# Briefing for the Hydropower Sector

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## Mainstreaming aquatic restoration using Nature-based Solutions: supporting transformation

A collaborative approach with key economic sectors is essential to enable the H2020 MERLIN project to promote systemic transformative change. We co-develop transformation strategies with different sectors to **mainstream restoration as a Nature-based Solution (NbS)**. Working with nature at landscape scale can contribute to the EU Green Deal objectives (climate resilience, improved biodiversity, zero pollution, sustainable food systems, health, and wellbeing).

> NbS has been defined by the International Union for Conservation of Nature (IUCN) as "actions to **protect, sustainably manage,** and **restore** natural or modified ecosystems, that address **societal challenges** effectively and adaptively, simultaneously providing **human well-being** and **biodiversity benefits**"[1].

This briefing focuses on the **Hydropower** Sector. It summarises MERLIN's understanding of the sector's current connection with rivers and wetlands, and how NbS are viewed within the sector at the start of the collaboration. The briefing proposes how MERLIN (for more information visit www.project-merlin.eu) can support the Hydropower Sector to implement NbS.

## How can MERLIN support transformation?

The Hydropower Sector can play a crucial role in responding to Europe's Green Deal objectives, as the Biodiversity Strategy 2030 aims to restore at least 25,000 km of rivers to free-flowing by 2030. Transformation whereby NbS becomes the new normal will only happen through multiple actions involving government, markets, and citizens. MERLIN support this through understanding how and why the Hydropower Sector is already making positive changes, sharing good practices between European countries, and exploring how NbS could help overcome some of the challenges faced by the sector. The briefing is based on a range of insights from involving individuals actively engaged in the Hydropower Sector (using Round Table Discussions (RTDs), questionnaires, interviews) and a desktop review of formal documents. The MERLIN team is very grateful for the insights shared to date, which have helped to understand the different positions. The synthesis provided in this briefing reflects the views of the authors and does not imply consensus within the developing Community of Practice of MERLIN. The **Community of Practice** concerns EU and Member State level policy and commercial actors of the Hydropower Sector who share a common interest in improving their practices better through regular interaction and sharing information.



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## Relationship of the Hydropower Sector with freshwater restoration and NbS

### Brief description of the sector

Hydropower is one of the largest and oldest sources of **renewable** energy, involving the generation of electricity from the flow of water through turbines. Types of hydroelectric generation plants are reservoir power plants, run-of-river hydropower, pumped storage hydropower and hidden hydropower in conveyance networks (drinking water, wastewater, agricultural channels). Currently, hydropower contributes 13.8% to overall net electricity generation[2]. There are 21,387 hydropower plants in the EU, while 8,785 additional plants have been proposed or are under construction (Figure 1).

The **efficiency** of hydropower dams is an important factor for the sector (that may decrease as dams age) that has helped lead to the removal of large dams, as they become less reliable and costly to upgrade by age[5]. It must be noted that there are many other in-river dams across catchments that are not directly linked to hydropower generation, but to agriculture, water supply and sanitation, or navigation. Hydropower-related dams represent less than 2% of the approximately 1.2 million obstacles built in waterways[10]. However, the sector has an important role to play in **river restoration**. Firstly, because the sector as a whole is at a turning point now, due to a large number of ageing dams. In Europe, an average hydropower plant is 45 years old, which requires a structural transformation. This is a **unique opportunity** to conduct this transformation in line with the Green Deal objectives. Secondly, the removal of these ageing and no longer economically viable dams would have relatively less negative socio-economic consequences compared to other dams that provide water supply or irrigation for example. Moreover, removing dams that are no longer economically viable is beneficial for the sector, not only cost-wise, but also because hydropower plants have a more and more negative reputation in several parts of Europe.

