AQUA !
PATRIMOINES DE L'EAU
WATER HERITAGE

Water and society: shared past, shared future

European water standards must integrate the reality of water heritages and move toward a society-centered view of water management

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Taking into account millennia of interaction between nature and society

Europe's rivers, ponds, lakes, water bodies, wetlands and canals are the result of a long history of interaction between nature and society, spanning several millennia.

The water in our environment is thus a physical and cultural, social and economic, material and symbolic phenomenon: all these dimensions are intertwined. Only an integrative, global and open vision of water will support sustainable ecological transformation.

This complex, hybrid reality of water heritages, their new ecosystems and their multiple uses is already highlighted by scientific research, especially within the Water-Energy-Food-Society-Ecosystem Nexus.

Today this European approach is not fully translated in the various legislations and there is still a gap to match with local scale and the riverside communities' realities on the field.

KEY POINTS

Water heritages are human and natural constructions. Aquatic socio-ecosystems are the result of centuries of interaction between nature and human activities. To be effective, their management must recognize this hybrid reality.

Hydraulic structures also create ecosystems and ecosystem services. Man-made infrastructures are not simply impacts. They may also generate new environments favourable to biodiversity and contribute to sustainable water management.

The services rendered by water need to be better evaluated. Aquatic ecosystems, whether natural or man-made, provide numerous ecological and social services. Before intervening, it is essential to fully understand these benefits, which are too often underestimated.

River restoration must be rigorous. Restoration projects are too often poorly monitored and the results uncertain. It is crucial to develop more robust and objective methods for assessing their success, including the social dimension.

Water policies must include social issues. Water management is not just about ecology and natural sciences. Social, economic and heritage interests must be taken into account to avoid biased decisions.

Local perceptions and realities must guide management. Expectations and perceptions of rivers vary according to the players involved, the uses to which they are put, and their impact on the environment.

Water management is a question of shared governance. Water management must be democratic, involving all stakeholders. Only participatory governance can guarantee sustainable and equitable management of water resources.

1. Nature and human are not separated

The European Union's main standard-setting text is the **European Water Framework Directive**, adopted in 2000 and due for revision in 2027. The directive is problematic in its underlying vision of water. Everything seen as human intervention in nature is analysed as an impact.

The reference state of nature is seen as a nature without humans (or with a minimum of humans), which becomes a normative objective. This point of view has given rise to numerous and growing criticisms in scientific literature.

European aquatic environments have long been shaped by human activities, so their current nature is "**hybrid**", a natural and human co-construction (Lespez et al 2015, Verstraeten et al 2017, Brown et al 2018).

The notion of a reference state is therefore problematic, particularly at a time when climate change is altering what was the previous historical state, considered to be the natural reference of watersheds (Bouleau and Pont 2015).

The naturalistic ontology separating nature and humans fails to recognize the diversity of appropriations and interpretations of the environment (Linton and Krueger 2020, Lévêque 2020, Collard et al 2021).

More than just "restoring nature", today we are talking about improving the way in which humans and non-humans co-exist in ever-changing environments. The question we need to ask ourselves is: "What kind of nature do we want?" according to ecological, social, economic, aesthetic and ethical criteria.

The reality of European rivers and waterscape

A study by Belletti et al. (2020) found approximately 1.2 million barriers fragmenting European rivers, ranging from large dams to smaller structures like weirs and culverts. This extensive network of barriers significantly disrupts river connectivity, impeding sediment transport, altering hydrological regimes, and affecting migratory fish populations.

The authors emphasize that while removing barriers is a key ecological solution, socio-economic considerations and local context must guide decisions. They highlight the need to balance ecological restoration with human demands for energy, water management, infrastructure, leisure and amenities. The study advocates for integrated river management approaches, involving stakeholders to align ecological goals with societal needs. European rivers are predominantly "socio-natural" systems, shaped by millennia of human activity (Brown et al 2018).

Yet the implementation of European Water Framework Directive (WFD) has failed to classify most rivers as "heavily modified systems," despite this being the biophysical, historical and legal reality.

2. Human-water interactions also create ecosystems and new environments

A hydraulic structure cannot be reduced to an “impact”: it also creates a new environment.

