosystems is therefore needed.

The aim of this paper is to briefly analyze the holistic river/lake basin and ecosystem approach, and to promote this approach as a basis for concrete actions/initiatives.

I. CHALLENGES - PROBLEMS TO BE ADDRESSED

No poverty alleviation is possible without water

The significant inter-linkages between poverty and the state of the environment, including those between poverty and the shortage of water, are gaining increased recognition, but little consideration is being given to the fact that protecting ecosystems directly or indirectly related to water is key to sustainable development.

Some fear that protecting the environment may hinder development, while more and more evidence shows that environmental protection and development are mutually reinforcing.

Environmental problems hit the poor hardest and constitute a significant cause of poverty.

One of the most important health hazards, particularly for urban dwellers in developing countries, is faecal contamination of water and food due to poor or non-existent sanitation systems and inadequate hygiene, compounded by unreliable and unsafe drinking water supply. Industries and agriculture are increasingly affecting the quality and the quantity of water. Human activities, including agriculture and settlements, have seriously damaged the ecosystems related directly and indirectly to water and have contributed, for example, to the loss of about 50% of the world's wetlands during the 20th century[1]. One third of the world's major river/lake basins have lost 75% of their original forest cover. Tropical mountain forests are disappearing faster than any other kind of forest. This reduces water quality and quantity for human uses. While the situation tends to be improving in the developed world, it has actually worsened in developing countries, increasing conflicts over water uses.

The conservation of ecosystems that are water-related, directly or indirectly, should be the basis of any strategy aimed at achieving poverty eradication on a sustainable basis, through, *inter alia*, the provision of reliable, sufficient and good-quality water.

The hydrological cycle and water availability

The total amount of water on Earth is 1.4 billion Km^3, but only around 41.000 km^3 circulates through the hydrological cycle[2], falling as rain or snow, infiltrating into the soil, flowing as rivers

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[1] UNEP 2002. Global Environment Outlook, (p155). Nairobi, Kenya

[2] M. Acreman, Wetlands and Hydrology, Conservation of Mediterranean Wetlands – number 10. Tour du Valat, Arles (France), 2000.

to the sea and evaporating. Only 2.5% of the Earth's total water resources are freshwater, of which as little as 0.5 % is directly usable, the rest being in the form of ice and glaciers[3].

The amount of water on Earth is more or less fixed. Most water is neither created nor destroyed: it only moves from place to place and changes in form (ice, liquid, vapour) and quality (salinity, pollutant load). The hydrological cycle between the oceans, the atmosphere and the various stores and flows of inland water, including through forests and wetlands, is a continuous process of loss and renewal which is increasingly affected by demographic trends, human behavior, and social, economic and political choices.

Vegetation is particularly important in the hydrological cycle. A rain forest tree can release 11,000 m^3 of water into the atmosphere during its lifetime[4], but much of this is recycled and not lost from the forest. In the Amazon rainforest, 50% of rainfall is derived from local evaporation. After deforestation, desertification could occur because of the water cycle disruption between the atmosphere and the plants, making the climate drier and hotter. If the water support systems are destroyed in a given place, water will not disappear from the planet but will go somewhere else and/or be recycled into another system, either in the form of directly usable freshwater or not directly usable water (vapour, seawater or ice).

Not only is the total quantity of freshwater limited but its quality is decreasing. Polluted water has a serious impact on poverty and especially on people's health. It also has a negative impact on nature as a whole, even though, under certain conditions, nature can help to clean polluted waters.

From mountains to the sea - Values and functions of ecosystems directly or indirectly related to water

Basic physical principles on Earth (i.e., the law of gravity) make water run from uplands (mountains) to lowlands (a lake or the sea). Sound water policies have to take these basic physical properties into account in planning water management. Whatever happens upstream has direct effects downstream.

Water-related ecosystems, from mountains to the sea, have important values and functions. Obvious and well-known ones include drinking and irrigation water supply, transport, hydropower generation and recreation/tourism.

Other less obvious functions and values of water-related ecosystems include:

- **Flood control and water storage:** Wetlands and forests efficiently hold rainfall, reduce erosion, and prevent rush flooding downstream, thus replacing expensive engineered structures for flood control.

- **Products:** The list of products from water-related ecosystems exploited by humans is endless and includes water, fruits, fish, shellfish, game meat (deer, crocodileS, birds, etc.), resins, timber for building, wood as fuel, reeds for thatching and weaving, fodder for animals, fibers for textiles, medicines, dyes and tanning, etc.

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[3] UNEP, 2002, Global Environmental Outlook 3, Nairobi, Kenya.

