

DAM REMOVAL PROGRESS 2022

 : DAM
: REMOVAL
: EUROPE

New record number of removed barriers



The removal site at Talent River, Switzerland: (up) before and (down) during the removal operations of the Talent Weir in summer of 2022 © Aqua Viva - WWF Switzerland

INTRODUCTION

The Nature Restoration Law¹ proposed by the European Commission in June 2022, and currently being negotiated in the European Parliament and the Council, has presented new obligations and targets to restore the health of Europe's freshwater ecosystems. These would be complimentary to the obligations under the Water Framework Directive and the Nature Directives. Of special importance is Article 7 of the proposed law, which explicitly refers to river barrier removal as a means to "contribute to the natural longitudinal and lateral connectivity of rivers and the EU's objective to have 25000 km of free-flowing rivers" and to "... help restore river areas and floodplains", key elements of the EU Biodiversity Strategy for 2030². In addition to these new targets, for which each member state needs to come up with a national restoration plan, the EU Commission published a guideline document on dam removal in December 2021 to help member states identify and prioritize barriers to be removed and to search for funding sources³.

Some EU member states have long-lasting policies aiming to restore river connectivity. For example, Spanish policy compels owners to remove any obsolete river barriers they own, while also empowering the State to claim ownership of ownerless barriers and remove them by its own volition. Several other EU member states have recently amended their policies to align with the EU goal of restoring river connectivity. For instance, the newly modified Lithuanian Water Law explicitly states that all obsolete dams must be removed, while fishways must be built on all functional dams. Finnish government, in 2020, also committed to improve living conditions for migratory

fish and river connectivity through barrier removals and commenced a national program (NOUSU) which can cover the 50% of the project cost, including the potential purchase of a hydropower facility. In December 2022 Finland also revised its Water Act to enable setting environmental requirements to facilities that had none till then. By the same token, Sweden is currently reviewing its licensing system for the river water usage to align with the EU Water Framework Directive and the currently unlimited water permits for water use for hydropower purposes will be modified and the licenses will be reviewed continuously in the future. In that respect, the nine largest Swedish hydropower companies created the Hydroelectric Environmental Fund (1 billion euros) to assist the decommissioning of hydropower facilities or the process of acquiring modern permits that include fish passage requirements. This fund will cover up to 85% of the cost of the removal

DAM REMOVAL EUROPE

Dam Removal Europe (DRE) is a coalition of seven organizations: the World Wildlife Fund, The Rivers Trust, The Nature Conservancy, the European Rivers Network, Rewilding Europe, Wetlands International Europe, and the World Fish Migration Foundation. The overall ambition of DRE is to restore the free-flowing state of rivers and streams in Europe. In that respect, DRE aims to establish barrier removal as a restoration tool and to mainstream this practice. Through a bottom-up process DRE has created a continuously growing European network and it is working towards a holistic approach to remove barriers.

¹ European Commission, Nature Restoration Law

² European Commission, Biodiversity Strategy 2030

³ European Commission, Guidance on Barrier Removal for River Restoration

or construction works, including the permit acquiring process cost as well as the loss of income above 5% in case of decommission. Luxembourg is also stepping up its ambition to implement river restoration by mapping the remaining free-flowing rivers nationwide, by subsidizing barrier removal projects through the Water Management Fund (Fonds pour la gestion d'eau) and also by suspending – already from 2008 – all water permits for mills and hydropower plants.

Even countries that have yet to implement their first official barrier removal propose amendments to their national policies relative to river restoration and ecological flow. For example, in North Macedonia the proposed legislation is waiting for approval from the parliament, while in Hungary the 3rd River Basin Management Plan has already been approved since last year which – among other pieces of legislation – refers to restored longitudinal

connectivity and the National Biodiversity Strategy until 2030 remains to be approved from the government.

