



Watersheds and Aquifers in the Green Economy

Information brief



- Less than **3%** of the world's water is fresh; the rest is seawater and undrinkable.
- Groundwater represents about **90%** of the world's readily available freshwater resources.

Main challenges

Expanding human activities

Current unsustainable patterns of development and production are leading to overexploitation of aquifers and rivers, environmental degradation and the loss of inland and coastal wetlands. Protecting freshwater ecosystems requires recognizing the special characteristics of water; a change in one part of a catchment necessarily has consequences elsewhere. For example, any alterations to a river's flow – such as through building large dams or diversion for agriculture and industry – inevitably have impacts elsewhere in the system. These impacts may be of a scale that outweighs the economic benefits expected from the alteration to the river. In all cases, comprehensive impact assessment is needed.

- *Over the past **50 years**, increasing damage to ecosystems has been caused by excessive withdrawal of surface and groundwater for agriculture, energy, industry and urban growth.*
- *The Colorado River no longer consistently reaches the Gulf of California due to the huge diversions of water from the river.*
- ***83%** of the flow of the lower Jordan River is consumed before it reaches the Dead Sea because of diversions into Israel and Syria.*
- *Today, almost **72%** of the Mexico city's water supply comes from the aquifer that underlies the metropolitan area. Because of this overextraction, Mexico City is suffering from severe land subsidence.*
- *Overexploitation of aquifers in some areas is causing land surface levels to sink – increasing vulnerability to surface-water flooding – and intrusion of unusable salt water. There is an urgent need to bring groundwater to a sustainable level.*

Loss of freshwater ecosystems

Too often, little attention is paid to the importance of maintaining freshwater ecosystems. Freshwater ecosystems provide services that are crucial for human survival. As well as supplying clean water for household use, agriculture and industry, they support fisheries, recycle nutrients, remove waste, replenish groundwater, help prevent soil erosion, and protect against floods. Human well-being therefore depends critically on the health of freshwater ecosystems. This is particularly the case for the world's poor, as they often depend directly on water and other ecosystem services provided by rivers, lakes and wetlands for their livelihoods. In some cases up to **90%** of the 'GDP of the poor' is linked to nature or natural capital such as forests and freshwater.

- *The current rate of loss of freshwater biodiversity is more rapid than at any time in human history and shows no indication of slowing.*
- *Nearly a third (**31%**) of freshwater species assessed for the 2009 IUCN Red List are already threatened or extinct.*
- ***44%** of cities rely on forested protected areas for their water supplies.*

Climate change

Adapting to climate change represents another major challenge for the management of watersheds and aquifers. As a result of climate change, the hydrological cycle is expected to accelerate as rising temperatures increase the rate of evaporation from land and sea, leading to more intense rainfall and runoff. However, any increase in global rainfall is predicted to be unevenly distributed. Water-stressed semi-arid and arid areas of the world will generally become even drier and hotter. Both rainfall and temperatures are predicted to become more variable, resulting in a higher incidence of droughts and floods.

- *In 2030, an estimated **47%** of the world population will be living in areas of high water stress.*
- *Climate change will increase biodiversity loss, affecting both individual species and their ecosystems.*

The transition towards a green economy will only be possible if we are able to find and recover the lost balance between natural and human made capital for the sustainable provision of critical water services. A growth strategy that focuses too heavily on water



resources development and obtaining short term benefits may go at the expense of long term welfare and result in the degradation of natural assets. However, without properly designed public works there is no way to overcome poverty and inequality and to realize most opportunities for economic growth. The success of the green economy lies in the ability to find the right balance.

Opportunities for watersheds and aquifers in the green economy

Poverty alleviation

There is a recognized link between poverty alleviation and the benefits that people derive from ecosystem services – especially those provided by freshwater ecosystems. The protection and sustainable management of these ecosystems can therefore play a critical role in poverty reduction strategies, by securing the continued cost-effective delivery of the water, food and other services that poor people rely on.

Valuing ecosystems

Recognizing the valuable, less visible and non-monetized benefits of conserving ecosystems represents an opportunity to recover sustainable growth, fairness and poverty reduction paths while improving and protecting natural assets.

Water security

Sustaining or restoring the water-related services provided by ecosystems is at the heart of achieving water security for both people and nature. There is already solid evidence that ecosystem-based solutions to water-related problems are not only viable but can be very attractive in terms of investment returns. Water-related economic interests are already driving major shifts towards the wiser use of nature and biodiversity in the business, public and national policy agendas in many countries, including major developing nations.

Fund for the Protection of Water in Ecuador (FONAG)

FONAG was established in 2000 as a trust fund into which water users in Quito Metropolitan District could contribute to support watershed conservation and management activities to protect the supply of water.

Main challenge: Rehabilitation and protection of basins that supply water to the Quito Metropolitan District and surrounding areas.

Focus and objective

- Develop a market that channels economic demand for urban water supply (for 1.5 million people) to fund conservation in upstream protected areas.