[4] Gash J.H.C., C.A. Roberts, J.M. and Victoria, R.L. (Eds) – Amazonia deforestation and climate. J. Wiley and Sons, UK, 1996

- **Groundwater replenishment:** Underground aquifers store 97% of the world's unfrozen freshwater and provide drinking water to almost a third of the world's people.

- **Sediment and nutrient retention:** Water-related ecosystems tend to slow down the passage of waters and encourage the deposition of sediments carried in the water. This has many benefits to both downstream settlers (by avoiding blocking waterways) and local settlers by fertilizing their soils.

- **Climate change mitigation:** Water-related ecosystems have been identified as significant storehouses of carbon.

- **Water purification:** Plants and soils in water-related ecosystems, i.e. forests and wetlands, play a significant role in purifying water. High levels of nutrients commonly associated with agricultural run-off are effectively removed by wetlands, preventing eutrophication downstream, while toxic substances (pesticides, industrial discharges and mining activities) can be removed by plants.

- **Reservoirs of biodiversity:** Water-related ecosystems provide habitats for a large number and diversity of species.

- **Shoreline stabilization and storm protection:** Forests and wetlands, such as salt marshes, mangroves and other forested areas, act as shields against incoming storms, hurricanes and cyclones.

- **Religious and cultural values:** Although this is a relatively poorly documented function, many water-related ecosystems have significant religious, historical, archaeological and other cultural values.

II. POLICY OPTIONS

The unsustainable management

Water uses such as water supply, sanitation, irrigation, hydropower, etc., are often unsustainably managed. This is often caused by the over-exploitation of natural resources, such as the destruction of ecosystems like forests, wetlands and soils which sustain hydrological processes, as well as by the over-use of water for irrigation.

Since water is unpredictable and unreliable, infrastructure works are needed to improve both the storage and delivery of clean and safe water, especially to urban centers, while securing navigation and producing hydropower. Nowadays, the development of water supply infrastructures, which dominated policy options during recent decades, should no longer be seen as the sole panacea to water management in general and to poverty alleviation in particular.

The 'hard engineering approach', largely practiced in the past few decades, has shown its limits. Installation of powerful pumps, whilst producing short-term economic benefit, has led to the over-exploitation of groundwater. The draining of wetlands, the straightening of the courses of rivers, and their separation from their floodplains by embankments has led to serious flooding and loss of biodiversity and other important ecosystem functions in all parts of the world. Thus,

in the search for an ever-greater control over the environment, many of the natural control mechanisms have been destroyed.

The cost-efficient services of nature and natural processes may in many cases make unnecessary the construction of infrastructures. Focusing, or over-focusing, on the need for infrastructures may be cost inefficient, thus diverting money that could be used for poverty eradication.

Furthermore, as stated in the EU guidelines on sustainable water resources management, "development cooperation, during this last decade has shown a series of policy and operational imperfections. The over-use of too sophisticated technologies is one of them, the lack of attention to stakeholders and users, the lack of attention to gender issues are only a few of these imperfections."[5]

The sustainable options

A sustainable approach is one in which the use of ecosystems and their resources may yield the greatest continuous benefit to present generations while maintaining their potential to meet the needs and aspirations of future generations. This can only be achieved through the maintenance of the natural properties of ecosystems.

What is an ecosystem approach [6]?

The ecosystem approach is the conservation and the sustainable use of ecosystems such as wetlands, forests and sustainably managed soils which capture, filter, store and distribute water.

IUCN defines an ecosystem-based approach as a strategy for integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable fashion. The specific aims are to: (1) maintain ecosystem functions and services; (2) support livelihoods; (3) ensure equitable sharing of benefits amongst shareholders; (4) promote adaptive management, to enable people to make informed choices; (5) decentralize management, to empower people to manage their own resources; and (6) foster intersectoral cooperation, to achieve greater effectiveness through partnerships.

What is a river/lake basin integrated management approach?

There is more and more support for an Integrated Water Resources Management (IWRM) approach. Nevertheless, there are several interpretations of the word 'integrated'. Some consider that integration is between several water use sectors: drinking water, irrigation, hydropower, navigation, recreation, etc. It is therefore suggested that appropriate infrastructure works can help store and distribute the resource to the different users.

A basin-scale (river or lake) approach is increasingly recognized as the logical and appropriate geographical/spatial scale in which to address IWRM. However, such basin-scale management generally focuses on the management of surface waters, but importantly also needs to take into account the management of groundwater, and to recognize that groundwater aquifers can be shared between adjacent basins. Better understanding of the linkages between surface and ground waters is needed if truly integrated water resource management is to be achieved.

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[5] Ibid., European Commission, 1999

[6] The IUCN Programme: an assessment of progress 2001, p18

The EU Water Initiative stresses the need for integration between health, livelihoods, economic development, peace and security considerations.

