



Environmental Flows

Demonstrations and knowledge sharing through regional and global networks to turn policy into action



IUCN WATER PROGRAMME – THEMATIC CASE STUDY NO.1

WATER AND NATURE INITIATIVE (WANI) CASE STUDY

ENVIRONMENTAL FLOWS

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Environmental flows improve water management by ensuring a sustainable water supply to meet the needs of people, agriculture, energy, industry and the environment. Environmental flows are effectively a balance between water resources development and the need to protect freshwater-dependent ecosystems.

WANI has contributed to environmental flow assessments in river basins in Asia, America, and Africa over the last 10 years with the aim of reducing environmental impacts and increasing the benefits of river basin development. Through scaling-up, lessons learned have been mainstreamed into IWRM allowing for the capacity building of existing legislation and the establishment of new, appropriate legislation on environmental flows. This influence on IWRM and water policy has resulted in better water resources management.

Environmental flows issues are relatively new in South America and some countries have been able to include it in the new water laws (Peru and Ecuador) while others are inserting it in current water or environmental regulation (Brazil and Colombia). WANI has been supporting some of these national processes by co-organizing short courses on environmental flows. One key knowledge product is the FLOW toolkit, aimed at policy makers and practitioners and helps to inform and guide water resource management.

Globally, IUCN and partners are mobilizing learning, knowledge sharing and the adaptation of environmental flows approaches to the regional context through the Global Environmental Flows Network (eFlowNet).

WANI has demonstrated through its interventions that environmental flow regimes integrate the needs of people and nature according to the priorities negotiated by stakeholders and are essential to effective water resource management.

Highlights

- WANI supported environmental flow assessments in basins in Latin America, Africa and Asia.
- Workshops and training to support national processes to integrate environmental flows into water resource management, policies and laws.
- Global eFlowNet created to provide a central reference point where people can readily access or share environmental flows-related information. Regional eFlowNet platforms have also been developed in Latin America, East and Southern Africa and Asia.
- FLOW toolkit in 11 languages which offers practical guidance on technical issues and the economic, legal and political dimension of establishing environmental flows.

INTRODUCTION

Understanding environmental flows

The concept of environmental flows is adaptive and essential to the wider IWRM approach. It is closely linked to the concept of ecosystem services. An environmental flow is the quantity, quality and timing of water flows required to sustain freshwater and estuarine ecosystems and the human livelihoods and well-being that depend on these ecosystems. A useful way of understanding environmental flows is thinking of 'ecological water demand' in just the same way as there is agricultural or industrial water demand. Environmental flows are effectively a balance between water resources development and the need to protect freshwater-dependent ecosystems. When thinking about environmental flows it is important to consider all aspects of the river and drainage system. The basin must be viewed from its headwater to the estuarine and coastal environments.

Environmental flows improve water management by ensuring a sustainable water supply meets the needs of people, agriculture, energy, industry and

the environment within the limits of availability. The application of environmental flows supports the health of aquatic ecosystems and the well-being of people who depend on them. By providing a system for equitable allocation of water, based on available supply, the application of environmental flows can support development and poverty alleviation. Environmental flow assessments provide the tools and the data necessary to help support decision-making processes which focus on poverty reduction contributing to wider national development activities.

Measuring environmental flows

The actual estimation of environmental flows is complicated by the lack of both understanding and quantitative data on relationships between river flows and the multiple components of river ecology. However, the major criteria for determining environmental flows should include the maintenance of flow variability (See Figure 1), which affects the structural and functional diversity of rivers and their floodplains, and which in turn influences the diversity of aquatic species. Maintaining the full spectrum of

