



Restoration of the natural connectivity of rivers and natural functions of the related floodplains in the Nature Restoration Law

Briefing paper
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Freshwater ecosystems are one of the most degraded in Europe, with freshwater molluscs and fish the two most threatened animal groups¹ and 60% of surface waters failing to reach good ecological status.² The fitness check of the Water Framework Directive concluded that the main reasons for failure are for a large part connected to insufficient measures to tackle diffuse pollution coming from agriculture, and the hydromorphological changes affecting water bodies.³ Restoring freshwater ecosystems is therefore a necessity to sustain the natural functions of rivers, lakes and wetlands. Only with healthy, biodiverse water bodies can we allow nature to thrive, ensure clean and sufficient water supply, and resilience to climate change impacts.

The EU Nature Restoration Law proposed by the European Commission in June 2022 introduces new obligations to restore the health of fresh waters. It sets targets for the restoration of freshwater ecosystems alongside coastal and terrestrial ones, which include the restoration and re-establishment of areas, the restoration of habitats of species and the non-deterioration of the areas after restoration (article 4). It also sets obligations to remove river barriers in order to improve the natural longitudinal and lateral connectivity of rivers and contribute to the EU's objective of restoring at least 25,000 km of free-flowing rivers by 2030 (article 7). Those targets complement the obligations of the Water Framework Directive and the Nature Directives, and will contribute to improving the ecological status and the biological diversity of rivers, lakes and wetlands. While it is positive and important that the proposal contains a focus on restoring freshwater ecosystems, we strongly believe those targets fall short of the rate and to the extent that is currently needed recognising the significant degradation of our water environment.

We urge the European Parliament and the Council, acting as co-legislators on the EU Nature Restoration Law, to:

- **Raise the barrier removal target to 15% of EU river length (178,000 km) restored to a free-flowing state by 2030 and make it legally binding;**
- Remove the highlight given to exemptions to the Water Framework Directive and TEN-T regulation to ensure proper implementation.
- Ask Member States to prioritise barrier removals according to the ecological potential of the removal, in particular the connectivity between marine and freshwater ecosystems.
- Ask Member States to include in their national restoration plans a description of the simplification of procedures and skill-building measures necessary to enable river restoration projects to be carried out efficiently and with the necessary public engagement.

¹ Costa MJ, Duarte G, Segurado P, Branco P. [Major threats to European freshwater fish species](#). The Science of the Total Environment, 2021.

² EEA, [European Waters. An assessment of status and pressures](#), 2018.

³ European Commission, [Fitness check of the Water Framework Directive, Groundwater Directive, Environmental Quality Standards Directive and Floods Directive](#), 2019.

- Increase the intermediary percentage targets laid out in Article 4 for the restoration and re-establishment of areas and the restoration of habitats of species, and shorten the timeline for reaching 100%, as this article also covers some freshwater ecosystems and those restoration actions would also complement the action on river connectivity.⁴
- Call on the European institutions to expand the EU financing support available for free-flowing river restoration in addition to the sources identified in the EU [Guidance on barrier removal for river restoration](#), for example, through the establishment of dedicated funding for nature restoration, pursuant to the mid-term review of the Multiannual Financial Framework.

Benefits of free-flowing rivers and river restoration

River regulation has been a common practice in European rivers in the previous decades, resulting in heavy river fragmentation and floodplain degradation. Restoring the connectivity of European rivers and the natural functions of their related floodplains has many benefits for nature and for society in general.

