

Dam removal in Europe: Barrier databases, policies, reasons behind and case studies



Photo: Duero River Basin Authority (Spain)

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DAM REMOVAL EUROPE - 2024

Data available before 2020



**European
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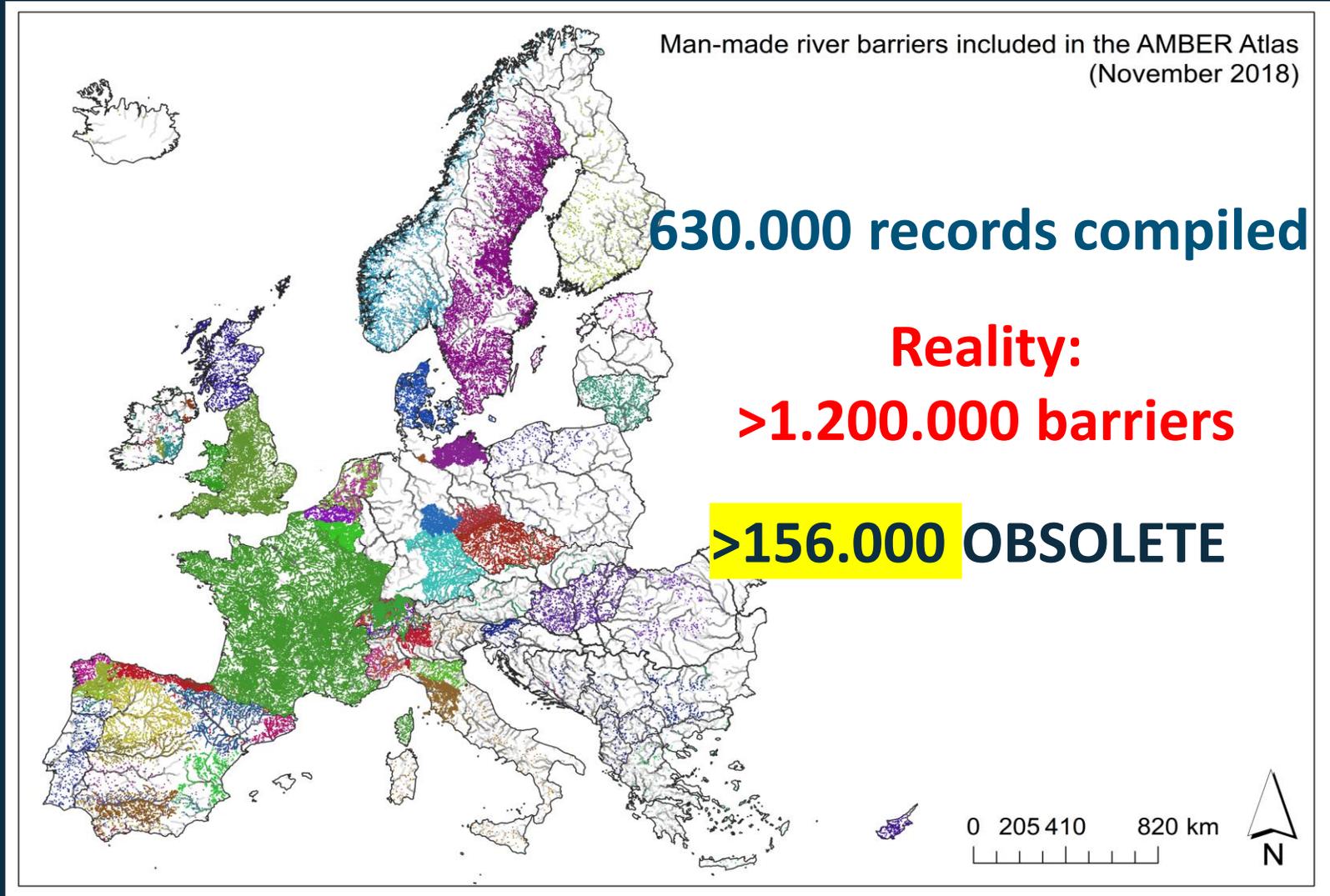
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7,000 (big) dams

Until year 2020, there wasn't a database of river barriers in Europe (continent). The only available information until 2020 was that we had 7.000 big dams, which are infrastructures higher than 15 meters.