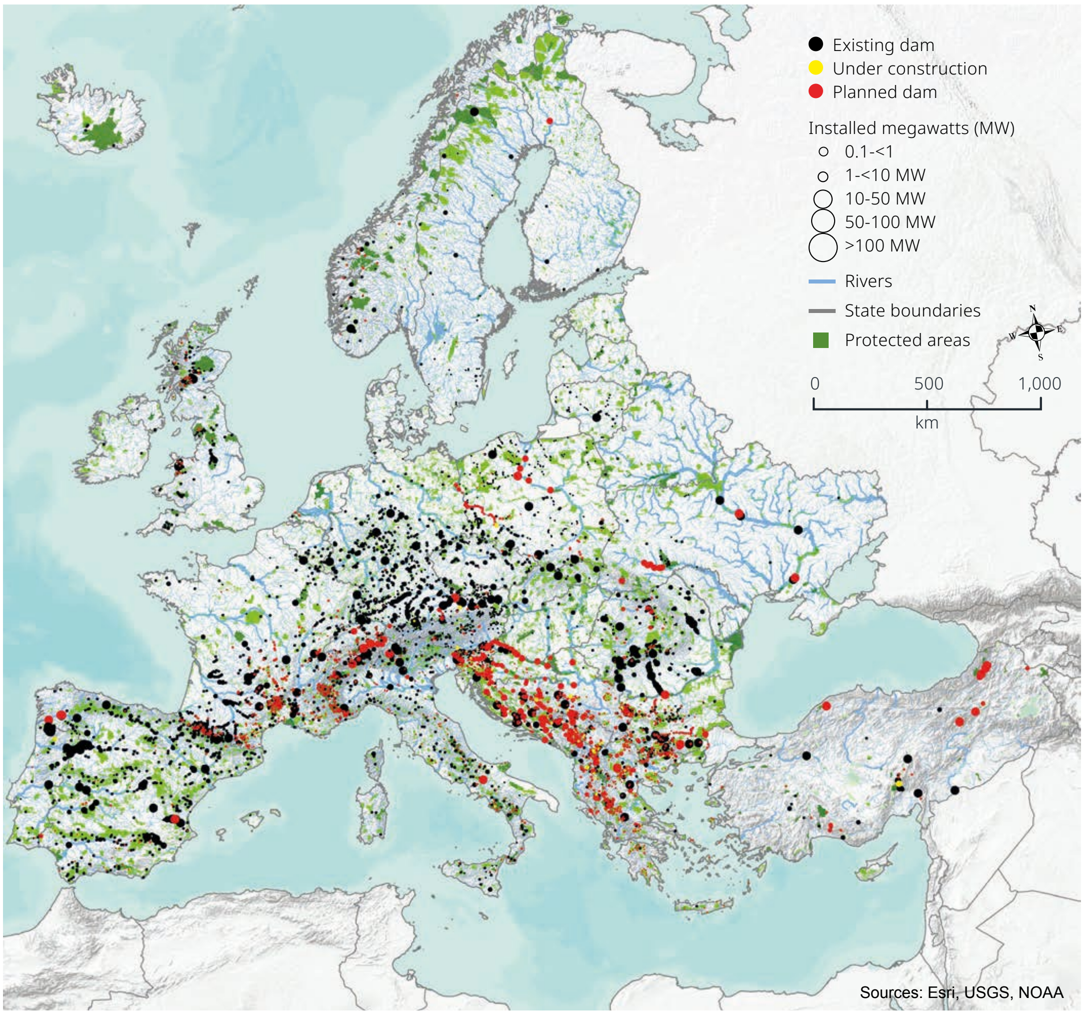


Figure 1. Distribution of recorded hydropower plants in Europe[3]



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## NbS and their potential for supporting the sector

NbS and their potential for supporting the sector ecological requirements (e.g. flow requirements attached to licences), technological improvements and sustainability standards mean the sector is moving towards reducing negative social and ecological impacts. However, these practices are far from being **mainstreamed** and many social, environmental, and economic challenges remain for the sector. Therefore, NbS could help address a range of these challenges, while the sector itself can be instrumental in enabling the implementation of catchment scale NbS.

NbS practice in the Hydropower Sector could be advanced through various pathways. For example, decisions to use technology that does not impede the natural flow of water (i.e run-of-the-river turbines). This maintains natural flows, preserves freshwater ecosystem health and provides a range of opportunities for upstream river restoration. Another example is removal of obsolete in-stream barriers. In river barriers alter the hydrological dynamics of a river section and alter freshwater ecosystems with ecological consequences. Removal of obsolete barriers could help restore natural flows, create opportunities for upstream restoration (e.g. for migratory fish and different recreational opportunities) and can also help to strategically tackle other socio-economic challenges. Such socioeconomic challenges could include the need to better management the impacts from extreme weather events within a catchment for industry whilst also increasing the resilience of local communities and restoring local biodiversity. Mainstreaming NbS within the sector could also help strengthen sustainability practice within the Hydropower Sector, i.e. by helping to apply the hydropower sustainability standards. Furthermore, such actions could also open up space to discuss and explore changing social values of freshwater ecosystems to incorporate local stakeholders who may feel marginalised by traditional practices. Achieving this to also provide benefits for the sector will be transformative and will involve greater cross sector collaboration.