Contrastingly, the newly approved modulations in the national policies of a few EU member states do not align with – or even contradict – the aims of the proposed EU Nature Restoration Law. In 2022, Germany amended its Renewable Energy Law (EEG) to continue subsidizing small hydropower plants which will lead to the construction of more such facilities regardless of their size and profitability. Similarly, in 2021, amendment in French law rendered the removal of barriers attached to old mills impermissible and of other types of barriers more complicated. The Dam Removal Progress Report, published on an annual basis by DRE, aims to evaluate the advancement in the implementation of EU policies and to analyze the progress and impact of dam removal⁴ utilization as a river restoration measure in each European country (Figure 1).

⁴ A barrier must have been removed through the full vertical extent of the structure for the total width (total removal) or a significant portion of the stream width (partial removal) permitting fish passage and ecological flow. Creation of ramps were also considered barrier removals given the restoration of free-flowing conditions. Technical fishways and bypasses were not considered barrier removals and thus were not included in this report

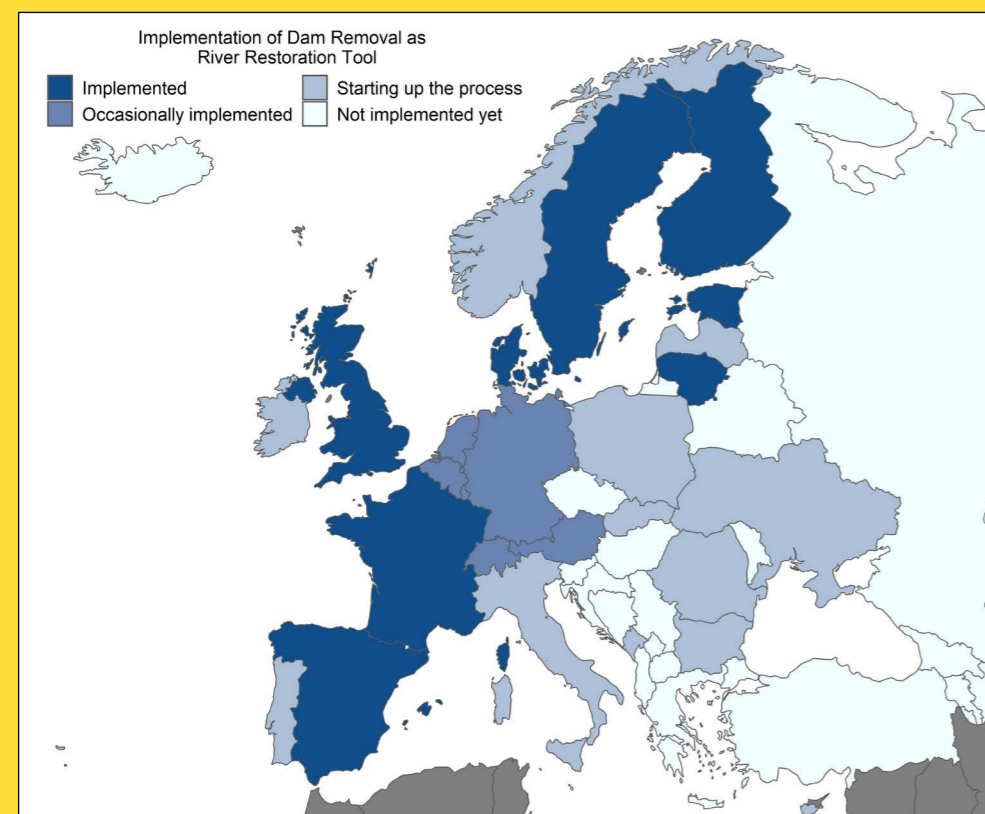


Figure 1. Implementation of dam removal as a river restoration tool in Europe

DATA COLLECTION & RESULTS

The data presented in this report were collected through: (1) direct written requests to public authorities of European countries dealing with barrier removals, river restoration projects and water management, (2) relative requests to the European DRE network (~3400 people from 40 countries), and (3) an online survey posted to the DRE website that remained active from April 2022 till the end of the year. Data were provided by ministries, municipalities, water agencies, river trusts, NGOs, scientists, researchers, and river restoration practitioners.