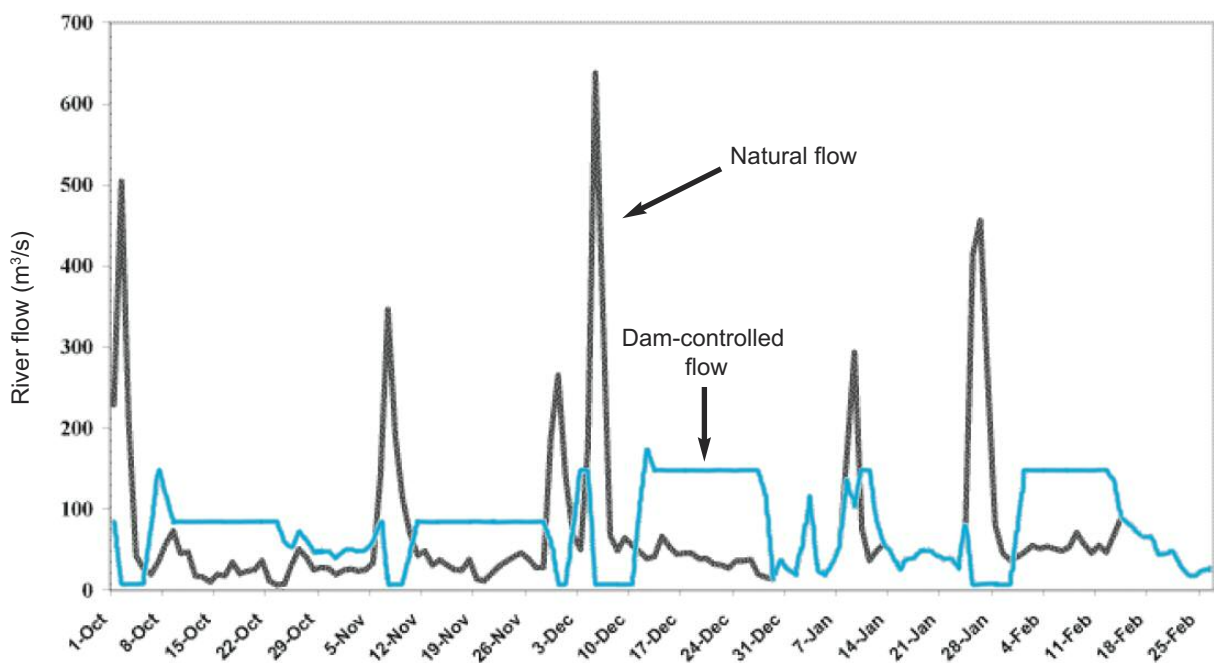


Figure 1. Operation of a flood-control dam on the Green River in Kentucky, USA results in substantially lowered flood peaks, followed by extended high-flow releases of stored floodwater (based on 1978 data). (Source: Richter, B. D., and G. A. Thomas. 2007. Restoring environmental flows by modifying dam operations. *Ecology and Society* 12(1): 12)

naturally occurring flows in a river is normally impossible due to water resources development and catchment land use changes. Therefore, environmental flows are often a compromise between river basin development on the one hand and maintenance of river ecology on the other.

There is no single best method, approach or framework to determine the environmental flow and there are a number of existing methodologies. Functional analysis and habitat modeling are the most widely applied approaches in impact assessment or restoration planning, whereas 'look-up' tables and 'desk-based' analysis are used in scoping studies, national audits or river basin planning. The risk is to over-simplify environmental flows requirements with key performance indicators whereas a range of mechanisms may be needed to deal with the high complexity entailed by the interaction between ecosystems and society as well. This is why scientific knowledge should be integrated with the social aspects of environmental flows in a more holistic manner. It is important for both scaling-up successful implementation and increasing buy-in of environmental flows approaches by policy-makers.

WANI and environmental flows

The overall goal of WANI is to mainstream the ecosystems approach and IWRM in catchment

policies, planning and management. To achieve this WANI is structured around four strategic objectives (see figure 2) which focus on demonstrating results through, good governance, economic development, empowerment through participation in management, improving knowledge and lesson learning.

Ecosystems approach

Any integrated management of water resources that focuses on maintaining and rehabilitating the natural regulatory functions of ecosystems within an entire catchment is said to be based on an ecosystem approach. Implementing such an approach improves the management and conservation of the river basin and its water resources.

For WANI, creating and sharing knowledge to support decision-making also means addressing the gaps and lack of global coverage in current information on freshwater ecosystems. With the aim to contribute to the lack of information on freshwater biodiversity in formats that are accessible to water policy makers and water managers, the WANI environmental flows projects have addressed this by supporting the development of baselines and benchmarks for environmental indicators. Such indicators are needed in order to evaluate the effects of water management activities and the effectiveness of conservation interventions.

