

Managing Water Allocation and Trade-Offs in the Water-Food-Energy Nexus

Key Message

An environmental flow is the water provided within a river, wetland or coastal zone to maintain ecosystems and their benefits where there are competing water uses and where flows are regulated.

'Environmental flows' is a tool for allocating water among multiple, competing uses in a watershed or river basin and building consensus on allocation decisions. Adoption and implementation requires that environmental flows are incorporated into water policies and laws. These should include the need for a negotiated consensus on flow allocation among all stakeholders. Environmental flows provide the means for integrated management of river flows to meet the needs of people, agriculture, industry, energy and ecosystems within the limits of available supply and under a changing climate. Environmental flows is thus a practical tool for managing allocation in the water-food-energy nexus.



Recommendations

The success or failure to mainstream environmental flows in water management will depend on whether they have their place in national legislation. The ability of Ministries to promote compliance and enforce a law and reconcile the interests of the traditionally powerful water users with the interests of less powerful sectors is crucial. Institutional strengthening in river basin planning and management is therefore essential to develop the capacity, legitimacy, experience and confidence needed in applying environmental flows.

Implementing environmental flows requires adaptive management, based on a 'learning by doing' approach. Flexibility is required to effectively negotiate the objectives and outcomes of environmental flows among various stakeholders. Careful preparation and building trust amongst partners is critical in such a transition. A step-by-step approach that gains in-country ownership over time will prove pivotal when negotiating everything from infrastructure such as dams to reducing abstractions for irrigation.

Environmental flows must have clear objectives and scenarios built on multi-stakeholder consensus that is informed by scientific evidence. Scientists must provide the required expert advice on how river basin development evolves under various flow conditions, through assessment of how ecology, economic costs and benefits across sectors, livelihoods and social equity respond to alternate river flow scenarios. Flow assessments must include examination of the contribution of biodiversity and ecosystem goods and services to promoting livelihoods and reducing poverty. However, it is the stakeholders who must say what the river is used for and how much water they need. To maximise the relevance of environmental flows to peoples' lives, stakeholders should participate in flow assessments and in negotiations that build consensus on flow allocation choices.

Environmental flows will only ensure a healthy river if they are part of a broader package of measures on a river basin scale. Appropriate measures to be considered are soil protection, pollution prevention, and protection and restoration of habitats. River basin scale should include wetlands, floodplains and associated groundwater systems within the hydrological river basin unit. Environmental, economic, social and cultural values have to be taken into account in relation to the entire system..

Justification

Rivers need water, debris and sediment to ensure that aquatic ecosystems stay healthy and provide benefits to people. Without careful flow management, water impoundment by dams and reservoirs or abstraction for irrigation can devastate ecosystems and livelihoods downstream. Integrating flow management into river basin development provides the means to make consensus-based decisions on how to manage trade-offs between infrastructure development (including for agriculture and hydropower), livelihoods and ecosystems.

Environmental flows allocates water among competing uses, within the limits of availability, integrating the water needs of ecosystems with those of other sectors and stakeholders. Environmental flows is thus a vital tool for managing water in the water-food-energy nexus.

Loss of natural flow regimes disrupts the productivity of freshwater and estuarine fisheries and of flood-recession agriculture. Communities downstream face increasing conflict over water access and lose the resilience needed to cope with water scarcity and climate change. Environmental flows provides tools to coordinate upstream-downstream water allocations in order to maintain healthy ecosystems and vital services. Without environmental flows, communities risk losing economic and environmental security.

Applying environmental flows in practice, policy and law allows a society to build the knowledge, capacities and institutions needed to implement integrated water resource management (IWRM), and to adapt to climate change. Integrating environmental flows into water management policy and practice requires communication, stakeholder participation, awareness raising, adaptive management and demonstration of the benefits of flows for people and nature.

Environmental flows can be applied to existing or proposed infrastructure, helping to determine if the flow from a dam should be al-



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tered, if a dam should be modernized to optimize benefits, or if it is more appropriate economically to decommission the dam entirely. Where new dams are proposed, environmental flows can build in flexibility, satisfying current needs and allowing for future changes in regulation, use and climate.