Thanks to the Horizon2020 project called “[Adaptive Management of Barriers in European Rivers](#)” (AMBER), after 4 years collecting official inventories from 36 countries, AMBER consortium discovered that there are at least 1.200.000 barriers, out of which last least 156.000 are obsolete and not being used.

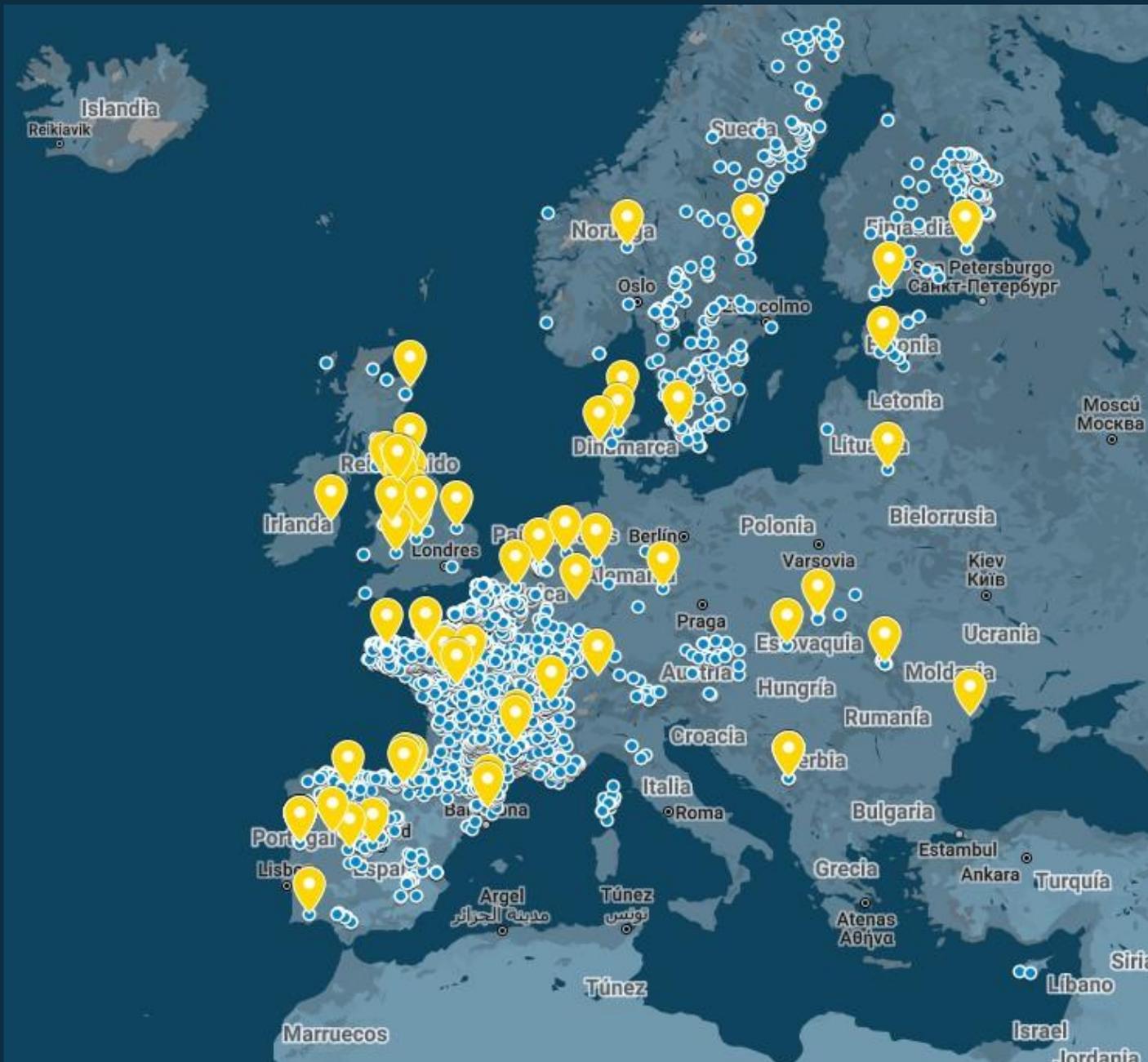
Until 2023

FRANCE	>3600*
DENMARK	1450
SWEDEN	>850
SPAIN	>800
FINLAND	>500
UK	>250

* Naturally removed + man removed

In 2016 Dam Removal Europe found out that at least 5 countries (France, Denmark, Sweden, Spain and UK) had removed almost 5.000 barriers, and by December of 2023 there were 26 European countries have removed at least 8.146 barriers (Source: [Dam Removal Europe](https://damremoval.eu)).

Why? What are the reasons behind these removals?



Source: Dam Removal Europe Map

There are several reasons behind removing barriers, and most of them are not environmental reasons.

The most important driver to remove barriers is safety (also in USA).

Note: 99% of the “dam” removal projects are weir (small dams, less than 5m in height) and culvert removals.

