© Roel Slootweg

WORKING WITH NATURE IN THE WATER (MANAGEMENT) SECTOR

This document is part of the "Working with Nature" Quick Tips series, comprising 7 sectoral Quick Tips on Agriculture and Livestock, Cities, Disaster Risk Reduction, Forestry, Renewable Energy and Transport.

The close links between water and nature

Water is an extremely broad sector ranging from river basin and water quantity management, water supply and sanitation, to disaster risk reduction (DRR) and the fight against desertification.

The water sector is intricately linked to nature. Well-functioning ecosystems maintain the water cycle (evaporation, runoff, storage, purification, infiltration, drainage) and influence the availability of water and its quality. Nature is a consumer, provider and regulator of water, including many water-related ecosystem services (e.g. water supply to people, agriculture and industry; water quantity and quality regulation; transporter of sediments, nutrients, pollutants; provider of renewable energy; substrate for economic activities such as shipping, fisheries, aquaculture and tourism; provider of connectivity for aquatic species; etc.). Therefore, examples of green and blue infrastructure, nature-based solutions and payment for ecosystem services schemes abound in the water sector.

Water sector interventions create serious problems. Escalating water abstraction rates, flow modification, wetland habitat conversion, flood protection measures, increased nutrient loads and pollution have altered aquatic ecology worldwide. Freshwater ecosystems have high numbers of species under threat of extinction and show fast rates of biodiversity loss. Wetlands are particularly threatened.

How the water sector can benefit from nature

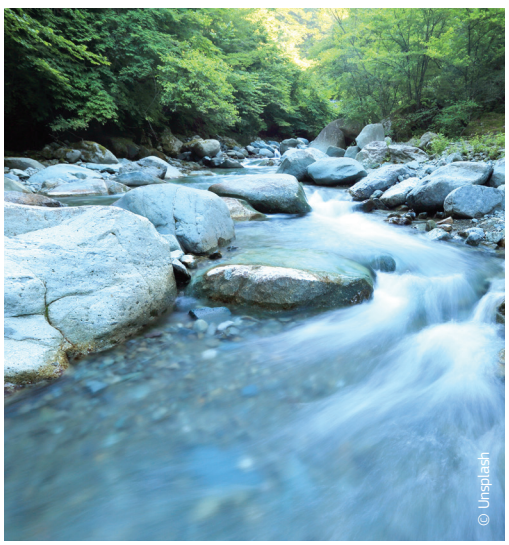
The 2022 *Global Biodiversity Framework* requires us, by 2030, to restore at least 30% of degraded inland water and coastal ecosystems (target 2), effectively conserve and protect another 30% (target 3), and to restore, maintain and enhance ecosystem functions and services, through nature-based solutions (NbS) and/or ecosystem-based approaches for the benefit of all people and nature. Some specific objectives of *integrated water resources management* (IWRM) can be addressed by working with nature:

- **Urban water management** - Protecting biodiversity and natural vegetation in catchment areas prevent the pollution of water sources, reduce erosion and prevent floods and help to deliver clean and reliable water. Natural areas within cities can provide natural infrastructure to support drainage and storage (see urban sector note).
- **Agricultural water management** - Intact floodplains regulate seasonal water flows, securing water availability and quality for agriculture and industry. Buffer strips along water bodies reduce the run-off of nutrients, chemicals and sediments from farming. Vegetation regulates local climates and groundwater infiltration thus securing water for farming and livestock.

- **Water management for dams and hydropower** - The management of vegetation and soils in catchments to prevent erosion and reduce sediment loads in reservoirs has long been good practice. Increasingly, ecosystem restoration is also used to improve dam efficiency and economic lifespan. Healthy watersheds regulate both surface and groundwater recharge of reservoirs (see hydropower note).
- **DRR and climate change adaptation** – Ecosystem degradation contributes to water-related disasters. Conversely, intact ecosystems can be a means of DRR by augmenting or replacing built infrastructure, often at reduced operational and capital costs. Similarly restoring soils and vegetation in dryland landscapes is an effective response to reducing risks from drought (see note on DRR).
- **Protection of infrastructure** – restored or enhanced ecosystems can play a role in protecting costly infrastructure from being washed away or threatened by landslides; vegetation cover reduces flow velocity of water, stimulates water infiltration, and avoids soil erosion. It may reduce costs of climate adaptation in infrastructure design (e.g. for roads and railways), simultaneously providing co-benefits, for example in harvestable products or biodiversity conservation.
- **Drinking water supply** - Delivering clean water is already one of the primary motivations for establishing nature protection areas. Where poor water quality exists, it is increasingly evident that improving catchment management can be much more cost-effective than treating water through artificial means.
- **Climate change mitigation** –Wetlands such as coastal mangrove forests, and natural floodplains provide a strong co-benefit in absorbing greenhouse gasses and act as carbon sinks. Peatlands store at least twice as much carbon as all of Earth's forests; mangrove soils can sequester up to 3-4 times more carbon than dryland forests.