Implementation

than 13 million people, 52% of whom are poor, and economic benefits for 1800 people associated with watershed management and conservation. Long-term (80 year) funding focuses on environmental education, research and watershed conservation.

IUCN's Water and Nature Initiative (WANI) has promoted environmental flows with the joint aim of reducing environmental impacts and increasing the benefits of river basin development, especially energy production through hydropower and food security through irrigation development. After more than 10 years of experience, WANI has learned key lessons in how best to implement environmental flows:

The success or failure to mainstream environmental flows in water management will depend on whether it has a place in national legislation.

Tanzania's National Water Policy (2002) and the Water Resource Management Act (2009) promote integrated water resource management principles, recommending water management at the basin level, in a participatory and equitable way that emphasises sustainability and conservation. Under the policy framework, WANI and the Pangani Basin Water Office (PBWO) piloted the Environmental Flows concept as a new basis for water allocation. The goal was to develop

an understanding of the hydrology of the Pangani River Basin, the flow-related nature and functioning of the river system and the links between the river and the social and economic value of the river's resources. Multi-stakeholders then created scenarios for possible basin management. Both decision-makers and stakeholders are now learning how to use environmental flows to negotiate water allocations.

In the Limpopo River Basin (Botswana, Zimbabwe, South Africa and Mozambique) interest in environmental flows has been promoted by the South African Water Law, which calls for prioritisation of water allocation to meet the basic needs of people and the needs of ecosystems. WANI conducted an environmental flow assessment downstream from the Mzingwane dam. Analysis showed expected changes in river conditions as a result of changes in flow allocation. As in Pangani, scenarios for improving management of flow from the Mzingwane dam, including future options for water supply to the city of Bulawayo, were then developed through multi-stakeholder workshops from the catchment management agency and the City of Bulawayo. The project culminated in the formation of a Southern Africa Regional Environmental Flows Network, which aims to increase access to technical expertise, promote sharing of experiences learned from the assessment, and to ensure that environmental flows

are implemented in the Mzingwane.

Establishing adaptive management, based on a 'learning by doing' approach is a critical aspect of environmental flows.

In the Huong River Basin (Vietnam), WANI coordinated a rapid environmental flows assessment, bringing together public officials, engineers and scientists in an action research process. Basin authorities determined which flow options accommodated economic goals, while protecting downstream ecosystems and their services. The increasing awareness and capacity created by the flow assessment has resulted in environmental flows being incorporated into provincial planning for the Huong Basin and, at national level, the government has included environmental flows in the natural resources strategy and in water sharing plans.

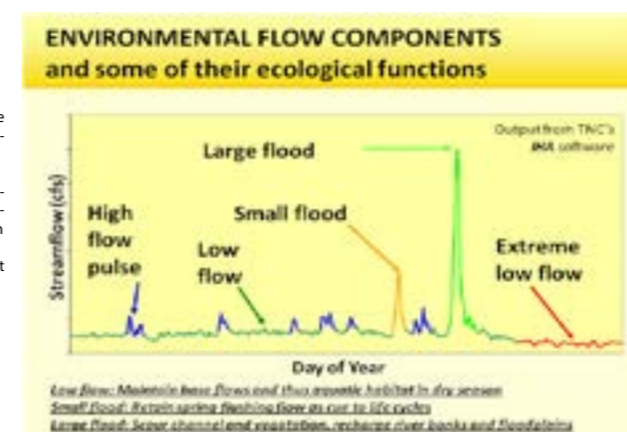
Environmental flows must have clear objectives and scenarios built on multi-stakeholder consensus

In the Himal – Hindu Kush Basins (Pakistan, India, Nepal, Bangladesh, China), WANI conducted a comprehensive review of water management issues and environmental flows. Syntheses and implementation roadmaps were prepared for India, Pakistan, Bangladesh, Nepal, China and Bhutan as well as reviews of best practice in IWRM in Nepal and India. WANI convened a multi-stakeholder workshop on the role of high altitude Himalayan wetlands as water towers to assess management needs for ensuring the sustainability of these vital ecosystem services. The workshop concluded that improving and sharing understanding of the pressures, impact and response measures for Himalayan wetlands is an urgent high priority. This action will support the drive to integrate water management with economic development, alternative livelihoods and climate change adaptation.