Based on this information DRE reports that in 2022:

- ✂ At least 325 barriers were removed in 16 European countries⁵ (Figure 2)
- ✂ Spain was the trailblazer of barrier removal in Europe (Figure 3) for the second year in a row, followed by Sweden and France as was the case also in 2021 (Mouchlianitis 2022)

- ✂ Countries (Latvia and Luxembourg) reported barrier removals for the first time. Latvia's first reported barrier removal was a natural collapse. 15% of all existing barriers in Europe are considered obsolete (Belletti et al. 2020), and thus are at risk of structural failure
- ✂ 73% of the removed barriers were weirs⁶. Culvert and dam were the next most common types of the removed barriers
- ✂ 71% of the removed barriers were lower than 2 m high, 25% were 2-5 m high and 4% were higher than 5 m⁷
- ✂ At least 10 hydropower dams were dismantled in England, Finland, France, Norway, Spain and Sweden⁸ (see also page 11)
- ✂ 832 km of habitat were reconnected through barrier removals based on the information available from 137 removals out of the 325 removals in total

⁵ Accurate estimation of the total number of barrier removals executed per year is a highly complex endeavor because the verification process of such projects and whether they satisfy the criteria of a barrier removal is time-consuming. In that respect, data from a few organizations/countries (e.g., Denmark) were not included in this report. Thus, the final number of removed barriers reported herein is certainly an underestimation. Also, WWF Finland reported a higher number of removals in the country than the one presented herein, which however could not be verified in time due to the lack of national database.

⁶ Type was available for 182 out of the 325 barriers that were included in this report

⁷ Height was available for 231 out of the 325 barriers that were included in this report

⁸ Original use was available for 148 out of 325 barriers that were included in this report

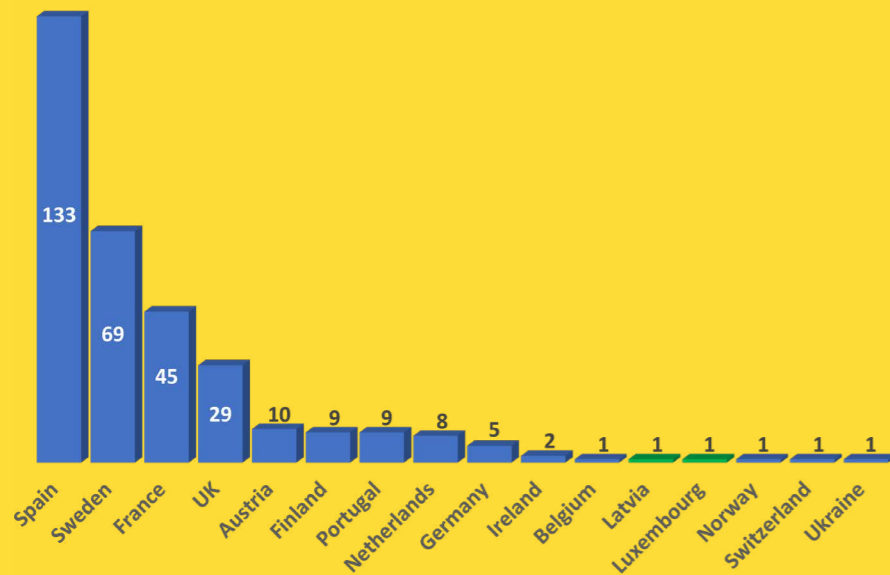


Figure 2. Number of reported barriers removed per country in 2022. In green, the countries that reported their first barrier removal