The Global Water Partnership's definition of IWRM[7] says that "IWRM is enshrined in the first Dublin principle, which says that, as water sustains life, effective management demands a holistic approach, linking social and economic development with protection of natural ecosystems, and links land and water uses across the whole catchment area or aquifers" (GWP, p14).

The Convention on Wetlands (Ramsar, 1971) considers that river basins or river catchments (the land area between the source and the mouth of a river including all of the lands that drain into the river) and coastal and marine systems influenced by catchment discharges are important geographical units for considering the management of wetlands and water sources.

Chapter 18 of Agenda 21 identifies seven focus areas for action, including (1) ensure the integrated management and development of water resources; (2) assess water quality supply and demand; (3) protect water resources quality and aquatic ecosystems; (4) improve drinking water supply and sanitation; (5) ensure sustainable water supply and use for cities; (6) manage water resources for sustainable food production and development; and (7) assess the impact of climate change on water resources.

WWF-International[8] defines river basins as 'the land area between the source and the mouth of a river, including all the lands that drain into the river. Some river basins . . . may terminate at lakes and/or inland deltas, with no exit to the sea.'

The Convention on the Law of the Non-Navigational Uses of International Water Courses[9] also stresses the need to utilize international watercourses in an equitable and reasonable manner (art 6) taking into account all relevant factors, including: (a) geographic, hydrographic, hydrological, climatic, ecological and other factors of a natural character; (b) the social and economic needs of the watercourse states concerned; and (c) the population dependent on the watercourse in each watercourse state.

The Convention on Wetlands has adopted Agenda 21's definition of integrated water resources management[10], which is based on the concept that water is an integral part of an ecosystem, a natural resource, and a social and economic good, whose quantity and quality determine the nature of its use.

The river/lake basin management approach seems to be the most appropriate geographical entity for water management and should include incentive-based and participatory mechanisms for solving conflicts and allocating water between competing users, including the ecosystems.

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[7] Global Water Partnership. Towards Water Security: A Framework for Action. GWP, Stockholm, Sweden, 2000.

[8] The WWF River Basin Approach – Turning IRBM theory into Action. WWF Living Waters Programme – Gland, Switzerland, May 2002.

[9] UN General Assembly Doc. A/51/869 – April 1997.

[10] Ramsar Convention Bureau, 2000. Ramsar handbooks for the wise use of wetlands. Handbook N° 4: Integrating Wetland Conservation and Wise Use into River Basin Management. Gland, Switzerland.

Ecosystems will only be protected by integrated land and water resource management, basin by basin, lake by lake – along with full cost pricing for water services and management reforms for water delivery and wastewater disposal.[11]

What is a holistic approach?

The EU[12] defines a holistic approach to water resources management as one that encompasses "environmentally-sound water management; food security especially for the poor; private sector involvement; reduction of subsidies; decentralization of decision-making to the lowest appropriate administrative level; user participation in services; institutional reform and regulatory frameworks; and cost recovery and pricing".[13]

A holistic approach requires balancing the competing demands on the resource – domestic, municipal, agricultural, industrial and environmental.

Finally, the European Commission also rightly stresses that "The protection of the ecosystem and natural resources upon which all forms of life on earth depend should be regarded as an obligation . . . and include investments in environmental protection of vulnerable areas such as wetlands, coastal zones and fisheries, marginal farming lands, deserts, areas vulnerable to flooding and/or soil erosion."[14]

III. SUSTAINABILITY AS A GOAL: HOLISTIC RIVER/LAKE BASIN AND ECOSYSTEM APPROACH FOR WATER MANAGEMENT

Generally accepted principles

The Dublin 1992 International Conference on Water and the Environment (ICWE) was the first global water-related conference. It already concluded that "since water sustains all life, effective management of water resources demands a holistic approach, linking social and economic development with protection of natural ecosystems".

In the last decade, many international conferences, including the Rio Earth Summit in 1992, the Second World Water Forum - The Hague in 2000, the International Conference on Freshwater - Bonn in 2001, the conferences of the Parties to multilateral environment agreements (Ramsar, CBD, UNCCD), seminars, workshops and all kinds of meetings (including those of UNEP/GPA, UNCSD, WWF, and OECD/DAC) have all reiterated the urgent need to give due importance to ecosystems in water management policies and practice.

Nevertheless, "there is still a gap between ideas and actions endorsed at the macro-level debate, and their translation into policy making structures and programmes in developing countries".[15]

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[11] World Water Vision, Making water everybody's business. William J. Gosgrove and Frank R. Rijsberman for the World Council, Earthscan Publications, 2000

[12] European Commission, 1999. Towards Sustainable Water Resources Management : A Strategic Approach

[13] Ibid.

[14] Ibid. European Commission, 1999.

[15] Ibid.