- Free-flowing rivers support biodiverse aquatic and terrestrial ecosystems. They ensure nutrient balance, sediment transport, and ecological flows that are necessary for rivers, floodplains, lakes and wetlands to thrive, directly and indirectly contributing to human well-being as well.
- Free-flowing rivers help protect and restore threatened species, in particular migratory fish which are able to safely reach their spawning and feeding grounds. Freshwater migratory fish populations have declined by 93% in Europe within the last 50 years.⁵ In Europe, all 8 sturgeon species are endangered and the latest update of the IUCN Red list declared the ship sturgeon extinct in the Danube, with the excessive fragmentation of rivers as one of the main causes.⁶
- Restoring free-flowing rivers supports the achievement of many pieces of existing EU legislation or action plans, such as: reaching favourable conservation status for specific habitat types and species of interest under the Birds & Habitats Directive; achieving good ecological status under the Water Framework Directive; achieving the objectives of the Eel Regulation and of the Pan-European Action Plan for Sturgeons.
- In addition, removing river barriers can help improve water quality as it avoids nutrient loading and eutrophication processes in reservoirs or in backwaters.
- Free-flowing rivers help reduce greenhouse gas emissions. Reservoirs in dammed rivers emit considerable amounts of methane, even in European latitudes, as a result of mud formation⁷. Also, removing lateral barriers to reconnect floodplains to the river sustains wetlands which, when properly managed, store significant amounts of carbon.
- Free-flowing rivers help alleviate the increase in water temperatures, which has deadly consequences for many fish species.
- Rivers that are free-flowing until the sea help protect against storm surges and rising sea levels, as they can carry sediments downstream that replenish deltas and estuaries.
- Free-flowing rivers and reactivation of floodplains improve the water supply of groundwaters and soil and contribute to reducing water scarcity risks. Indeed, having rivers with sufficient flow levels, and which are able to overflow, improves the conditions of habitats and agriculture lands,

⁴ This ask is covered with more detail in the joint NGO analysis "[Proposal for a regulation on nature restoration](#)" (August 2022).

⁵ World Fish Migration Foundation, [The Living Planet Index \(LPI\) for migratory Fish](#), 2020.

⁶ [Update of the IUCN red list](#), 21 July 2022.

⁷ Wilkinson, J., Bodmer, P., Lorke, A. (2019) [Methane dynamics and thermal response in impoundments of the Rhine River, Germany](#). *Sci. Total Environ.* 659, 1045-1057.

provides a natural way of water retention, and can ultimately replenish aquifers. In addition, it reduces irrigation demands, which have costly development and maintenance costs, and includes the risk of overusing the water resources.

- Free-flowing rivers reduce risks of flooding. Indeed, measures to restore the natural functions of floodplains, such as removing or relocating lateral river barriers such as dykes, and/or re-meandering channelised rivers, allows the river to overflow and creates “sponges”, which can absorb excess water in case of flooding. Restoring floodplains can avoid millions of euros of flood damage, and is often less costly than having to fix embankments destroyed by flooding events.⁸
- Removing dams can avoid significant maintenance costs, and create short and long term jobs. Studies conducted in the US show that dam removals are 60% less expensive than repair and maintenance over 30 years.⁹
- Free-flowing rivers provide opportunities for tourism and recreation, support the maintenance and preservation of other valuable ecosystem services such as drinking water purification and regulation of heat waves. Free-flowing rivers allow citizens to access the river. Studies conducted in Austria on the Mur river showed that free-flowing river sections have more recreational value than dammed sections.¹⁰

Shortcomings of the proposed targets on river connectivity

Lack of robust quantitative target on barrier removal

The European Commission’s proposal contains obligation for Member States to carry out an inventory of river barriers identifying those that need to be removed (article 7(1)), to proceed to the actual removal (article 7(2)), and to take the measures necessary to improve the natural functions of the related floodplains (article 7(3)). However, the level of the barrier removal effort, set in Article 7(1), is only specified for the barrier inventory, and based on two indications: it should “contribute to the achievement of the restoration targets set out in Article 4 of this Regulation”; and it should contribute to the achievement of the objective of restoring at least 25,000 km of rivers into free flowing rivers in the Union by 2030. Thus unlike some other targets in the Commission’s proposal, the target to restore the natural connectivity of rivers and natural functions of the related floodplains is not quantified robustly. This risks failing to drive large-scale barrier removal forward.

In addition, the references to the exemptions under the Water Framework Directive and TEN-T Regulation in the text weaken the obligation to remove barriers. During the Water Framework Directive’s fitness check, the European Commission and the European Parliament flagged the excessive and unjustified use of the exemptions which, in some EU Member States, result that up to 90% of water bodies are exempt from reaching the WFD objectives. Those exemptions shall not become a blank cheque for not planning the barrier removals necessary to restore free-flowing rivers, and the references to the exemptions regimes should therefore be removed and all stringent conditions in applying exemptions should be met.