The structure is associated with reservoirs, canals, aquatic or wetland annexes. These environments have been referred to in scientific literature as new ecosystems (Hobbs et al 2006, Backstrom et al 2018) or anthropogenic cultural ecosystems (Evans and Davies 2018).

It has recently been suggested that small river structures should be interpreted as **ecotones**, transitional environments with environmental gradients (Donati et al 2022).

It has also been pointed out that the environments created by these structures (reservoirs, canals, wetlands), numbering 500,000 for a country like France, are today absent from the management framework of the European Water Framework Directive, often orphaned from studies and management (Touchart & Bartout 2020).

In some cases, a river with a structure enters a stable alternative ecological state: it lacks its former natural dynamics but reorganizes energy and sediment flows and biotic communities in a new configuration (Skalak et al 2017).

Environments of artificial origin have beneficial effects on certain aspects of aquatic biodiversity, be they canals (Guivier et al 2019), local reservoirs (Fait et al 2020), ponds (Wezel et al 2014), mill weirs (Sousa et al 2019), small water bodies and other human hydraulic environments (Chester and Robson 2013, Davies et al 2008, Hill et al 2018, Bolpagni et al 2019, Vilenica 2020, Koschorreck 2020, Zamora-Marín et al. 2021).

Hydraulic structures do not necessarily pollute or eliminate aquatic and wetland environments; they also create new environments and host biodiversity, sometimes greater than that of the previous environment. Hydroclimatic change accentuates the role of refuge and resource that these structures can play, including for surrounding terrestrial biodiversity.

Conservation in man-made waters: a case for freshwater mussels

36 experts in freshwater mussel conservation have published a synthesis on the role of anthropogenic habitats. Their study highlights that these human-made habitats can offer underestimated opportunities for species conservation, particularly given the rapid alteration of natural freshwater ecosystems and accelerating biodiversity loss.

By compiling 709 records of freshwater mussels inhabiting various anthropogenic habitats, including canals, reservoirs, and artificial ponds, they identified 228 species, including 34 threatened ones listed on the IUCN Red List, with most data coming from Europe and North America.

While anthropogenic habitats can serve as critical refuges for freshwater mussels, they can also act as ecological traps due to incompatible management practices or population sink dynamics. Consequently, the study underscores the importance of context-specific management.

Read more at : Sousa, R., et al. (2021).

3. Water heritage assets also provide numerous ecosystemic and social services

To analyse a man-made hydraulic structure as merely an impact that should ideally be eliminated ignores the many scientific studies that have shown that such structures can have economic and social, as well as ecological, benefits.

Research has shown that small water bodies can provide up to **39 ecosystem services** (Janssen et al 2020). As for examples:

Thousands of small weirs contribute to the renewable energy generation through hydroelectric equipment (Punys et al 2019, Quaranta et al 2022). This decentralised and renewable energy allows to utilize existing infrastructures and to generate local economic benefits. Reservoirs help to clean up nitrogen and phosphorus inputs into watercourses (Passy 2012, Cisowska and Hutchins 2016), and sometimes pesticides (Gaillard et al 2016, Four et al 2019).

Hydraulic structures and their appendages, such as canals and ditches, maintain a low-water line, recharge groundwater and retain winter water, while their removal has the opposite effect, incising the bed and accelerating flow (Aspe et al 2014, Maaß and Schüttrumpf 2019, Podgórski and Szatten 2020). The dam reservoirs can also be seen and managed in the future as a refuge from climate change (Beatty et al 2017).

Hydraulic structures are embedded in a cultural, societal and historical heritage that is a mode of co-existence attentive to natural environments (Lejon et al 2009, Sneddon et al 2017, Dabrowski et al 2022).

The removal of water heritages in countries where it has been strongly supported raises social controversies and sometimes produces questionable results (Barraud and Germaine coord 2017, Bravard and Lévêque 2020).

All the benefits of new ecosystems created by humans need to be analysed before intervention, with 39 potential ecosystem services for society. Rather than a bio-centric or geo-centric view of an unchanged nature, we need a socio-centric approach of water as a social construction with mutual benefits for humans and non-humans.