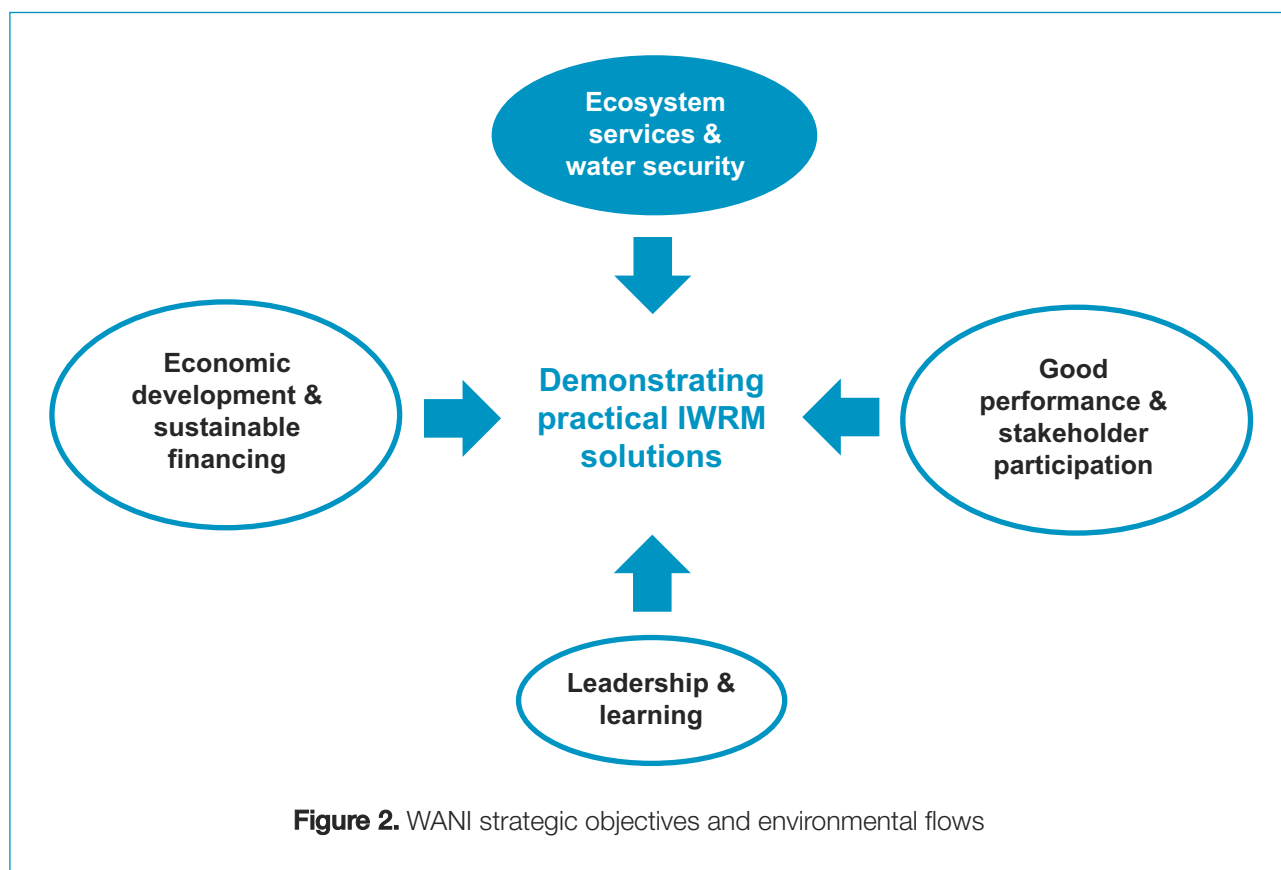


Figure 2. WANI strategic objectives and environmental flows

Integrating the needs of people and nature

The use of environmental flows methodologies in WANI's IWRM projects is cutting edge. WANI has demonstrated through its projects that environmental flow regimes integrate the needs of people and nature according to the priorities negotiated by stakeholders. Promoting environmental flows has the

joint aim of reducing environmental impacts and increasing the benefits of river basin development. WANI demonstrated that environmental flows catalyze development of knowledge, capacities and institutions needed to move IWRM beyond planning to implementation.

