



Implementing environmental flows with benefits for society and different wetland ecosystems in river systems

Wetlands need an adequate amount and quality of water at the right time to maintain their ecological character¹, to sustain nature and to provide water-related ecosystem services and benefits to humans.

These water requirements are also known as “environmental flows”. Consideration of environmental flows can help reconcile the different demands for water and reduce the degradation and loss of wetlands, protect and restore their ecological integrity and halt the loss of biodiversity they sustain. Within the context of climate change, an understanding of environmental flows can provide a better understanding of the changing nature of water availability and allocation needs within river basin systems. Environmental flows can also help achieve the wise use of wetlands and contribute to all Sustainable Development Goals (SDGs), particularly SDG 6, “Ensure availability and sustainable management of water and sanitation for all”.

This Policy Brief supports policy makers by facilitating an understanding of the linkages between the water needs of wetlands and of people, as well as the different levels of decision making needed (for example, at local wetland scale, across river basins, or in national sectoral plans) to implement environmental flows. It highlights the complexity of trade-offs between stakeholders required to sustainably meet competing water needs. This Brief also presents a set of actions to assist with successful implementation of environmental flows.

¹ Ecological character refers to “the combination of the ecosystem components, processes and benefits/services that characterize a wetland at a given point in time” (Ramsar Convention, 2005 a).



Policy recommendations²

- Implementation of environmental flows requires cross-sectoral policy, legislative, regulatory and financial frameworks for water resources management at the local and basin levels, engaging stakeholders and respecting different cultures and values.
- Wetland managers should be engaged in water management processes.
- Effective implementation of environmental flows should be ensured to meet the SDGs, especially SDG 6, “Ensure availability and sustainable management of water and sanitation for all”.
- The environmental flows of wetlands can be met through careful water infrastructure planning and development; releases of water from dams; removal of dams; dam construction planning; limitations on groundwater and surface water diversions; and management of land use practices.
- Commitment to long-term monitoring of surface and groundwater flow patterns and the ecological and societal responses to changing patterns is essential to improve water management strategies and develop effective regulations.
- Public participation in the monitoring, evaluation and adaptive management of environmental flows can lead to broader acceptance of the need for water to meet the ecological functions of wetlands, depending on location, increased community capacity, shared ownership of purpose and better outcomes for rivers, wetlands and estuaries.

The issue

Wetlands³ are a critical source of fresh water for human consumption. About 70% of freshwater extracted is for agricultural use (Ramsar Convention on Wetlands, 2018). Estimates suggest that out of approximately 42,000 km³ per year of existing renewable freshwater resources from rivers and aquifers, humans extract about 3,900 km³ per year (Ramsar Convention on Wetlands, 2018). Wetlands also perform an important role in the global water cycle, purifying, retaining and releasing water. However, they are under pressure from over-extraction of water, land use, infrastructure development, pollution, extractive industries and other threats. These pressures can have an impact on the quantity, quality and flow patterns of water in wetlands, negatively affecting their ability to supply water to humans. Therefore, healthy wetlands are critical to nature and human communities and their wise use must be ensured.

Over the past decade, many governments have instituted some form of policy or legal provision that explicitly recognize the environmental water needs of ecosystems and dependent communities. However, implementation has been limited in many places due to a combination of:

- Insufficient political will;
- Lack of stakeholder support;
- Lack of capacity and resources; and
- Institutional roadblocks and conflicts of interest.

Additional challenges facing those assessing and securing the environmental flows of a particular wetland within a river system include:

- A limited understanding of the multiple benefits of wetlands (see Ramsar Policy Brief No.2, <https://www.ramsar.org/document/ramsar-policy-brief-2-integrating-multiple-wetland-values-into-decision-making>);
- Exclusion of wetland stakeholders from central decision-making and priority-setting processes in river basins;
- Limited scientific methods for determining the water needs of wetlands, especially when considering the broad range of wetlands under the Convention’s definition of wetlands, and biological groups requiring water;



² These policy recommendations are partly based on the recommendations of the 2018 Brisbane Declaration and Global Action Agenda on Environmental Flows.

³ The Convention defines wetlands as “permanently or seasonally inundated freshwater habitats ranging from lakes and rivers to marshes, along with coastal and marine areas such as estuaries, lagoons, mangroves and reefs” (Ramsar Convention on Wetlands, 2018).

- Lack of ecological or social monitoring systems in many wetlands to evaluate changes in their functioning or status and to identify corrective actions; and
- Lack of tools to support proper integration of wetland water requirements into broader natural resource management.

These challenges led to Ramsar Resolution XII.12, *A call to action to ensure and protect the water requirements of wetlands for the present and the future*, and an updated *Brisbane Declaration on Environmental Flows and Wetland Water Regimes*, acknowledging that SDGs will not be met if the freshwater regimes that sustain and connect life are further degraded.