Priorities for action:

- **Apply ecosystem services-based approaches** which offer the water sector the opportunity to improve its own water performance whilst simultaneously improving the status of biodiversity and contributing to a broader development agenda.
- **Carry out basin-scale ecosystem conservation and restoration investments**, based on water quantity and quality requirements for healthy freshwater and coastal ecosystems, including groundwater-dependent wetlands or lagoons.
- **Establish watershed protection schemes, such as payment-for-ecosystem-services**, to link downstream and upstream communities, and protect vital headwaters and recharge areas, from unsustainable practices in land-use value chains.
- **Harness nature-based-solutions for improved resilience**, including natural water retention measures (floodplains, wetlands and mangroves) to minimise flood and drought risks, and 'soft' investments such as early warning systems and improved spatial planning, hampering construction in floodplains and fostering 'sponge cities'.
- **Water quality is best maintained by functional and healthy wetlands and freshwater bodies**; constructed wetlands can assist in the pre-treatment of wastewater.
- Improve water use efficiency, and sustainable consumption of water-dependent products.
- **Dismantle obsolete infrastructures to recover free-flowing rivers**; restore water, nutrients and sediment flows to deltas, estuaries, coasts, and beaches and recover biodiversity migration corridors.
- Encourage EU partner countries to **adopt and apply the** *UNECE Water Convention*.
- Encourage **cross-country collaboration** platforms and joint initiatives and apply *water diplomacy* to leverage the environment and promote climate resilience.



The Case of the Bragues Demonstration Site in France

Case highlights

Nature-based solutions (NbS) for flood risk mitigation in the Brague catchment are economically more beneficial than traditional grey engineering solutions. This is largely caused by the co-benefits associated with NbS. Flash floods cannot entirely be avoided by upstream measures in this type of river basin so downstream spatial planning measures are needed in support of NbS to create sufficient room for the river. This requires involvement of a broad group of stakeholders.

Case history

The Brague basin measures 61 km², and combines rural headwaters, a forested central part and urban lowlands on the French Riviera. On 3rd October 2015, severe rainfalls triggered dramatic flash floods. Twenty people died, about € 550-650 million in losses were observed, as well as cascading complications on transportation, communication, and energy networks. The flood event has been used for an in-depth study of torrential flood hazards and risks, the effects on ecosystems, and the effectiveness of nature-based flood solutions as compared to traditional engineering approaches.

The impacts of classic "grey" solutions for flood mitigation strategies were assessed against NbS. The grey solution included huge retention dams, concrete channels, and measures to avoid bridges becoming obstructed with trees and debris. NbS combine retention measures that give room to the river by creating small natural water retention areas in the upper catchment and widening the river corridor in the lowlands, enhanced by floodplain works including bed and bridge widening, maintaining of a forest corridor, wetlands restoration, and debris management. They are integrated in a so-called "giving-room-to-the-river" strategy.

Flood modelling demonstrates that traditional engineering techniques such as retention basins and channelization of water courses are not capable of coping with extreme events such as the October 2015 flood. The broader message is that in rivers hit by large-scale Mediterranean thunderstorms, even a high level of ambition on retention measures in the upper and mid-catchment is insufficient to prevent flooding of downstream floodplains. Therefore, a sufficiently large corridor must be maintained so that such rivers can convey water. Protecting built up areas may become extremely expensive or even impossible so new construction works should be avoided. Large corridors are most resilient, sustainable and provide numerous co-benefits, but require a long-term land-use strategy which has to be accepted by all local stakeholders

Best practice lessons

NbS solutions were found to have lower costs of implementation than grey solutions for the same level of risk reduction. However, the economic benefits arising from the reduced flood damage are not sufficient to fully cover the investment, maintenance, and opportunity costs. It is the co-benefits of NbS that makes the measures economically interesting.

NbS for water-related risks can thus not automatically be assumed to be economically efficient. There is a need for an economic evaluation to identify the most suitable strategy in a context of limited public funding. The high value of the co-benefits leads to the need to maximise co-benefits in the design of the solution. Apart from reducing peak flows and flood risks, co-benefits in the Brague catchment included climate change adaptation; reduction of drought risk; improved resilience of infrastructure and local populations; better protection of coastal ecosystems.

It is essential to build and choose solutions on strong physical evidence, accepted and understood by traditional (technical) flood risk managers, but also to consider other environmental and social features and to make them accepted and implemented by stakeholders, preferably through a participatory approach.

Elsewhere: DRAVA LIFE (2015-2014) – Integrated management of rivers in Croatia
The Drava is one of the last semi-natural rivers in Central Europe. Hydropower development has left a free-flowing section in Croatia, with a length of 310 km, including 4 Natura 2000 sites. Key natural features of the riverine ecosystem are restored to showcase this innovative approach of river management. The restoration encompasses the opening of new side-arms, removal of embankments and groins, as well as the preservation of retention areas and natural steep riverbanks. This will benefit endangered habitats and species within Natura 2000 sites. Furthermore, the restoration is favourable for flood control by lowering high water levels locally, and diverting water away from settlements, bridges, roads and dikes. Climate and disaster resilience of floodplains will be enhanced by increased infiltration of river water and higher groundwater levels. Recreational opportunities for local inhabitants will increase. Extensive awareness raising activities will be organized in cooperation with local citizens and schools.

Further information and support

- *QuickTips on Working with Nature*
- QuickTips on *Integrating the Environment and Climate Change in Water Resources Management*
- Case: *NAIAD Case Studies: Brague Demonstration site (France)*
- EEA: *NbS in Europe for climate change adaptation and disaster risk reduction*
- UNEP: *Ecosystem based adaptation. Selected cases from Africa*, *https://www.unep.org/explore-topics/disasters-conflicts/what-we-do/disaster-risk-reduction/ecosystem-based-disaster-risk*
- EWN: *Engineering With Nature® An Atlas* (118 examples from around the globe)
- *Water and Biodiversity. Summary of the findings of the Fourth Edition of the Global Biodiversity Outlook*
- WMO/GWP - *Associated Programme on Flood Management* (APFM)

All documents are available on capacity4dev (public group: *Environment, Climate Change and Green Economy*)

Contact INTPA and NEAR Environment & Climate Change Mainstreaming Facility:
INTPA-GREENING-FACILITY@ec.europa.eu | *NEAR-GREENING-FACILITY@ec.europa.eu*