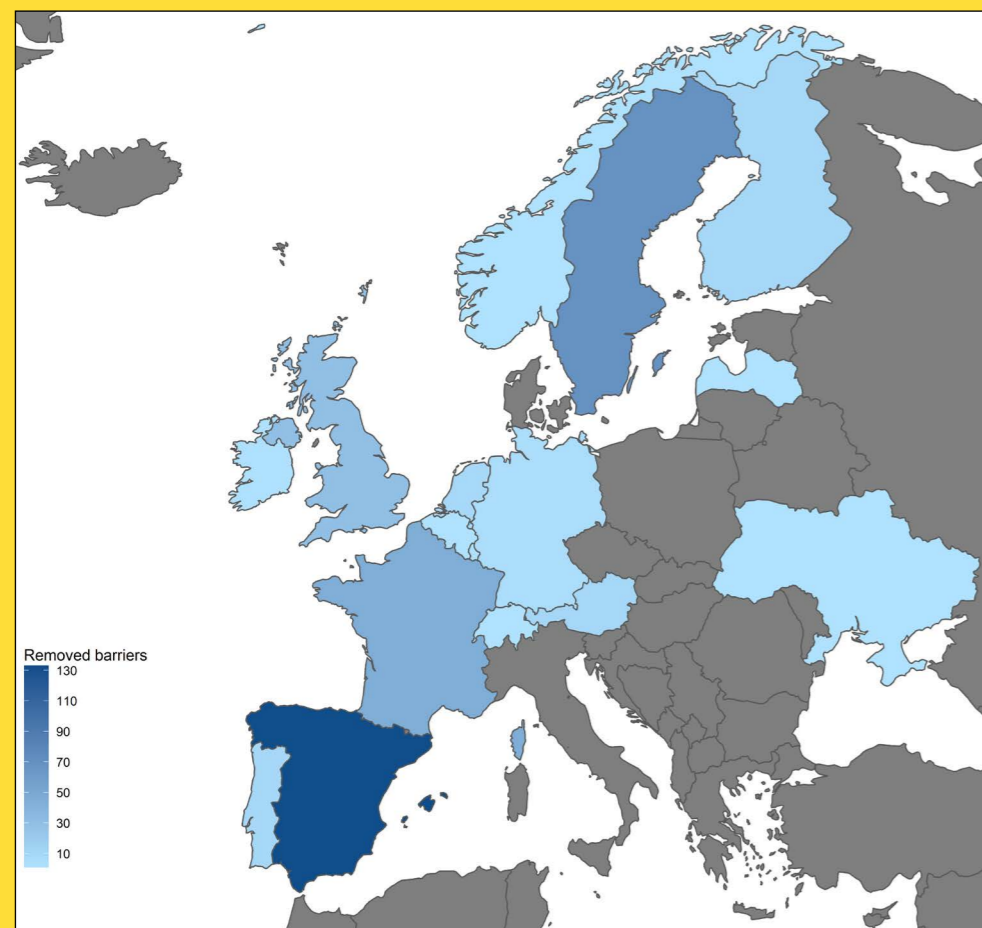


Figure 3. Map of European countries that reported barrier removals in 2022. Color gradient refers to the number of removals per country

The total number of removals in 2022 represents a 36% increase from the previous year (239 barrier removals in 2021; Mouchlianitis 2022).

These results can be attributed to a combination of:

