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From the Mountains to the Sea - Focus on Vital Links in the Catchment Basin

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Ecosystems, such as forests, wetlands, floodplains and coastal areas, form an important component of water infrastructure. Yet, typically, such ecosystems are not allocated sufficient water nor funding. As a result, water decisions have in many cases proved to be financially and economically sub-optimal. Valuing ecosystems in water equations can help us to better meet our targets for poverty alleviation and clean and adequate water provision for all. Ecosystems can no longer be ignored when formulating policies, shaping markets or setting prices.

Essential facts about water and ecosystems

Barely 2.5% of the earth's water is freshwater and almost of that is locked up in ice and permanent snow or retained in largely inaccessible underground aquifers. What we are left with for all our needs, domestic, agricultural, industrial, is less than 1% of freshwater, to be found in lakes and rivers and underground aquifers. Our daily lives depend on the water cycle. Plants, particularly forests, play an important role in the cycle, absorbing soil moisture and releasing it back into the atmosphere through evapotranspiration.

Wetlands and the water cycle

Wetlands play a vital role in the water cycle by capturing and holding rainfall and snowmelt, recharging aquifers, retaining sediments, and purifying water. Yet we have drained, dammed and polluted vast numbers of our wetlands in the past 50 years. Dams and canals have significantly fragmented and altered water flow in 60% of the world's largest rivers, often compromising the many valuable ecosystem functions upon which we humans depend. Diminishing the capacity of these ecosystems meant diminishing also their capacities to provide clean water to satisfy the needs of a global population that has more than doubled in that time.

Our impressively increased food production has often been at considerable cost to the health of wetlands and freshwater supply. Not only have we destroyed forests and wetlands to make way for agriculture and placed increasing demands on freshwater resources – agriculture now claims 70% of global freshwater withdrawals – we have put further pressure on the remaining natural ecosystems through the high levels of nitrogen, phosphorous, pesticides and sediment loads in surface and groundwaters from agricultural activities. And still in many areas, sewage is dumped, untreated, into water systems. The net result is a serious reduction in both freshwater quantity and quality.

The ecosystem approach based on the catchment basin

Back in 1971, the Convention on Wetlands was adopted as the first of the modern multilateral environmental treaties in Ramsar, a small Iranian town on the shores of the Caspian, "**considering the fundamental ecological functions of wetlands as regulators of water regimes and as habitats supporting a characteristic flora and fauna**".

The Convention's "**wise use principle**" recommends looking at the big picture when establishing management schemes, including not only biological factors, but also institutional, economic and cultural aspects. Today, this is called the "**ecosystem approach**", and it is the core of integrated water resources management (IWRM) planning processes that are called for since the World Summit for Sustainable Development in 2002.

Freshwater is key to sustainable development. Water supplies of good quality are dependent on the protection and sustainable use of ecosystems that naturally capture, filter, store and release water, such as forests, wetlands and soils, including their biodiversity. Water resources management schemes

should be based on this integrated approach. Only then will human livelihoods, including food through agriculture and fisheries, have access to clean water, and adequate sanitation be properly ensured.

Unfortunately at national level, too often, Ramsar's approach is confined to the nature conservation sector only, while water managers, equally isolated, exploit the water resource in view of short-term economic benefits only, without taking the full environmental, social and cultural costs into account.

Water allocation and environmental flows

Are there solutions? They lie in IWRM strategies at the river basin level with full stakeholders' participation. Solutions must also pay due regard to the use of improved technologies for more efficient use of water in agriculture, industry and homes, and to paying for the true value of water infrastructure and ecosystem protection, with the appropriate safety nets for the poor.

The Ramsar Convention believes that the source of freshwater, our **wetland ecosystems**, should be the starting point of all integrated water management strategies. Forests, floodplains and coastal areas need water to provide goods and services for production and consumption. On the supply-side of the equation, natural ecosystems generate important economic services when they maintain the quantity and quality of water supplies and help to mitigate or avert water-related disasters.

So why do they rarely appear as part of the water allocation equation? Natural ecosystems, and especially wetlands, are critical components of the water cycle that delivers our freshwater, but they also require a certain amount of water if they are to maintain their structure and functions and continue to deliver the quantity and quality of water upon which we depend.

A gradual shift in recent water management philosophy and practices is broadening the recognition that the **water requirements of natural ecosystems** must be fully taken into account in any effective water management regime.

Water managers need to assess, in the first instance, the minimum water requirements to maintain the ecological functions of natural ecosystems such as forests and wetlands. Assessing these water needs is a relatively new area of focus, but there are tested tools and methodologies, both scientific and social, for such assessments.