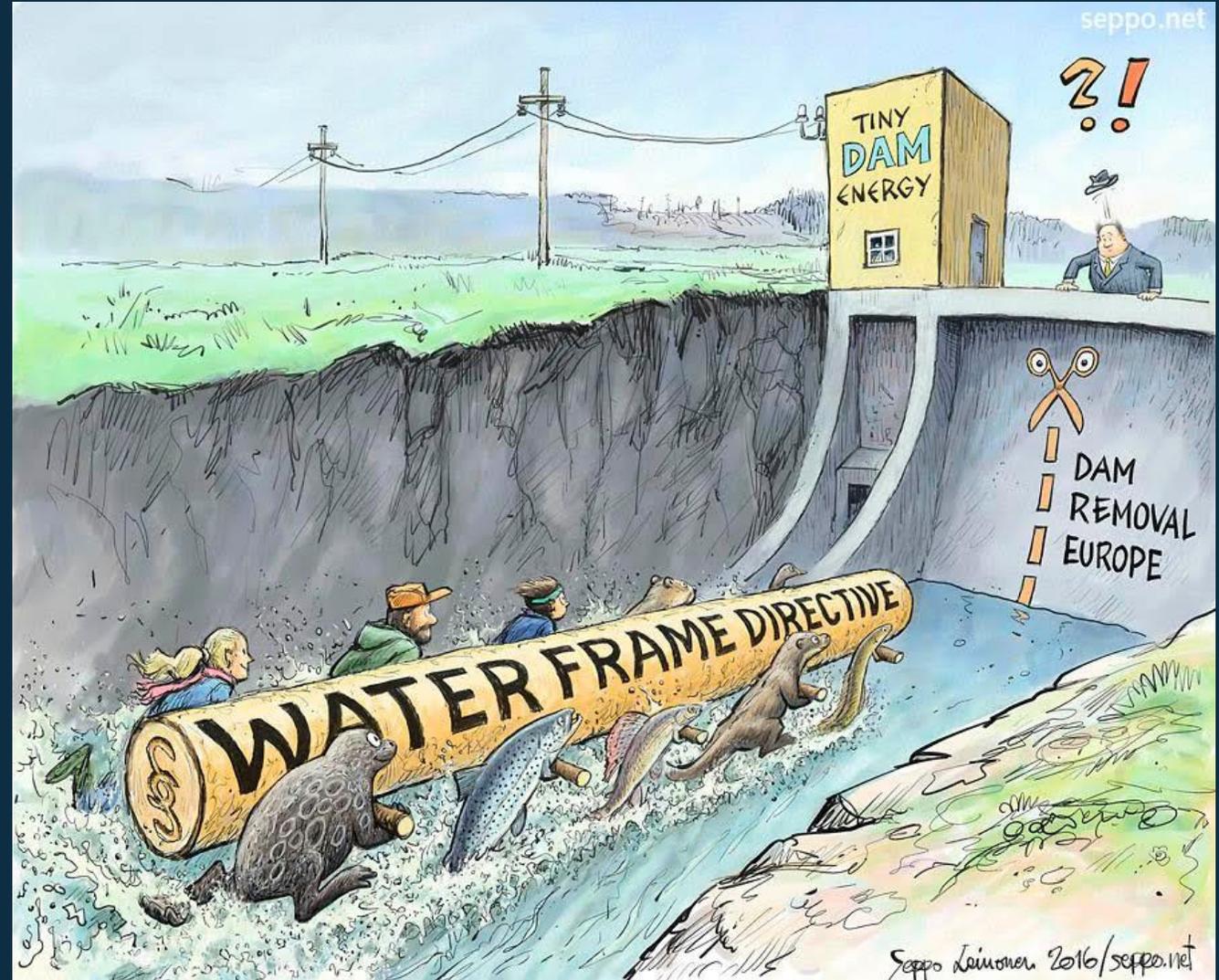


3.1. Legal reasons

For some countries, the first reason behind barrier (infrastructure) removals is related with their national legislation. In Spain or Austria, if the owner is not going to use the infrastructure anymore or the water relicensing petition has been declined, it is mandatory that the owner removes the infrastructure, by their own means, and leave the river as it was before the construction of the infrastructure.

These national legislations have been in place before Water Framework Directive (WFD) and are based in Roman Law (infrastructure constructed in public domain).

WFD has been a very positive policy to activate barrier removals, because river managers know that in order to reach a good ecological status of their water masses, it is not enough building water treatment plants, they also needed to restore river connectivity.



3.1. Legal reasons

Dam removal included in Lithuanian National Water Law

June 2022:

- Structures that fragment rivers, have no function or are economically unviable must be removed
- Government fund - pilot project to open dam removal fund - 1,9 mln Euros.

June 2023:

- Land Law changes: Allows to take the land on which the dam stands for public needs.



3.2 Environmental reasons

Sediments and nutrients trap behind dam

- Nutrients and sediment starving downstream the dam, causing channel and bank erosion
- Dismissing deltas' formations due to the lack of sediment deposition