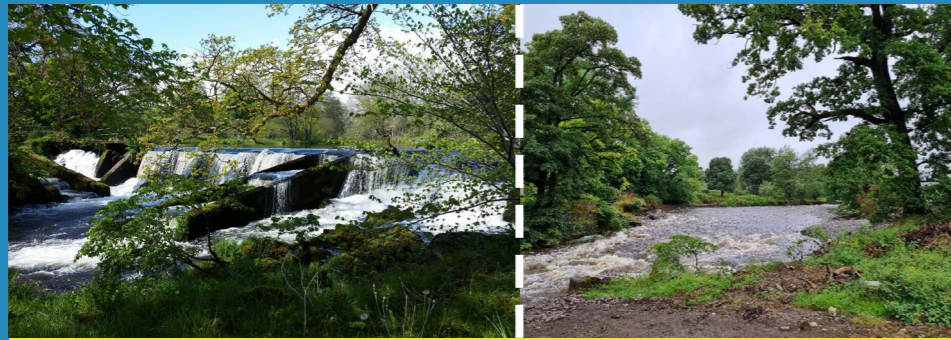
- ✂ The newly available funding opportunities (e.g., European Open Rivers Programme, EU LIFE Programme)
- ✂ The coordinated efforts of national and regional public authorities (e.g., the Spanish Ministry for the Ecological Transition and the Demographic Challenge and the Bavarian State Ministry of the Environment and Consumer Protection)
- ✂ The mainstreaming activities over the past 7 years by the DRE coalition and the increase of public awareness all around Europe through publications in national and international media and
- ✂ The improved way of collecting data from the European network over the past 3 years

The number of European countries that reported barrier removals remained almost the same as last year (it decreased by 1). Similarly to 2021, most of the removed barriers were weirs, as these structures have a high probability of being old and/or obsolete and can be removed in a cost-efficient way (Garcia de Leaniz and O’Hanley 2022). In addition, most of the removed barriers were low head structures (≤ 2 m high) as was the case in 2021 (Mouchlianitis 2022). Such structures are the most abundant longitudinal riverine barriers throughout Europe and can be removed in an easier and cheaper manner than larger structures, whose removal might also face stronger opposition from local communities and stakeholders (Belletti et al. 2020). Lastly, this year’s report – which is the third volume – shows an increasing trend in the total number of removals for a second year in a row (Table 1).

Table 1. Number of removed barriers in Europe reported by Dam Removal Europe

YEAR	NUMBER OF REMOVED BARRIERS
2020	101
2021	239
2022	325

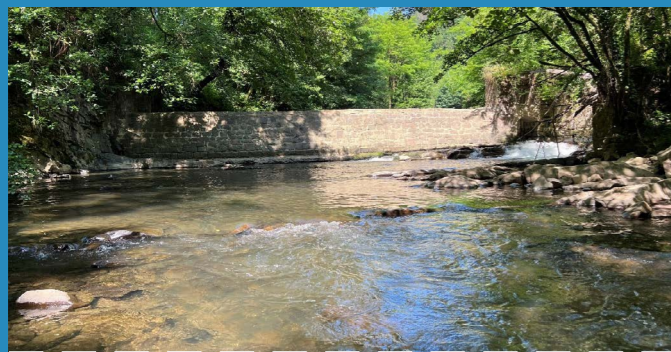
BEFORE AND AFTER REMOVAL



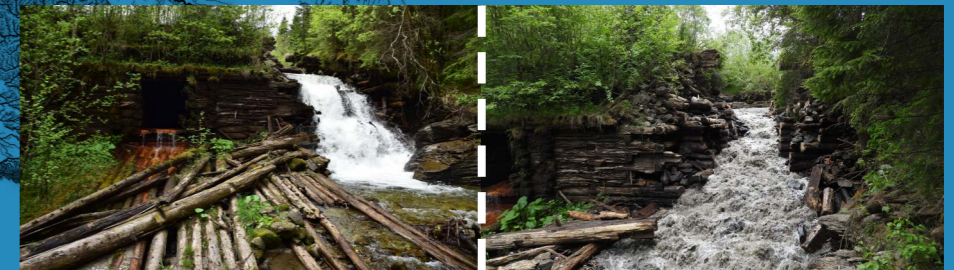
BOWSTON WEIR – KENT RIVER – ENGLAND
© South Cumbria Rivers Trust