Low level of the barrier removal target

The EU Biodiversity Strategy politically endorsed goal of 25,000 km of rivers returned to free-flowing state would represent only around 2% of rivers across the EU¹¹. This is far too low when you consider

⁸ WWF, [Investing in Nature to build resilience](#), 2021.

⁹ Baker, C. et al (2015) [Economic & Community Benefits from Stream Barrier Removal Projects in Massachusetts](#).

¹⁰ Getzner, M. (2015). [Importance of Free-Flowing Rivers for Recreation: Case Study of the River Mur in Styria, Austria](#).

¹¹ [WISE database](#) and more detail in [scoping paper](#) from the Living Rivers Europe coalition.

that hydromorphological pressures act as significant pressures for 34 % of European surface water bodies, and that out of those 34 % surface water bodies, 20 % failed to reach good ecological status because of the presence of barriers.¹²

There is also a lack of long-term vision for barrier removal, as no indication is given to quantify the effort needed after 2030, while article 12 of the Commission's proposal states that the national restoration plans should include an estimate of the length of free-flowing rivers to be achieved by the removal of [...] barriers by 2030 and by 2050.

Prioritisation of barrier removal

The European Commission's proposal states that Member States shall primarily address the removal of obsolete barriers, defined as "those that are no longer needed for renewable energy generation, inland navigation, water supply or other uses". Although obsolete barriers, which are delivering little or no benefits to society, can indeed be considered as low-hanging fruits for removal, their identification should not be the only criteria for prioritising barriers to be removed.

First, the appreciation of whether a barrier is no longer needed or not leaves a very large room for interpretation. Member States might for instance claim that some obsolete barriers might be "needed" in the future for hydropower plants retrofitting or new reservoirs for irrigation, therefore reducing the scope of barriers available for removal. Also, the obsolescence of a barrier is not always the most relevant criteria for identifying barriers to be removed - instead, the primary criteria guiding the identification of barriers for removal should be the ecological benefits of the removal.

In particular, barrier removal should be strategically planned at river basin level in order to restore ecological connectivity along fish migration routes between marine and freshwater ecosystems. This is crucial for diadromous fish - those migrating between freshwater and saltwater, which are particularly affected. For instance, the European eel is listed as Critically Endangered by the IUCN Red List of Threatened Species due to a decline of 90-95% in species populations in the last 45 years,¹³ and the Living Planet index of migratory fishes suggest similar decline for other migratory species as well.¹⁴ The systemic restoration of migratory corridors for those species should therefore be seen as a priority for barrier removal.

Why the law must set a binding and higher target on river connectivity

The barrier removal target should be made legally binding. It should be raised to 15% of EU river length (178,000 km) restored to a free-flowing state by 2030, broken down to 15% of river length at Member State level, and duly evaluated by the European Commission in their assessment of the draft national restoration plans.

Restoring 15% of EU river length into free-flowing rivers is ambitious but achievable by 2030.

A WWF [study](#) analysed a sample of 30,000 river barriers (3% of the estimated 1 million barriers in Europe) on large and medium-sized rivers in Europe and assessed their reconnection potential. Within this sample alone, removing the barriers identified as having high or good reconnection potential would

¹² EEA briefing, [Tracking barriers and their impacts on European river ecosystems](#), 2021.

¹³ IUCN, WFMF, WWF, TNC, ZSL, [The Living Planet Index \(LPI\) for migratory freshwater fish](#), 2020.

¹⁴ World Fish Migration Foundation, [The Living Planet Index \(LPI\) for migratory Fish](#), 2020.

achieve 49,000 km of free-flowing river stretches in the EU (twice the EU Biodiversity Strategy target of 25,000 km).¹⁵

Large free-flowing river stretches are needed to effectively complement the Water Framework Directive. Europe's rivers are the most fragmented in the world. In fact, the vast majority of rivers in Europe are not free-flowing.¹⁶ The EU [Guidance on barrier removal for river restoration](#) released in December 2021 states that "[...] the aim of the Biodiversity Strategy when it comes to freshwater ecosystems is to be understood as going beyond the concept of continuity of the WFD, which does not necessarily require barriers to be removed. It is to focus on the overall connectivity of the river system, intended as free from artificial barriers, including in its lateral dimension."¹⁷

The stretches of free-flowing rivers, deprived of any artificial obstacles, must therefore be large enough to deliver this overall connectivity of the river system, otherwise the nature restoration law will only deliver isolated free-flowing segments of rivers, lost in a network of more or less continuous rivers where barriers are adapted, but never fully removed. Delivering only 2% of additional free-flowing stretches - the level of ambition proposed by the European Commission for 2030, will not change the picture to the extent that is needed to restore the connectivity of rivers.