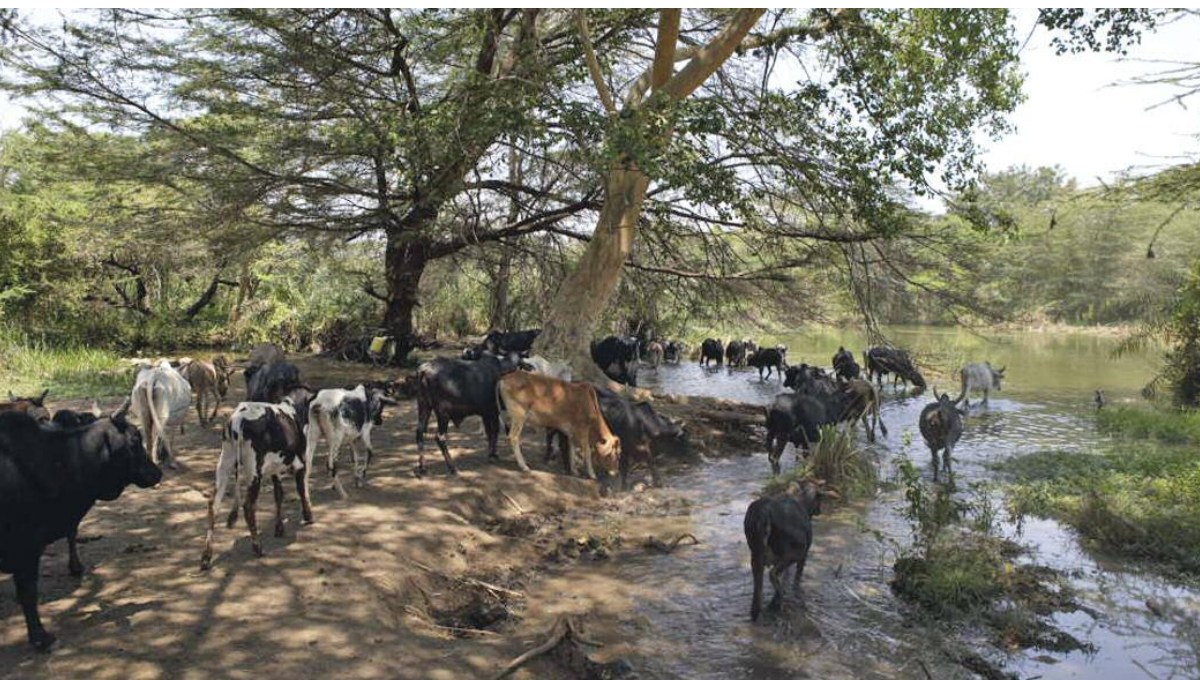
TURNING POLICY INTO ACTION

WANI has contributed to environmental flow assessments in river basins in Asia, America, and Africa over the last 10 years with the aim of reducing environmental impacts and increasing the benefits of river basin development. Through scaling-up, lessons learned have been mainstreamed into IWRM allowing for the capacity building of existing legislation and the establishment of new, appropriate legislation on environmental flows. This influence on IWRM and water policy has resulted in better water resources management as illustrated in the following examples.