Contributions of environmental flows to the SDGs

Adequate environmental flows are crucial for ensuring access to clean water and sanitation for all (SDG 6), and for ensuring that wetlands can continue to deliver ecosystem services such as water purification and improved water quality (SDG 6.3). Environmental flows can also contribute to the protection and restoration of wetlands and other water-related ecosystems (SDGs 6.6 and 15.1). In fact, SDG indicators 6.4.2 (level of water stress) and 6.6.1 (change in the extent of water-related ecosystems over time) explicitly refer to environmental flows. Environmental flows are also important to the productivity of freshwater and estuarine fisheries (14.2), contributing in turn to the fulfilment of other SDGs, such as: SDG 1 (no poverty), SDG 2 (zero hunger), SDG 3 (good health and well-being), SDG 8 (decent work and economic growth), SDG 12 (responsible consumption and production), and SDG 16 (peace, justice and strong institutions). (Source: Arthington *et al.* 2018).

Wetlands contribute to 75 SDGs indicators



Wetland water requirements for the Ramsar Convention

The Ramsar Convention on Wetlands recognizes⁴ that water, wetlands and people are intrinsically linked and that all wetlands (whether at the local or basin scale) are crucial in the regulation of the water cycle, and in the provision of water-related benefits and services to humans. These are underpinning principles of integrated water resources management (IWRM). IWRM seeks to balance the conservation and sustainable use of water resources in the long term with the human use of their benefits and services in the short to medium term in cooperation with other sectors.

The Convention has recognized water-related issues, including IWRM and environmental flows, through numerous resolutions and guidance⁵ over the years, and more recently through the adoption of Resolution XII.12, which encouraged Contracting Parties to increase efforts to address the environmental flows of wetlands.

⁴ The preamble of the Convention refers to wetlands as "regulators of water regimes" (Ramsar Convention 1994).

⁵ See the Ramsar handbooks (4th ed) for the wise use of wetlands on *Water-related guidance* (No.8), *River basin management* (No. 9), *Water allocation and management* (No. 10), *Managing Groundwater* (No. 11), as well as the Ramsar Technical Report on *Determination and implementation of environmental water requirements for estuaries* (No. 9), available at: <https://www.ramsar.org/resources/ramsar-handbooks>.

Case studies on implementing environmental flows as a tool within water resources management

Murray Darling Basin (Australia) – A series of instruments have been adopted in the Murray Darling Basin to implement environmental flows, including a Basin Plan (2012-2019), a Basin-wide environmental watering strategy, regional water resource plans and a “sustainable diversion limit” (with an adjustment mechanism). This has led to the allocation of 2,107 gigalitres per year of water for the environment (as of October 2017), changed water operations and water-sharing rules, new water management structures, and the establishment of local and shared water recovery targets and of quantified environmental objectives. Constraints to floodplain inundation are now being targeted for removal. Since 2013 to 2014, more than 750 environmental flow events have been delivered to specific wetland sites across the Basin. Several of these sites, of high conservation value and cultural significance, are protected under the Ramsar Convention on Wetlands. Environmental flow-targeted monitoring revealed achievement of the following outcomes: increased waterbird breeding events; reduction in the rate of decline in bird numbers; increased movement and recruitment of native fish; and improved localized floodplain forest condition and regeneration.

Yangtze River (China) – The operation at the Three Gorges Dam, one of the largest dams in the world, was modified between 2011 and 2017 to mimic the river’s natural flood pulse and support the spawning of carp. As a result, more water could be released from the reservoir to improve downstream conditions for human livelihoods in the dry season. The Dam is a multi-purpose project that has major functions of flood management, electricity production, navigation and drought alleviation. Poyang Lake, a Ramsar Site, is a key area for flood retention, rice production and fishery support in the basin. In this example, conflict with existing infrastructure is being turned into a way to reconcile competing paradigms in climate change adaptation policies.

San Pedro Mezquital River (Mexico) – The San Pedro Mezquital River is a free-flowing river at the mouth of which lies the Marismas Nacionales Biosphere Reserve and Ramsar Site. A proposed dam prompted concerns over the impact of the development on the ecosystems and people that rely on the river. The Government enacted a decree that set the amount of water needed to maintain a suitable hydrological regime in the river. The River was designated as the first environmental water reserve in Mexico and it was one of the six pilot studies undertaken to test the concept of Environmental Water Reserves in Mexico (highlighted in Resolution XII.12). Since 2012, the National Water Commission, a federal agency, has developed a standard that establishes the principles and procedures to determine a regime of environmental flows in hydrological basins.

Mara River (Kenya and Tanzania) – Flowing from the Mau Escarpment through the rangelands around the Maasai Mara in Kenya and Serengeti National Park in Tanzania, the Mara River forms a floodplain wetland before discharging into Lake Victoria in Tanzania. The groundwork for a transboundary flow agreement between the two countries has been achieved, through national level assessments and continued support to Kenya’s Water Resources Management Authority and Tanzania’s Lake Victoria Basin Water Board on mechanisms to safeguard reserve flows, and support to the multi-stakeholder participatory water allocation process. However, there is a proposal to build dams for hydropower and irrigation on the Kenyan side of the river, which would not only reduce water flows into Lake Victoria but also destroy the Serengeti ecosystem. Mara River is vital for the Mara-Serengeti ecosystem, and any change to its regime, whether caused by direct human actions, climate change or both, may have serious impacts on the ecosystem.