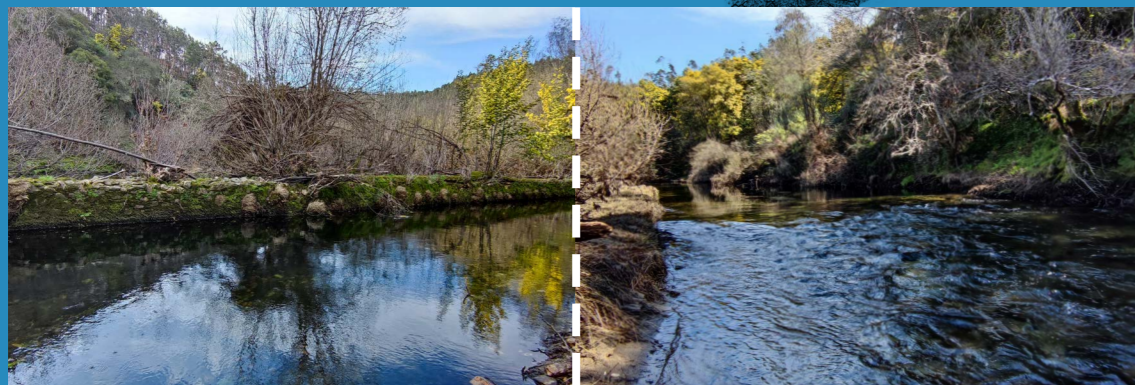
TROMSA DAM – TROMSA RIVER – NORWAY
© (left) Rob Kleinjans (right) Tore Solbakken



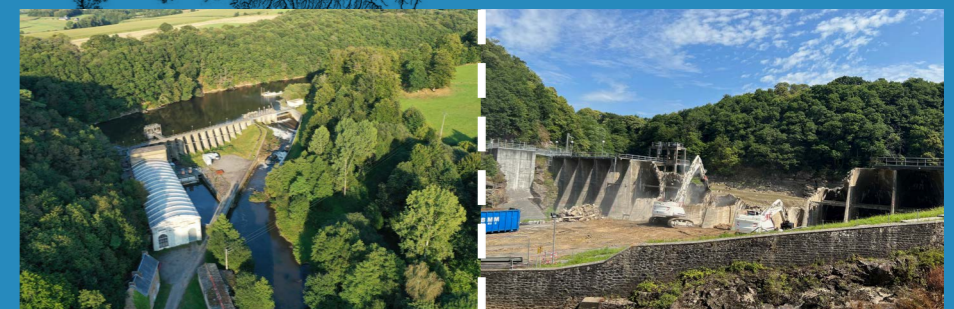
SAN PRUDENTZIO DAM – DEBA RIVER – SPAIN
© Gipuzkoa Provincial Council



BAYURIVKA DAM – PERKALABA RIVER – UKRAINE
© Yaroslav Zelenchuk / WWF Ukraine



PRESA VELHA WEIR – ALFUSQUEIRO RIVER – PORTUGAL
© Sílvia Pedro (LIFE Agueda project; MARE-University of Évora)



LA ROCHE QUI BOIT DAM – SELUNE RIVER – FRANCE
© ERN-Roberto Eppele





The removal site at Hiitolanjoki River, Finland: (left) before and (right) after the removal operations of the Lahnasenkoski Dam in August 2022 © Hanna Ollikainen



DAM REMOVAL IN UKRAINE

WWF Ukraine, with the financial support of Open Rivers Programme – a grant giving organization dedicated to restoring rivers – and despite the ongoing war in the country, moved forward to accomplish their goal to restore 3000 km of free-flowing rivers in Ukraine by 2030. Bayurivka Dam, a 120-year-old splash dam made of wood logs at Perkalaba River on the territory of Verkhovynskyi National Park, was removed in June of 2022. At the end of the 19th century, Bayurivka Dam was used for timber transportation but remained obsolete for the past 40 years and was in risk of structural failure. The removal aimed to eliminate the safety risk opposing by the dam's decaying