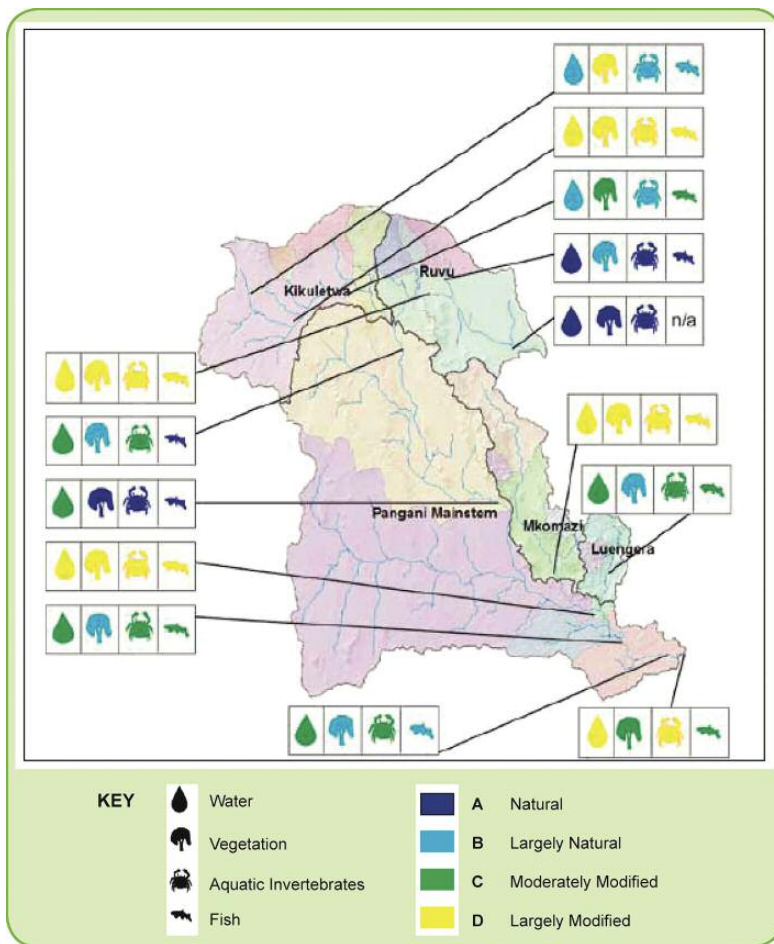
Pangani River Basin, Tanzania: provided data to support decision making

The Pangani Basin Flow Assessment (2005–2009) brought together a core team of Tanzanian

specialists in a range of disciplines related to rivers including biophysical, social, economics, water management and policy making as well as an international team of flow-assessment specialists from South Africa. As the first assessment of its kind in the area, the study used cutting edge methodologies to gather specific hydrological information. A series of 17 reports were produced that provide information on the flow regime of the river, indicating that the river system has changed considerably from its natural condition, with some areas more degraded than others (see Figure 3). These changes in the river flow reduce the capacity of ecosystems to perform functions that are important to people such as replenishing groundwater supplies and providing a habitat for fish and plants. The livelihoods of people in the basin



Cattle drinking from the Pangani River, Tanzania



River health assessment conclusion: moderate to poor

The Pangani River is in moderate to poor condition throughout and has lost valuable ecosystems services it once provided, including lakes, swamps and a reliable supply of water of good quality.

Figure 3. Summary of the Pangani River condition
(Source: *Future of the Basin Report 2011*, PBWB/IUCN)

who depend on the water resources are therefore being negatively impacted.

Building on this information, stakeholders are now gaining understanding of social, economic and environmental trade-offs for different water allocations through the development of a number of scenarios. The technical outputs of the Pangani Flow Assessment project, such as present-day hydrological data, baseline data on the condition of rivers, wetlands and the estuary, and the environmental flow assessments for a wide range of future development pathways, are a step toward IWRM, providing invaluable decision support for water resource planning in the basin.

ecology of the river course has been modified as a result of the construction of numerous dams. As a dryland river, surface flow in the main channel ceases entirely in the winter dry season although water continues to flow in the deeper alluvial deposits. Designated as a WANI site for demonstrating an environmental flows assessment, stakeholders in the Mzingwane Catchment in South Western Zimbabwe understood that environmental flows does not mean providing water when it is normally dry but rather to try and mimic the natural flow pattern as closely as possible. In addition, the Limpopo project contributed to the adaptation of globally established environmental flows methodologies in Southern Africa.

Limpopo Basin in Southern Africa: understanding environmental flows

The Limpopo Basin is one of the most developed in southern Africa. As such, the natural flow regime and

SOUTH AMERICA: USING KNOWLEDGE, RESULTS AND TRAINING TO SUPPORT NEW POLICY

WANI has been supporting national processes of including environmental flows in water law and legislation through training and capacity building. Globally, IUCN and partners are mobilizing learning, knowledge sharing and the adaptation of environmental flows approaches to the regional context.

As the concept of environmental flows is relatively new in South America, some countries have included it in new water laws (Peru and Ecuador) while others are adding it to current water or environmental regulatory mechanisms (Brazil and Colombia). WANI supported some of these national processes by co-organizing short courses and workshops (Brazil, Chile, Peru, Colombia and Ecuador). These activities have supported the

growth of a Latin American environmental flows network which has progressively evolved into a regional reference for environmental flows.