Environmental flows will only ensure a healthy river if they are part of a broader package of measures on a river basin scale.

By the 1970's the Yellow River, known as the cradle of Chinese civilization and as 'China's sorrow' for its once devastating floods, was sapped of water loss through irrigation and industrial use that it often failed to reach the sea. In 1997, it went dry for more than seven months. Determined to keep the river flowing and empowered with new authority, the Yellow River Conservancy Commission (YRCC) is experimenting with managing water allocation using the concept of environmental flows, partnering with WANI to produce a Chinese language version of IUCN's FLOW book. The YRCC's determination to adopt an environmental flow approach represents an important shift in the way China and its Ministry of Water Resources approach the task of managing natural resources. In 1999, the Government gave YRCC control of the Yellow River's floodgates and authority to determine its water allocation. Now, provincial governments that previously took as much water as they wanted must submit to the YRCC, which aims not only to keep the water flowing, but to reduce water pollution and control the massive erosion of soil that gives the river its namesake colour.

Environmental Flow Components in Kathmandu, Nepal



E. Kendy, 2011, An Introduction to Environmental Flows: Presented at the IUCN E-flows Training Workshop for South Asia in Kathmandu, Nepal. IUCN



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Further reading

- Values and rewards: counting and capturing ecosystem water services for sustainable Report (2005)
- Muthurajawela Marsh, Sri Lanka" Case study
- Lessons Learned from the KYB Project Report (2008)
- Okavango Delta" Management plan
- Pangani River System: Future of the Basin Report (2011)

All publications available from: www.waterandnature.org



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Examples from the field

In Northeast Thailand, WANI's pioneering interdisciplinary work on River Basin Management revealed that water levels in the Songkhram River are controlled by the water level in the Mekong River. Fisheries here provide crucial food and income to 1.9 million people. WANI's assistance helped generate an agreement to treat the Songkhram River as a basin, mitigating the impact of existing and future development plans. Four provinces now jointly plan and manage the Basin.

In Costa Rica's Tempisque watershed, a dam planned where water is over-allocated would divert water to tourist areas. Already actively helping develop new water legislation, WANI used this situation to introduce environmental flows into law. WANI's partner, the Organisation for Tropical Studies (OTS), conducted the first rapid flows assessment in the region, leading to a proposal for a full fledged environmental assessment of the watershed.

WANI cofounded the Global Environmental Flows Network, whose goal is to integrate e-flows into standard practices for river basin management and use. The network facilitates communication, capacity building and education to make river basin management accessible to policy makers, NGOs, governmental and international agencies and local communities, encouraging a broad dialogue on e-flows and bridging the gap between science, policy and implementation.

Learn more

WANI Toolkits

VALUE – Counting ecosystems as water infrastructure

PAY – Establishing payments for ecosystem services

Websites

www.iucn.org/water

www.waterandnature.org

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About IUCN

IUCN, International Union for Conservation of Nature, helps the world find pragmatic solutions to our most pressing environment and development challenges. IUCN works on biodiversity, climate change, energy, human livelihoods and greening the world economy by supporting scientific research, managing field projects all over the world, and bringing governments, NGOs, the UN and companies together to develop policy, laws and best practice.

IUCN is the world's oldest and largest global environmental organization, with more than 1,000 government and NGO members and almost 11,000 volunteer experts in some 160 countries. IUCN's work is supported by over 1,000 staff in 60 offices and hundreds of partners in public, NGO and private sectors around the world.

About the IUCN Water and Nature Initiative

The Water and Nature Initiative (WANI) is an IUCN initiative that has worked with more than 80 partners in more than 30 countries to mainstream environmental and social issues into water resources planning and management. The initiative uses ecosystem management as a strategy for integrated management of land, water, nature and communities. WANI helps to solve the dilemma between fulfilling development options and conserving aquatic resources by resolving water conflicts, reviving rivers and spurring local economic development.