- Coastal erosion (beach shrinking or disappearing)

Emission of green gasses from the reservoir (i.e.: CO₂, methane)

- Depending on the location, climate, dimensions of the reservoir
- Water loss due to high evaporation at reservoirs (\cong 5-20% \rightarrow 11-40% expected for 2060)

River fauna blocked and isolated

- Not able to migrate to be able to feed and reproduce
- Decline or extinctions of freshwater fish population

Alter the natural flow of rivers, decreasing the river's natural flood frequency

- Reduces channel connection with floodplains (= decreases soil fertility)
- Impedes natural water aquifers recharge
- Deteriorating water quality (less oxygen levels, no natural temperatures above and below the dam, toxic algae booming)

3.2 Environmental reasons

Four Major Rivers Project (South Korea)



Source: Jenny Shin, Korean Federation of Environmental Movement – *DRE international Seminar France 2019*



Source: The Four Rivers: "Building A Greener Korea" Birdskorea.org

3.2 Environmental reasons

Four Major Rivers Project (South Korea)



3.2 Environmental reasons

Vezins Dam (France)



Photo: Observatoire photographique du paysage de la Sélune, Université Paris-Nanterre et SMBS (May 2019)

The reservoirs behind Vezins Dam (36m high) and La Roche quit Boit (16m high) had very severe cyanobacteria problems, both dams were active HP dams, one owned by the government and another one by EDF. People were forbidden to swim in these waters. The HP produced by Vezins Dam could be produced by 3 wind-mills.