In Peru, WANI supported the Peruvian Environmental Ministry MINAM and the National Water Authority ANA by providing advice on the environmental flows regulation process. Currently the web page of Spanish eFlowNet (www.eFlowNet.org) is providing relevant information about courses, events, workshops and documents about environmental flows.

Huong Basin, Vietnam and beyond

In the Huong Basin in Vietnam a flow assessment showed how changes in river flow affect both economic returns and ecosystem health. Basin authorities were able to determine which flow options

accommodate economic goals while protecting downstream ecosystems and their services. As a result of the increasing awareness and capacity created by the flow assessment, environmental flows have been incorporated into planning for the Huong Basin by the provincial People's Committee and at national level the government has included environmental flows in the natural resources strategy and in water sharing plans.

Experience gained in the Huong Basin led to a second environmental flows demonstration in the Songkram Basin in Thailand, a tributary of the Mekong River. With the involvement of government and NGOs, regional actors, academics and community groups, results demonstrated the importance of flood regimes for the high productivity of the floodplain and rich fisheries that support livelihoods for 1.9 million people in the basin. Increased awareness and broad participation led to convening of a basin dialogue that called for joint planning and management of water resources development by the four provinces in the basin.



Fishing on the Nam Ou River, a tributary of the Mekong River, Lao PDR

As a contribution to the Dialogue on Water, Food and the Environment, the Food and Agriculture organization's regional office for Asia and the Pacific and IUCN carried out a joint initiative in Attapeu Province, Lao PDR to investigate the role of aquatic resources in the nutritional status of people engaged in rural livelihoods and to determine any opportunities, constraints or threats that may exist concerning the management of aquatic resources and future development in the province. At the regional level, environmental flow efforts focused mainly on engaging in the Mekong River Commission's Integrated Basin Flow Management process. At the national level, constituencies of influential actors were built that understand and support use of the environmental flows approach.

Tempisque River, Costa Rica

WANI and partners presented the concept of environmental flows through workshops to government agencies and NGOs working in water management. This led to an environmental flow Rapid Site Assessment in alliance with local partners which provided a platform for broader dialogue among stakeholders. Through this work WANI and partners influenced national water policies including supporting the addition of three new articles in new Water Act Proposal addressing environmental flows. Work in Costa Rica has since triggered interest and action in other countries (El Salvador and Panama). This work also helped to establish the Network of Environmental Flows Experts in Latin America.

USING A GLOBAL NETWORK TO INFLUENCE THE FUTURE OF WATER ALLOCATIONS

Despite the generation of information across the globe, there was previously no central reference point where people could readily access or share the latest information in terms of terminology, links or contacts to details of scientific environmental flows methods, software or professional literature. Consequently, WANI has supported learning on environmental flows globally through the Global Environmental Flows Network (eFlowNet) (www.eFlowNet.org). It provides a central reference point where people can readily access or share environmental flows-related information, ranging from terminology, links or contacts to details of scientific environmental flow methods, case studies, software or professional literature.

The Network aims to reach out to stakeholders such as policy-makers shaping legislation on water allocation, water users from industry and agriculture, and fishers who rely on sufficient flows to support fishery stocks to influence the development of effective and efficient policies that allocate water for the environment to restore rivers and catchments. To

achieve this, the Network provides a forum of knowledge exchange and support to put environmental flows into practice, which is essential if river basins are to be restored and managed in a manner that serves environmental needs alongside livelihoods and well-being.

Currently, the Network supports a variety of activities which benefit stakeholders, including an interactive website with case studies, discussion forums, partnership development opportunities, a newsletter, and activities at workshops and conferences. These activities connect members of the network, enabling them to share information, lessons learned and experiences on environmental flows. More generally, eFlowNet partners team up to build capacity and support training on environmental flows which builds collaborations and advances knowledge to address gaps in information. EFlowNet also provides a resource bank and clearing house for environmental flows information and advocates for the inclusion of environmental flows in policy through awareness raising.