The best techniques take into account the multiplicity of ecosystem functions, rather than simply focusing on water for energy or water for crops. So that water is allocated to maintain, for example, the physical structure of a river and floodplain, fish and livestock diversity, water quality, recreational use, maintenance of fisheries that support rural livelihoods, etc. Individually, some of these functions have very significant economic and social implications. Maintaining certain flows at certain times of the year, to sustain fish populations or to maintain a floodplain, for example, may be a critical matter for many local communities.

New developments for the protection and restoration of water-related ecosystems

Efficient water allocation at the basin level requires not only such assessments as a starting point, but also the development of appropriate national policies, legal instruments and a decision-making framework to promote the allocation of water to wetlands with full involvement of all stakeholders in the process.

Effective management has been the exception rather than the rule in river basins. The problem lies not just in the large areas involved or the huge demands human populations make upon their natural

ecosystems, but most significantly through the sectoral approach to management. All too often hydrological management – for water supply (for industry, agriculture including irrigation, and domestic use), flood control, navigation – is controlled by national agencies that are quite separate from those responsible for ecological and habitat management – the management of forests, wetlands, and other habitats that play a role in the water regime of the river basin. Such a fragmented approach naturally leads to conflicting policies, laws and practice.

Integrated river basin management

The solution? Integrated river basin management (IRBM) where the basin is managed as an integrated unit that must balance economic, social, and ecological needs in a sustainable manner. A mighty challenge within a country, but an even more daunting task when you realize just how many river basins span one or more political boundaries.

In 2000, the European Union launched its new water policy with the adoption of the Water Framework Directive (WFD) aiming to expand the scope of water protection to all waters, surface and groundwater, achieving "**good ecological status**" for them, basing water management on river basin management, and adopting a combined approach to limit emission values of water pollutants and to establish water quality standards.

To achieve the WFD objectives, **coordination of existing measures** within each river basin is required, making sure that citizen are involved more closely. River Basin Management Plans need to be elaborated, specifying the river basin's characteristics, providing a review of the impact of human activity on the status of waters in the basin, as well as an estimation of the effect of existing legislation to meet the "good quality" objectives, and a set of additional measures where needed.

An economic analysis of water use within the river basin must be carried out. This is to enable a rational discussion on the cost-effectiveness of the various possible measures. The price charged to water consumers has to reflect true costs, although in less-favoured areas, deviations from this may be possible so that basic services are provided at an affordable price.

Restoring and developing landscapes, biodiversity and recreation opportunities

The WFD was elaborated by and written for water managers. Additional efforts are needed to involve all interested parties in the preparation of the River Basin Management Plans, notably those concerned with forests, agricultural lands, and wetland ecosystems. But also those planning transport routes, energy production and building developments.

The role of river wetlands, upstream water accumulating areas, peatlands, flood retention areas and other ecosystems needs to be assessed and enhanced. Numerous studies have shown that it is almost always more cost-effective to **maintain natural wetlands** than to drain or convert them to other, often marginal, uses, and then try to provide the same services through structural control measures such as dams, embankments, or water treatment facilities.

In many cases, it has also been found cost-effective to **restore or even create wetlands** to provide these functions (flood retention, sediment and nutrient retention, water purification, aquifer recharge, etc.) rather than to create expensive engineering structures.

Implementing the measures to assure a sustainable balance of provision of good quality waters and their consumption will have profound impacts on the landscapes and ecosystems in the river basins.

Water managers have to consult with major land users, such as agriculture and forestry. In many areas, cultivated lands may have to be reverted to wet meadows, providing grazing areas and flood retention zones when needed. By doing so, landscape and biological diversity can significantly be improved, a contribution to achieve the WSSD target to halt the loss of biodiversity by the year 2010. Clean water and more natural areas improve the landscape values for recreation and tourism, a growing sector of land use.

We all - experts in water management, forestry, nature conservation, fisheries, tourism, agriculture or else - will have to work together, rather than pursuing a specific goal of our discipline. Water links the different elements in our catchment: environmental, social and economic. Water is too precious a good to be left to one stakeholder group only.

Further reading

Further reading and detailed guidance is provided in the Ramsar Handbook series, particularly in volumes **4** on **river basin management**, and **12** on **water allocation and management**. They are available on CD or can be downloaded from www.ramsar.org/lib_handbooks_e.htm.

The essentials of environmental flows and **Counting ecosystems as water infrastructure** have been published by IUCN, the World Conservation Union, in print version or can be downloaded from www.waterandnature.org