condition and to restore the ecological connectivity and biodiversity of the river. The dismantling of the clogged Bayurivka Dam opened 27 km of the Perkalaba River allowing fish species, like the endangered Danube salmon (*Hucho hucho*), the Brown trout (*Salmo trutta*) and the Ukrainian brook lamprey (*Eudontomyzon mariae*), to reach their ancestral spawning grounds further upstream. The expected enhancement of the fish populations will boost the numbers of terrestrial species, such as the protected brown bear (*Ursus arctos*), and semiaquatic species, like the otter (*Lutra lutra*) and the European mink (*Mustela lutreola*) and could transform the area to a "biodiversity hotspot" in the Carpathians.

BIG HYDROPOWER PLANTS ARE DEMOLISHED

Norway dynamited a 106-year-old hydropower dam at Tromsa River in January 2022. This 9-m-high dam was built in 1916 and remained operative until the middle of the 20th century. Since then, remained obsolete but continued to fragment Tromsa River, a tributary of Lågen River, which feeds into Lake Mjøsa, Norway's biggest lake. A 5-year-long campaign by the Norwegian sports fishing club Gudbrandsdal Sportsfiskeforening was needed before the demolition of the dam and the construction of a nature-like step-pool cascade on the site were accomplished. The necessary funding for this project was provided by the Norwegian government. All fish species, including Grayling (*Thymallus thymallus*), Burbot (*Lota lota*), Alpine bullhead (*Cottus poecilopus*) and Eurasian minnow (*Phoxinus phoxinus*) inhabiting Tromsa River are expected to benefit from the dam removal. However, the main beneficiary is expected to be the lake-dwelling Brown trout (*Salmo trutta*), a fish species that is highly desirable from local anglers.

France has fully restored the free-flowing state of Sélune River in Normandy. In June 2022 the hydroelectric dam of La Roche-qui-boit was demolished, following the removal of the Vezins hydroelectric dam in 2020. La Roche-qui-boit, a 16-m-high and 125-m-wide concrete dam, was built in the early 1900s (between 1916 and 1919), and thus was blocking the ecological continuity of this historic salmon river for more than a century. Due to its removal, more than 60 km are now free and accessible to migratory fish like Atlantic salmon (*Salmo salar*), sea lamprey (*Petromyzon marinus*) and European eel (*Anguilla anguilla*). A multidisciplinary scientific program was initiated years

before the removal of the two dams and will continue for years after to characterize dismantling effects and therefore provide accurate ecological profits and costs of a fluvial ecosystem restoration project through the elimination of longitudinal barriers. The campaign for a free Sélune lasted for over two decades and was led by many associations including – among others – European Rivers Network, the French Fishing Federation and France Nature Environment.

Finland removed yet another operating hydropower plant, bringing Hiitolanjoki River one step closer to a free-flowing state. Following the removal of the Kangaskoski Dam in 2021, Lahnasenkoski Dam was demolished in August 2022. The dam was 8 meters high, and the power plant operated till the end of July of the same year. The demolition of the Ritakoski Dam will be executed in 2023 and will be the last step of the Hiitolanjoki project. This represents the largest river restoration project in Finland, carried out by South Karelia Foundation for Recreation Areas, and its main goal is to restore the upstream migration of the last fully natural landlocked salmon population. The fish production of natural populations of salmon and trout in the Finnish sections of Hiitolanjoki River following the completion of the three removals is estimated between 5000 and 11000 young fish on an annual basis. This makes Hiitolanjoki River the most important habitat of endangered landlocked salmon in Finland and would enable the development of recreational activities for local community and tourists in the area. A free-flowing Hiitolanjoki River, along with Ladoga Skerries National Park and Saimaa Geopark, will form a natural area with unique characteristics and potential not only in Finland, but also in Europe.