Actions for conserving and managing environmental water for wetlands⁶

Governments at all levels should develop a clear legal, policy and organizational basis for regulating water use and allocation. As part of this process, they should recognize environmental flows as a core component of water resource planning and as a priority for the protection of ecosystem services and achievement of ecological objectives. In addition, improved knowledge of specific basin environmental flow requirements can improve trade-off analyses for decision support systems, enhancing the potential for cooperation between stakeholders and countries (in transboundary contexts). The recommendations below should be considered with the national context and existing policy and legislative frameworks in mind.

⁶ These actions draw in part from the WWF report *Listen to the river: Lessons from a global review of environmental flow stories*.

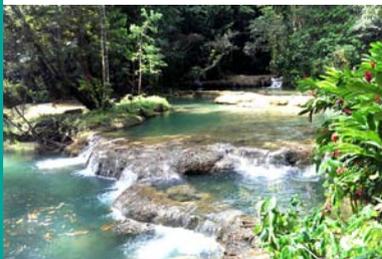




The following actions provide the building blocks for a framework for regional and national integrated basin water planning, with particular reference to wetland domains and contexts. They should be considered for integrating wetland environmental flows into river basin plans or national sectoral policies alongside available tools and approaches:

- **Consider setting clearly defined, timely and quantified environmental objectives** which are to be achieved by environmental flows and related resource management actions. Consider “SMART” (specific, measurable, achievable, relevant and time-bound) objectives; a hierarchy of objectives; measures of success, as a focus for monitoring; and social acceptance and envisioning of desired outcomes. Objectives should include references to responsibilities under multilateral environmental agreements and to ecological character descriptions for Ramsar Sites.
- **Consider setting water withdrawals standards** and limits that focus water management efforts on the most vulnerable or most valued wetlands, while steering future water development towards other parts of the river-wetland system. Consider land and water rights reform, water trading with a cap on consumptive uses and creation of environmental water reserves.
- **Consider establishing basin-scale environmental watering strategies** to define approaches to manage environmental water allocations within the local context and linked to relevant ecological, cultural and socio-economic objectives.
- **Consider assessing environmental flows to determine the requirements for different competing needs** (such as nature, energy, food and water supply) to inform multi-stakeholder dialogues, environmental policies, objectives and strategies and to enable the monitoring of interventions. Climate change modelling and scenario analysis should provide projections for future allocation objectives and policies based on robust trade-off analysis (that also includes ecological, social, cultural and economic parameters).
- **Consider building decision-support systems or coordinated planning and operational rules through multi-stakeholder dialogue** to target restoration of flow and water regimes to river reaches and other hydrologically connected wetlands. These must support the achievement of the quantified objectives and benefit the basin or wetland system overall, as well as other competing demands. Consider natural capital protocols, water infrastructure services of wetlands as a benefit to be optimized and structured social processes to develop desired objectives; and determine trade-offs and report on measures of success to negotiate water allocation.
- **Consider working directly with dam builders and operators** to find opportunities and understand constraints on design and operation of dams, related infrastructure and operating rules to provide environmental benefits to wetlands upstream or downstream, or to receive benefits from them. Consider multi-purpose dams, water release and reservoir re-operations and rules, water sharing and dam removal.
- **Consider fostering multi-stakeholder engagement and participation**, which are essential to build understanding between the multiple stakeholders with competing water demands, and determine optimal allocation strategies based on a balanced, benefit-sharing approach. Multi-stakeholder platforms provide the foundation for building more effective decision-support systems by increasing ownership and transparency. Consider working with: national, regional and local governments; local communities; river basin authorities; dam operators; private companies; irrigation, energy and water supply providers; civil service organisations, NGOs and academia.





Limitations and further research

The information above represents the seed elements of a “national action plan for wetland water requirements”. However, there are some additional policy considerations that need to be made for effective integration of wetlands into multi-sectoral river basin planning. The following processes can enable effective practice for managing the linkages between water, energy, land and ecosystems: collection and sharing of data and perspectives; mainstreaming of environmental flow assessments into project cycles by large water users, multiple levels of governance, from negotiation to collaboration; improvements in regulation and compliance; inclusion of social dimensions of environmental flows; formulation of collective multi-stakeholder and multi-sectoral quantifiable objectives for wetland water management; and consideration of an appropriate level of assembling and decision making.

Monitoring and the development of objectives should address all the relevant social, economic and ecological outcomes of restorative environmental flow actions. Monitoring should also be focused on measuring and reporting on successful achievement of ecological, cultural and socio-economic objectives, where these have been defined.

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The Ramsar Convention



The Convention on Wetlands, also known as the Ramsar Convention, is a global inter-governmental treaty that provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources. It is the only global treaty to focus on one single ecosystem.