## How the sector currently understands NbS

Nature-based solutions is not a widely understood concept within the sector. The current relationship to restoration in the Hydropower Sector involves three broad views:

- → Ecosystem restoration through dam removal is seen as a threat to meeting climate mitigation objectives through hydropower, thus dam removal at scale needs to be resisted. The sector stresses that there are other dams and obstacles in rivers that are not hydropower and could be removed instead of hydropower dams.
- → Negative ecological consequences of hydropower are an issue and need to be reduced or mitigated. These impacts are often narrowly viewed in terms of fish migration, and fish passages seem to be the preferred option before dam removal for the sector, forgetting water, sediments, and nutrients flow, as well as restoring ecosystem functionality. Policy frameworks exist which the sector needs to comply with.
- → Ecosystems have been degraded by sector activities and more widely, and the sector needs to make a positive contribution to biodiversity and ecosystem services.

The second view seems to be the most prevalent to understand the sector's current relationship with restoration. However, in relation to dam removal social dimensions (if considered) are often narrowly defined in terms of local livelihoods (tourism sector, subsistence). **Human well-being** considerations of ecosystem restorations are often overlooked. This is despite the sector recognising its reliance on and role in shaping a range of ecosystem services (e.g. reliance on water and changes to water quality and fisheries). Dam removal has to be inspected through the NbS lens with the consideration of specific societal challenges. IUCN currently refers to seven societal challenges (climate change adaptation and mitigation, disaster risk reduction, reversing ecosystem degradation and biodiversity loss, human health, socio-economic development, food security and water security) and follow the NbS process accordingly, using the Global Standard on NbS[7].


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## Good examples of NbS for the Hydropower Sector

As mentioned above in the section "NbS and their potential for supporting the sector", several NbS practices are already applied in the sector, yet the most efficient one is considered to be dam removal, when in line with NbS. Therefore, in this briefing, we selected four examples of hydropower barrier removals from different parts of Europe (listed in Table 1), where this solution proves to be an NbS.

| Initiative (name, locations, date) | Key driver highlighted | Lead stakeholders/funders | Retrieved from (link) |
|---|---|---|---|
| UNIPER plant on the Mörrum River, Sweden, 2020 | → Fish migration<br>→ River connectivity | UNIPER funded the plant's removal with financial support from several other stakeholders, including the Baltic Salmon Fund and Life Connects | http://www.fiskmarknad.org/images/Presentationer/FM2016-Dag-2-1450-Johan_Tielman-Dam_removal.pdf |
| Molló Dam Removal in Catalonia, Spain, 2020 | → Located in a Natura 2000 site and considered a trout genetic reserve | Coordinated by the Department of Territory and Sustainability, and the Catalan Water Agency. | https://damremoval.eu/mollo-dam-removal-in-catalonia-spain/ |
| La Roche-qui-boit and Vezins on the Sélune, Normand, France, 2019 & 2021 | → Fish migration<br>→ Water quality problems<br>→ Low energy productivity of dams<br>→ Regulatory obligations (e.g. make safe for local community) | Environmental Defense Fund, supported by Patagonia (similar to other schemes) | https://www.ern.org/en/selune-libre/ |
| Fåvang, Innlandet, east Norway – Old dam (not used in 50 years) | → Fish migration<br>→ Safety (the dam was blown up as there was a rack in the middle) | Norwegian angling club Gud-brandsdal Sportsfiskeforening; public funding | https://damremoval.eu/explosive-dam-removal/ |

Table 1: Examples of NbS for hydropower-dam removal

## Challenges and Opportunities of the Hydropower Sector

### Challenges

- **Water availability:** Climate change on the one hand increases water scarcity risk and decreases water availability. On the other hand, it induces more severe natural hazards, such as floods and landslides, which contests the resilience of dams[4].
- **Negative reputation of hydropower:** The sector is increasingly recognised as holding some responsibility for the decline in freshwater biodiversity.
- **Economic viability:** Hydropower increasingly may not be the cheapest renewable energy option because of decreasing costs of alternative technologies, such as solar and wind. This could hinder new development, and for refurbishment, it is a factor that needs to be considered.
- **Operational costs:** Ageing of hydropower plants can incur higher maintenance costs (e.g. to maintain structural integrity or capacity, and to meet shifting legal and/or societal expectations).