Large free-flowing river stretches are necessary to substantially improve connectivity for fish.

1.2 million instream barriers are reported in 36 European countries, with a mean density of 0.74 barriers per kilometre.¹⁸ Large variations in barrier density are observed, with higher barrier densities in the heavily modified water bodies of Central Europe, and relatively unfragmented rivers still found in the Balkans, Baltic states, and parts of Scandinavia and Southern Europe.¹⁹ Still, the high density of barriers in various European rivers means that migratory fish species have to go through many obstacles before reaching their spawning grounds - with mortality rates getting higher at each passage.

Adapting river barriers with fish protection and guidance facilities might reduce fish mortality rates but not avoid impacts on fish²⁰ - especially because of the cumulative impact of a series of dams. High-technology fish protection and guidance facilities also come at a substantial cost which should be balanced with the ecological benefits they provide. There will always be barriers which are not to be removed, and for those ones fish protection and guidance are the best possible option, worth the cost. But adapting a barrier is never as efficient, and therefore large, fully free-flowing segments are very often the best and most cost-effective option to deliver better connectivity for fish at a basin level.

¹⁵ WWF, [The potential of barrier removal to reconnect Europe's rivers](#), 2021.

¹⁶ EEA, [Floodplains: a natural system to preserve and restore](#), 2019, page 20, from Grill et.al., 2019

¹⁷ European Commission, [Guidance on barrier removal for river restoration](#), 2021, Page 15.

¹⁸ Belletti, B., Garcia de Leaniz, C. Jones, [More than one million barriers fragment Europe's rivers](#), Nature, 588(7838), 436-441.

¹⁹ Ibid.

²⁰ Fish mortality rates can be reduced from around 80% with conventional Kaplan turbines, to around 64% with innovative, so-called 'fish friendly' turbine types such as screw turbines and VLH turbines (Mueller, M., Knott, J., Pander, [Experimental comparison of fish mortality and injuries at innovative and conventional small hydropower plants](#). *Journal of Applied Ecology*, 2022) or even 7-40% with measures such as natural bypass channels or interruptions of operations during migration periods, etc. (Rutschmann, P., Kampa, E., Wolter, C., et. al., [Novel Developments for Sustainable Hydropower](#), 2022 ; WWF, [The Unkelmühle small hydropower plant](#), factsheet, 2021). However, the latter numbers should be treated with caution as results are highly dependent on species, flow conditions, time of the year, downstream or upstream migration ; most studies are conducted on migratory species that are more likely to use fish guidance devices; and studies often do not take into account the cumulative impact of barriers on fish populations.

Dam removal is gaining momentum in Europe.

The Dam Removal Europe movement reported at least 239 dams removed in 2021 only across Europe, a 137% increase from the previous year (101 barrier removals in 2020).²¹ Those numbers are probably underestimated, due to the complexities of barrier removal tracking. But they show that the movement is growing, and that an adequate policy framework can amplify it.

Living Rivers Europe is a coalition of six environmental and angling organisations: WWF's European network, the European Anglers Alliance, European Environmental Bureau, European Rivers Network, Wetlands International Europe and The Nature Conservancy. Living Rivers Europe puts forward a strong vision of healthy river ecosystems flourishing with wildlife to the benefit of society at large, the economy and sustainable development in Europe. To make this vision a reality and give our water ecosystems a real future we stress the importance of an ambitious implementation of the EU Water Framework Directive and related policies. Together with our members and supporters, representing a dedicated movement of over 40 million people across Europe, we aim to ensure that the loss of aquatic wildlife is halted and reversed and that European waters are managed more sustainably.



²¹ Dam Removal Europe, [Dam removal progress 2021](#), 2022.