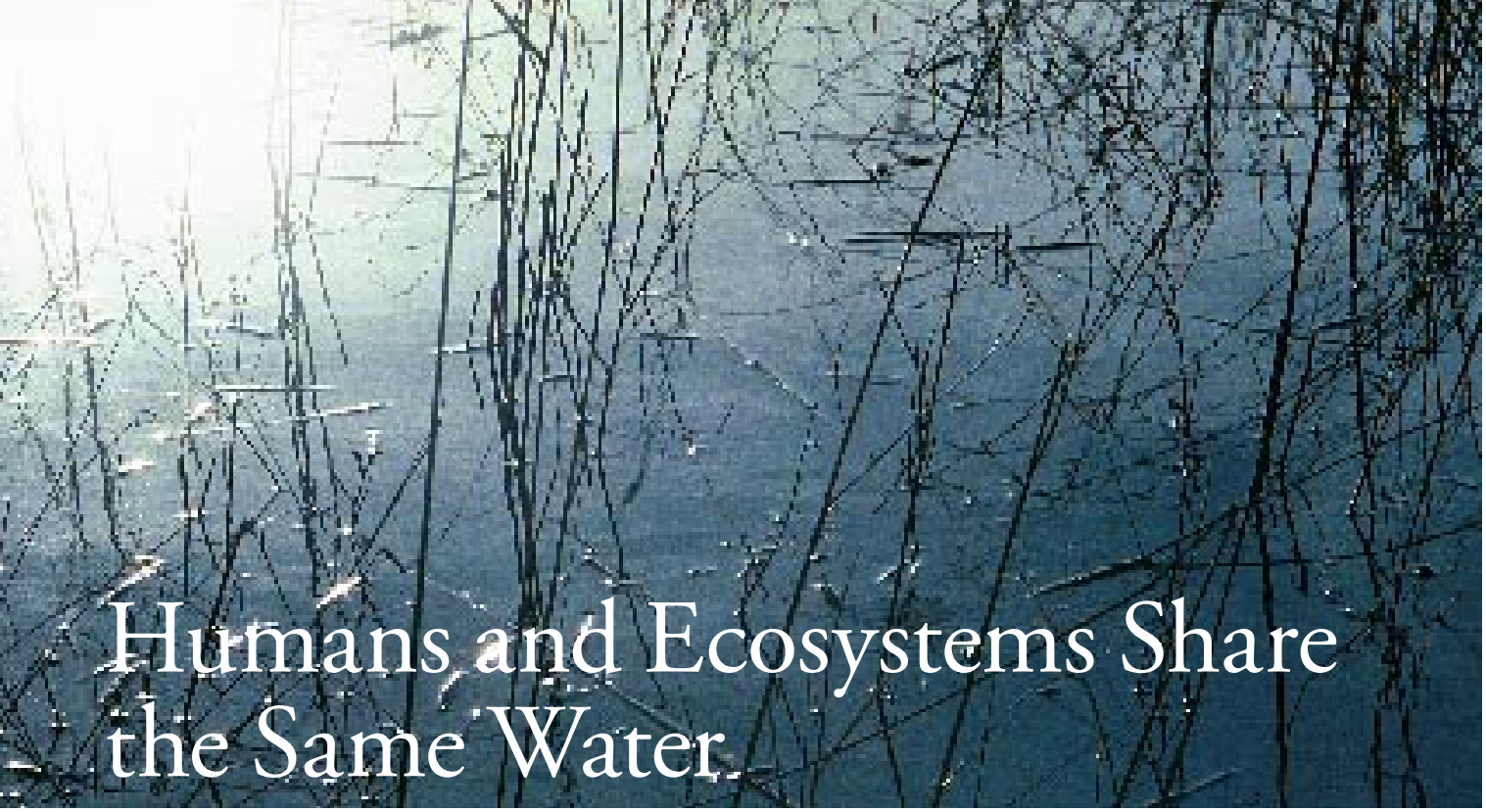

Humans and Ecosystems Share the Same Water

For some 30 years water managers have been told by environmentalists that they have to protect ecosystems. But what does that really mean in practice? What exactly has to be protected?

Since development cannot be stopped – least of all in view of the Millennium Development Goals (MDGs) – the landscape will continue to be altered to secure access to water, food, fiber, timber, minerals, energy, etc., so that poverty and hunger can be alleviated. The core problem is that meeting human needs necessitates landscape manipulations (clearing, drainage, well drilling, piping, etc.). Due to natural processes operating in the landscape (most of them water-related) such manipulations will generally have unintended ecological consequences.

One of the conclusions drawn after the 2nd World Water Forum in the Hague in March 2000 by the Global Environment Facility was that there is now need for land/water integration in a catchment based ecosystem approach, and that we have to find out how that should be interpreted.

GWP seeks to find out how

For four years a study has been going on within the Global Water Partnership (GWP) to find out the answers to these questions. GWP defines Integrated Water Resources Management (IWRM) as "a process which promotes the co-ordinated development and management of water, land and related resources, in order to maximise the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems."