European project Interreg Europe Wave: water-linked heritage valorisation

The European project Wave brought together 5 territories—Breda (Netherlands), Aarhus (Denmark), Ravenna (Italy), Alicante (Spain), and the Ister-Granum region (Slovakia-Hungary)—to exchange knowledge and promote the adaptive reuse of water-linked cultural heritage sites.

It emphasized the role of water in addressing societal challenges, connecting urban and regional transformations with energy, mobility, and blue-green spaces. The Wave manifesto summarizes lessons in 10 points to guide policy changes across Europe and beyond. It highlights the role of water and related heritage in tackling climate change, resource overconsumption, and fostering a circular economy through transformations in energy, mobility, and water management.

Available at: https://projects2014-2020.interregeurope.eu/wave

4. The future of water as our common heritage is a democratic question

While all European texts insist on consultation with stakeholders, the restoration of rivers and wetlands tends to forget about citizens and gives precedence to the expert approach (Vos and Boelens 2020), particularly that based on natural rather than social sciences (Wei and Wu 2022).

Restoration policies, often driven by technical choices, **lack consultation with stakeholders**, and ignore debates on social and environmental values (Perrin, 2019; Dufour et al, 2017). These projects affect social and economic issues as much as ecological ones, raising conflicts of interest between ecological continuity and the conservation of artificial ecosystems (Drouineau et al, 2018).

Decision-making on projects such as weir and dam removal requires a more inclusive and balanced approach, taking into account the complexity of ecosystems and societal needs (Lejon et al, 2009; Zingraff-Hamed et al, 2017; Dufour et al., 2017). Furthermore, the management of environmental flows, based on pre-anthropic states, is undermined by climate change, necessitating a revision of these criteria (Kendy et al., 2012).

These environmental flows or Eflows are often perceived as a simple technical issue. However, this issue goes far beyond hydrological data. Behind decisions on water flows lie political issues, power struggles and divergent if not conflicting visions of the nature and role of rivers in our societies (Alexandra et al 2023). Social perceptions of rivers vary according to groups and their geographical positions, demonstrating the need to further integrate the diversity of local expectations into management (Boyer et al, 2018).

The management of rivers, wetlands and water heritage is not just a matter for experts inspired by the natural sciences, but first and foremost a matter of democratic choices with a diversity of viewpoints on the trajectories of living environments. The water social sciences and the humanities need to be mobilized to a greater extent, just as the promise of inclusive governance needs to be genuinely fulfilled in watersheds.

A successful experiment in citizen participation

The watershed syndicate of the Drôme River undertook an experimental initiative to promote citizen participation in water management as part of the Interreg Alpine Space program, funded up to 85% by European funds.

This European SPARE Project (*Strategic Planning for Alpine River Ecosystems*) was carried out from 2016 to 2018 in 5 Alpine valleys following three phases: co-constructing the framework for participation with citizens, creating a shared assessment with citizens, and drafting an action plan to integrate into the SAGE (Water Development and Management Plan).

A “Water Debate” group met regularly. This project accounted for over 800 proposals during the SAGE revision process. Since 2018, citizen observers have been able to participate in CLE (Local Water Commission) meetings.

LEGAL CHANGES ARE ESSENTIAL

In the light of this scientific work, reinforced by the field experience of riverside communities and managers of water heritage, we are calling for **several fundamental points to be included in the evolution of European water standards, in particular the future revision of the European Water Framework Directive.**

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IS ASKING FOR:

- **the recognition of anthropogenic and cultural ecosystems in European laws, with the need to study and protect them too.**
- **the obligation to carry out a complete and sincere analysis of ecosystem services, not limited to endemic biodiversity or "natural" functionalities but including all socio-ecological dimensions.**
- **the need to balance biodiversity or natural integrity issues with energy, water regulation and climate issues, with the fight against climate change (prevention, adaptation and mitigation) taking precedence in the event of conflicting standards.**
- **the urgent need to combine, rather than oppose, nature-based, culture-based and technology-based solutions to guarantee a resilient management of water, at a time when we are facing critical episodes of drought or flooding.**
- **the imperative of more inclusive governance where all visions of water can participate in shaping decisions, recognizing the diversity of social aspirations.**

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