FROM GLOBAL TO REGIONAL NETWORKS

Spreading the environmental flows concept requires developing or linking up to new regional nodes. Identifying the most relevant experiences on environmental flows and disseminating them to the regional level increases sharing of context-specific information and comparison of lessons learned. Ideally, the most active members will eventually take over much of the network building and maintenance on a regional basis as the ultimate objective for the global network is to evolve towards a multi-hub structure with regional nodes. Regional networks are

slowly emerging and linking with the global network to have access to this knowledge sharing.

They are instrumental to communicating the importance of implementing environmental flows on a local, national and regional scale. The scaling strategy sets out to invest in developing regional environmental flows networks in Latin America, East and Southern Africa and South and South East Asia by providing support to IUCN Regional Offices.

FLOW

The WANI environmental flow toolkit 'FLOW' was produced with input from specialists from the IUCN Environmental Law Centre, the IUCN Commission on Ecosystem Management, the Centre for Ecology and Hydrology (UK), Deschutes Water Conservancy (USA), and the University of Capetown and Southern Waters Ecological Research and Consulting in South Africa. This guide offers practical advice for the implementation of environmental flows in river basins and explains how to assess flow requirements, change the legal and institutional framework, incorporate economic information into scenarios, involve stakeholders in negotiation, build capacity and generate financing.

FLOW draws extensively on the experiences of South Africa, Australia and the United States as those who pioneered efforts and provides hands-on advice for this emerging issue on the water resource agenda. It goes well beyond existing literature to offer practical guidance on technical issues, such as assessments methods and infrastructural adaptation, and the economic, legal and political dimension of establishing environmental flows. Development of FLOW was an integral part of a process that also included support to national and local initiatives to establish environmental flows, as the examples of Tanzania, Costa Rica, Vietnam and Thailand illustrate. The guidance provided in this book was tested in collaboration with national stakeholders, experts, policy makers and elected officials. As a result, FLOW and those field experiences allow a much wider community to develop the most appropriate ways to implement environmental flows.

To date, FLOW has been translated in 11 languages to increase uptake and as a means of building national-level ownership of new concepts in water resources management. The process of translation was a partnership between IUCN and an inter-disciplinary national working group. Translation was thus used as an awareness-building and capacity-building process for key national stakeholders, to lay a foundation for subsequent dialogue and uptake. Translation has been strategically driven, responding to local demand. From the Huong, Tempisque, Limpopo and Pangani rivers, to Vietnam, Costa Rica, Zimbabwe and Tanzania, WANI has helped integrate environmental flows into policy and practice. Stakeholders, basin managers and policy makers alike learned, using the WANI toolkit FLOW, that including ecosystems in water allocation decisions can support practical, long-lasting development.

WHAT HAS WANI LEARNED?

A common conceptual understanding of environmental flows is necessary

Environmental flows applications deliver more than project milestones, as they help to mobilize partnerships and relationships that are the basis for the long-term sustainability of interventions. Widening the scope of environmental flows from a scientific concept to a water management approach is challenging. Careful preparation and building trust amongst partners is critical in such a transition. Environmental flows is attracting great interest from water managers and politicians alike. Generating and discussing the impacts of alternative scenarios is a socio-political process, not just a matter for technical experts.

Adaptive management

Establishing adaptive management is a critical aspect of environmental flows. An environmental flow regime is not an absolute: it may need to be adapted and modified based on 'learning by doing'. Negotiating the objectives and outcomes of environmental flows among various stakeholders requires a flexible approach. Establishing appropriate legislation on environmental flows is an important instrument in getting the methodology into the mainstream. The ability of ministries to implement and enforce a law and reconcile the interests of the traditionally powerful water users with the interests of less powerful sectors will also be crucial. Institutional strengthening in river basin planning and management is therefore essential.

Environmental flows contributes to IWRM

Environmental flows across the portfolio has progressed from a somewhat abstract technical theory to practical assessment and an essential component that in many cases has been the pivot around which wider IWRM solutions have been tested and evolved. This catalyzed greater interest and political awareness of environmental flows concepts as an integral part of water resource planning. This is seen in the development of national level awareness and development of environmental flows regulations in fledgling national policies and legislation and potentially in regional-wide initiatives. This cuts across regions and has been demonstrated in diverse basins in Asia, Eastern Africa and South America.



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