IWRM in other words aims to strike a balance between the use of resources for livelihoods and conservation of the resources to sustain their functions for future generations. The study is now being reported as TEC Report No. 9 ("Water Management and Ecosystems: Living with Change"), to be released in late 2003. It outlines how ecosystem-focused approaches may be incorporated into IWRM and provides a conceptual background to support land/water integration in a catchment based ecosystem approach to human activities.

Two partly incompatible imperatives

Meeting human needs, in general, and reaching the MDG goals, in particular, while at the same time preserving the ecosystems, can be seen as two partly incompatible goals which call for trade offs. The dilemma may often be most conveniently addressed within the catchment since the water passing down the catchment links land use, water use and ecosystems. The challenge is to "orchestrate," through IWRM, human needs and ecosystems, balancing them for internal compatibility.

The catchment may be thought of as composed of two twinned and interacting mosaics of human activities and local ecosystems, respectively, which are linked through the cycling water. The latter mosaics incorporate both terrestrial ecosystems (involved in the runoff generation process) and aquatic ecosystems (for which the water arriving from upstream constitutes the habitat). Since this water reflects the impacts of human activities upstream, the biodiversity of aquatic ecosystems tends to be the most deteriorated one.

Living with change

In view of ongoing population growth, globalisation, MDG goals, etc., there is currently in the ecological community an increasing acknowledgement of the strong driving forces at work, each of which acts on the life support system. The challenge, therefore, is not to stop development, but to learn to live with change and find out what, exactly, this means.

It has been shown recently by a long-term study on the Mediterranean basin that, over time, societal development and environmental change have taken the character of resonance phenomena rather than simple cause-effect relations. A key will be the protection of environmental sustainability, i.e. to safeguard vital environmental processes in the life support system from degrading in such a way that the next generation cannot be properly supported.

Two types of human activities need particular consideration:

1) production of waste, which tends to follow human activities. It also tends to lead – even when natural biodegradation processes are taken into account – to pollution and deteriorating water quality, a fundamental water determinant of aquatic ecosystems. Emission of pollutants is therefore essential to minimise, particularly in regions where a long dry season leaves the rivers without dilution flow.

2) consumptive use of water in crop production, whether rainfed or irrigated. The evaporated water is symbolised by the green end in the GWP symbol. In both cases large amounts of water evaporate and are withheld from forming downstream runoff, i.e. not available for reuse downstream.

What should be protected?

As seen from the ecological perspective, the catchment is a life support system that has to be protected from collapse. It produces crucial ecological services on which welfare critically depends, such as crop production, pollination of crops, facilitated groundwater recharge, denitrification, oxygen production, carbon sequestration and fish production.

The GWP study arrived at the conclusion that protection of ecosystems has two different interpretations:

1) protection of biological landscape components of particular local value from a social or biodiversity perspective, such as a particular wetland, forest, river stretch, lake etc. Here humans are the disturbance and protection is an issue of safeguarding the interplay of crucial organisms by protecting key water determinants of those ecosystems (for aquatic ecosystems streamflow, flow seasonality, water table, river quality, etc.).
2) protection of the catchment as an ecosystem producing essential ecological services. This is the approach taken in the Millennium Ecosystem Assessment program. Here humans are a component of the ecosystem and the basic issue is to protect the resilience of the enclosed life support system, i.e. to safeguard its long-term productivity and the key ecological services involved. The underlying key processes have to secure enough resilience to meet unavoidable variability in terms of fire, extreme drought, pollution events, etc. In this case, however, it remains difficult to see what the precise action should be – it still remains at the research front.

Conclusions

The study concludes that IWRM may be useful in the efforts to try to cope with the challenge to protect ecosystems. What will be needed is on the one hand institutions able to handle the intentional trade offs which will have to be struck between human interests and ecosystem protection, and on the other, stakeholder participation to secure social acceptance of legitimate trade offs. The ultimate task will be to separate dreams from reality by accepting the challenge to live with change, not to stop development.

What has to be done is to define minimum conditions to be met in the river: "environmental flow" in the sense of the bottom-line needed to protect aquatic ecosystems, i.a. flood-mimicking flow episodes and minimum flow, but also minimum water quality.

A fundamental challenge in order to secure implementation will be bridge building between water professionals and the ecological community. Communication has to be actively facilitated. A more transparent use has to be encouraged of the word "ecosystem," which still tends to be used in a rather unclear way, difficult for the water professional to come to grips with. What it basically means is a group of interacting organisms living in a certain environment where water is a key component.

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The complete TEC Report No. 9 "Water Management and Ecosystems: Living with Change" can be requested via email at: gwp@gwpforum.org.

Photo: Mats Lannerstad

It is indispensable to see humans as a component of ecosystems. The basic issue is to protect the resilience (buffering capacity) of the enclosed life support system, i.e. to safeguard its long-term productivity and the key ecological services involved.

Mangroves are an example of a fragile ecosystem which is very sensitive to human influence both with respect to water pollution and to land use changes causing changes in coastal stream patterns. At the same time it is of particular local value from a social perspective (fish breeding ground, tourism, etc.).