### Opportunities

- **Enhancing localised climate resilience:** Hydropower dams can hinder local community's climate resilience with a changing climate requiring both mitigation and adaptive action[5]. The focus on climate adaptation and aspects of social justice could provide entry points into a discussion about how NbS could complement and strengthen the sector.
- **Targeting less viable dams:** Some hydropower schemes can be adapted and modernised to increase capacity and cost effectiveness, while there is also recognition that some hydropower structures will be retired. There are also many dams not in use that could be removed. This represents 'low-hanging fruit', and could be considered as part of a transformation strategy, if approached in terms of NbS (i.e. as part of a catchment scale strategic plan).


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- **Linking to the EU Taxonomy:** As for financial opportunities, the EU Taxonomy could be used to support investment in dam removal as part of a NbS approach with its principal goal is to help the EU scale up sustainable investment and implement the European Green Deal. The Taxonomy regulation's main objectives include climate change mitigation, adaptation, sustainable use and protection of water and marine resources, and protection and restoration of biodiversity and ecosystems[8]. However, currently there are concerns regarding how the delegated acts are defined, and the Taxonomy needs to include NbS more specifically.
- **Drawing on diverse finance mechanisms:** Green finance mechanisms could incentivise NbS application in the sector. The Climate Bonds Standard is also helpful in providing guidance for developers, banks, governments and others for direct investment on ensuring climate change resilience, improving environmental and social sustainability[9].
- **Working at scale with other sectors:** Dams may be linked to other uses (now or in the past) such as agricultural irrigation, navigation and water supply and sanitation, and achieving the EU Green Deal needs to involve all such sectors. Across a catchment, opportunities for multisector NbS could be identified, potentially opening up additional finance options.

## Cooperation (MERLIN & the Hydropower Sector)

MERLIN needs to base suggestions on transformation and mainstreaming on **practical experience**. There are many different aspects of how the Hydropower Sector may connect to NbS.

In order to be the most effective and reach low-hanging fruits, MERLIN would like to **facilitate dam removal where dams are no longer economically viable and are more beneficial to society when removed**. In the MERLIN project we will focus our work with the sector on the issues in bold:

- **Help to develop tools** to assess the costs and benefits of aging hydropower dams which includes externalities as well, such as biodiversity degradation and socio-economic impacts.
- **Offer tools** to the sector to assess costs and benefits to help decision making about the removal of in-river barriers (e.g. that are not economically viable and for restoring freshwater ecosystems).
- **Draw on existing examples of dam removal** (such as the La Roche qui Boit example above) to develop understanding of NbS and dam removal across the sector.
- Work to support the development of **cross sector partnerships** involving hydropower organisations for more holistic approaches and large catchment scale NbS for restoration through dam removal.
- Develop an understanding about key entry points into **decision making processes** about future economic viability of dams to ensure consideration of NbS as an option.
- Develop an understanding and awareness of different **finance mechanisms** for supporting dam removal and NbS as a financially feasible path for the sector.
- For **cross sectoral cooperation** the relationship between the Hydropower Sector and freshwater NbS has to be understood. In general, all the MERLIN sectors (Hydropower, Navigation, Peat Extraction, Agriculture, Insurance) rely on the others to manage water resources better to avoid floods and droughts that mean that their sectors can continue to operate profitably. If not well managed hydropower barriers and regulation of water can be in conflict with Water Supply and Sanitation, and Navigation; although in the past barriers were used to regulate water to help Navigation, Water Supply and Sanitation, and protect against flooding (therefore helping Insurance). Impoundments can be also used for agricultural irrigation but sediments from upstream land use including farming can silt up dams. Therefore, the implications across sectors will be considered.


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## Next Steps

Overall, MERLIN is building a Community of Practice to support an understanding of NbS and how MERLIN can enable mainstreaming of NbS in the Hydropower Sector; as well as how hydropower can work with other sectors.

**Together with participants from the six sectors, in the next year MERLIN will:**

- → Continue to engage with the sector to exchange ideas and develop understanding of their needs, challenges, and opportunities for NbS.
- → Examine the EU policy context and how in the future policy could better enable NbS.
- → Incorporate issues of social justice alongside ecological and economic considerations in the process to mainstream NbS within the sector.

**In the longer term, MERLIN will:**

- → Identify opportunities for cross sector partnerships by applying a value chain approach.
- → Co-develop route maps for transforming the sector's relationship with NbS.

For more information on how we collaborate with the sectors' representatives or to discuss how you can help MERLIN please contact
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