COUNTRIES THAT JOINED THE DAM REMOVAL MOVEMENT IN 2022

LATVIA

Latvia's first reported barrier removal was a natural collapse. The barrier was fragmenting Vilaune River and was attached to a decommissioned and obsolete watermill. Hundreds of thousands of longitudinal riverine barriers (~200000), corresponding to the 15% of all existing barriers, along European waterways are considered obsolete (Belletti et al. 2020), and thus are at risk of structural failure. Thousands of such failures, of both small (e.g., weirs) and big (e.g., dams) barriers, have occurred around the world causing immense property and environmental damages and have even claimed innocent lives (Zhang et al. 2016). The causes of such failures include natural hazards, human activities, the barrier type, and the age of the barrier (Viseu T. & de Almeida 2009). The evaluation of failure probability of aging barriers that have outlived their useful lives and the possible effects of such events is imperative, given the magnitude of the latent hazard, and can be used to make well informed decisions and assist in the prioritization of barrier removal projects.

LUXEMBOURG

Luxembourg joined the dam removal movement in 2022 by executing the removal of a weir. The removal was part of a bigger project aimed at restoring the ecological continuity of Pétrusse River and the return of its aquatic fauna. In the early 1930s, this waterway in the center of Luxembourg City was straightened, given a concrete riverbed and was since used as an open sewer. That transformation had detrimental effects on the waterbody itself and its catchment area (4600 ha), increasing the flood risk for adjacent neighborhoods. Through this restoration project, the Pétrusse River was renaturalized by removing the concrete artificial riverbed and by re-meandering its course. During the two years of construction, a new riverbed was created through natural sedimentation and erosion processes, vegetation has flourished and terrestrial and semiaquatic animals, like foxes and ducks, resettled in the area. Due to the cultural heritage and historic value of the Pétrusse Valley, protected as part of the UNESCO World Heritage Site of Luxembourg City, the public was involved from the very start of the project. To do so, innovative tools were utilized, including architectural drawings, visualizations, animations and interactive screens, while a new park was created along the newly formed river corridor aiming to improve the life quality of the local communities.

The removal site at Pétrusse River, Luxembourg: (left) before and (right) after the removal operations of a weir in September 2022
© Ralph Moelter



Acknowledgements

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References

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NEXT STEPS

DRE's main goal is to mainstream and scale up barrier removal in Europe. In that respect, DRE enables knowledge exchange, connects practitioners, and celebrates successful projects through seminars, webinars, workshops, and dissemination activities (e.g., case studies and newspaper articles). DRE also aims to initiate the discussion in countries/regions where barrier removal has yet to be implemented (e.g., Balkans). In addition, DRE has created – and constantly updates – the most accurate database of removed barriers in Europe to evaluate the advancement in the implementation of European policies and to analyze the progress of this river restoration measure in each country.

Barrier removal is a cost-efficient and highly effective river restoration tool and DRE's goal is to establish it as a common practice throughout Europe in the next few years. DRE will continue monitoring and reporting the trends in barrier removal and will keep providing guidance and assistance to river restoration practitioners, with the ultimate goal to mainstream barrier removal in all European countries. Additional information on unique barrier removal cases, upcoming projects, seminars, webinars, and relative news is provided on the DRE website (<https://damremoval.eu/>) and via the DRE Newsletters (subscription available through the DRE website).



DAM REMOVAL EUROPE

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Resources and tools

For more information about dam removal showcases, events, tools and resources, visit: www.damremoval.eu

World Fish Migration Foundation

World Fish Migration Foundation is the coordinator of the Dam Removal Europe coalition, working together with other international NGOs to restore rivers in Europe that have high natural or cultural importance by removing obsolete barriers and ensure healthy free-flowing rivers.

Dutch Postcode Lottery & ForestPeace Foundation

World Fish Migration Foundation is proudly supported by the Dutch Postcode Lottery and ForestPeace Foundation to enable and scale up dam removal as a viable tool for river managers in Europe. Interested in becoming a donor too and help to restore free-flowing rivers in Europe? Send an email to: info@damremoval.eu

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