Approach

- FONAG is an example of payment for the environmental services provided by ecosystems (commonly referred to as Payment for Ecosystem Services or PES), in which local water users, including hydropower and water supply companies contribute regularly under a self-taxing arrangement.
- Activities involve land purchase in critical areas to sustain ecosystem services and improvement of agricultural management practices, but no direct payments to farmers.

Highlighting practice

Biodiversity

- Biodiversity conservation can be a useful tool for managing nutrient uptake and storage; in certain freshwater ecosystems rapid vegetation growth can be used to remove excess nutrients from water, reducing the need for conventional water treatment plants. Maintaining both the physical and biological diversity of watercourses helps to buffer ecosystems against nutrient pollution.
- One of the key ways that water managers and those interested in conserving biodiversity have collaborated is through the setting up of investments and fiscal measures that provide incentives for the sustainable management of ecosystems. One of the most widely implemented approaches during the last 5 to 10 year is Payments for Ecosystem Services.

Ecosystem services

- **Environmental flow** assessment is becoming an influential decision-support tool. Environmental flows describe the quantity and timing of water needed to sustain freshwater ecosystems and the services they provide. The implementation of policies to restore and protect environmental flows ensures the maintenance of ecosystem services which people and economies rely upon.
- Sustainable provision of ecosystem services can be achieved through **changes in land-use practices** and incentives for farmers that are both equitable and targeted at maintaining or enhancing livelihoods.
- A program of **public awareness** can sensitize stakeholders to upstream – downstream environmental linkages and the economic significance of the ecosystem services management carried out by watershed owners/managers. This can enhance willingness to pay on the part of users, and willingness to adapt land/water management practices by service “suppliers” – or at least willingness by both groups of stakeholders to engage in dialogue.

- It may be better to “**start small**” and to “**scale up**” rather than to try to implement a fully fledged financial mechanism from the beginning. This can be done, for example, by targeting a specific land/water management practice – and the drivers underlying it – that influences a specific ecosystem service (e.g. deforestation driven by the need for fuel wood, causing increased runoff, erosion and sedimentation of water courses).
- The way in which ecosystems are **valued** has to be reconsidered. Water is usually only priced at the point of consumption, but in order to improve decision making and protect ecosystems, valuing the multiple benefits of water is essential.

Aquifers

- Development of mechanisms to ensure that decision making of water users sharing an aquifer is based on the capacity of the aquifer to meet their long-term water demands. Cooperation and sharing the benefits of a well-protected aquifer is always better than the competitive the race to the bottom dynamics that have led to the depletion of aquifers.

Integrated management

- Shift in focus towards a **systemic approach** to water management which takes into account ecological considerations.
- Management of **catchments as systems**, considering water usage within the catchment as a whole.
- **Joint management of cross-border basins and aquifers** and integrated quality monitoring programmes (surface and groundwater).
- Shift from “fixing” point challenges to **systemic solutions**. Individual action within a catchment can be promoted to enhance overall catchment performance, e.g. in the provision and maintenance of ecosystem services.
- **Integration of land and water management** instead of treating them as separate problems or allowing land management to drive water management.
- **Reallocation** of resources from low-value to higher-value uses.

Managing climate variability

- Build **resilience, adaptiveness, and adaptability**, learning from past mistakes.
- Managing variability **as a whole** instead of treating different stages in that variability (i.e. droughts, resource, and floods) as separate problems. Actions which reduce runoff do so in drought periods as well as during periods of heavy rainfall.
- Due to the inherent uncertainty of future climate change projections, water management needs to be **flexible** and able to cope under a range of possible futures.

Management of wastewater and pollution

- Reduction of pollution through **catchment-based strategies** and action plans for more sustainable land use – especially agriculture – and working with industry (public and private sectors) to reduce water use and pollution.
- Investments in **wastewater treatment facilities** to reduce pollution from organic chemicals, pesticides, nitrates, heavy metals and waterborne pathogens.
- Water reuse, such as making use of grey water in peri-urban agriculture.

Payment for Environmental Services pilot project in Lake Naivasha basin, Kenya

Main challenges

Lake Naivasha basin faces significant environmental threats from poor land-use practices, unregulated and excessive water abstraction, weak policy enforcement, water pollution and climate change. These pressures have resulted in degradation of ecosystem services, economic losses, worsening poverty and reduction of biodiversity.

Focus and objectives

To develop a viable financial mechanism for payments for watershed services that delivers sustainable natural resource management and improved livelihoods and serves as a pilot and learning model for further expansion and replication.

Approaches

- Payment for Environmental Services (PES) market-based mechanism whereby land owners are rewarded financially by service beneficiaries for undertaking land use transformations that provide agreed ecosystem services.
- The Lake Naivasha Water Resource Users Association– on behalf of ecosystem service beneficiaries, notably the major floricultural/horticultural industry based around the lake – agreed to compensate small-scale landowners/farmers represented by the Upper Turasha-Kinja and Wanjohi Water Resource Users Associations (WRUAs) for foregoing some potential income to manage their land to provide good quality water to downstream users.



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