Vezins Dam (France)



Photo: Miroslav Očadlík – WWF Slovakia (June 2023)

Vezins Dam was removed in 2019, La Roche quit boit Dam in 2022. Cyanobacteria problems were solved. Native fish species like salmon, trout, lamprey and eel have come back to the basin after 100 years (Selune River Basin was one of the most important rivers for commercial fisheries in the past in France). Photos above show one of the locations of the former Vezins reservoir. A 15-year research study (before and after removals) with over 100 scientists involved is being implemented (the largest and longest scientific research on dam removal in Europe): [“Selune Scientific Program”](#).

3.2 Environmental reasons

Besides cyanobacteria algae problems, or fish populations extinctions, there are green-house gas emissions linked to many of these reservoirs and ponds.

For example, the scientists monitoring this dam removal in Catalonia, executed in December of 2023, already detected the drop of methane emissions only 2 months after the removal of this abandoned dam.

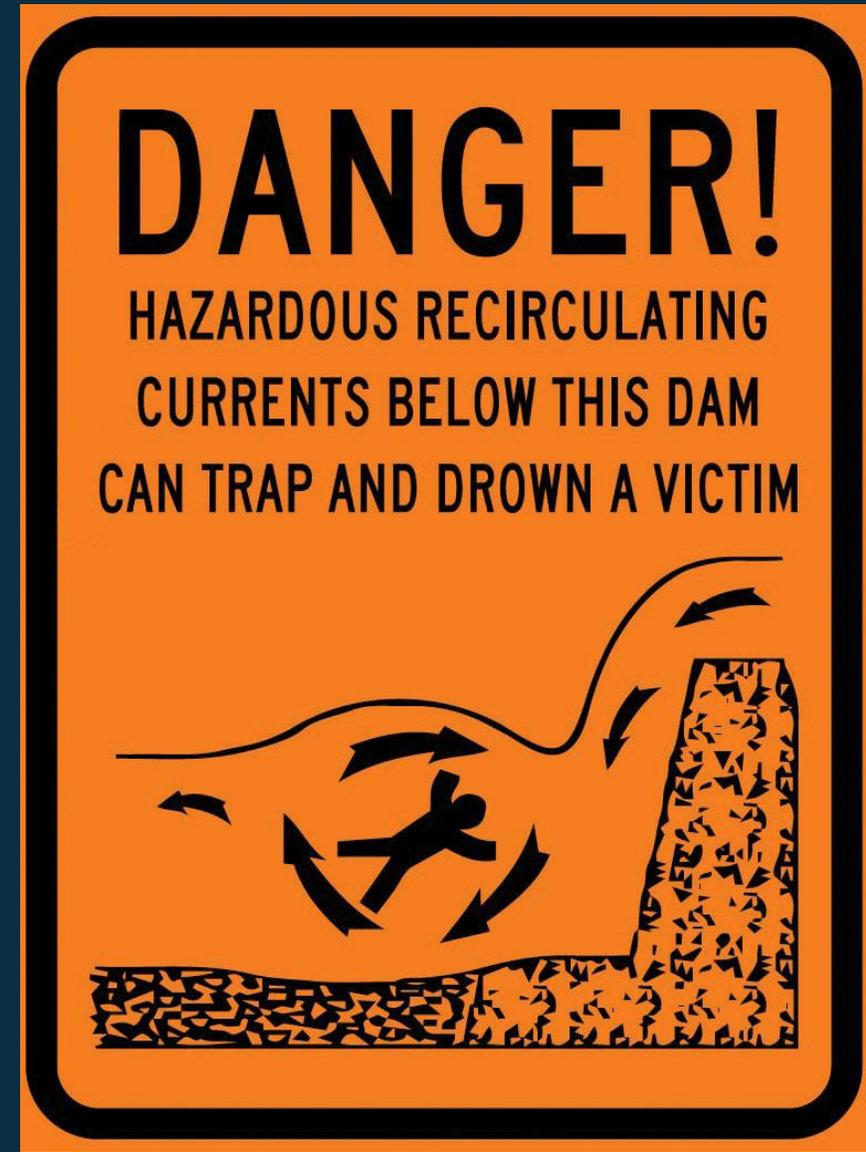


3.3 Safety Reasons

- Small barriers can be “*drowning in machines*”



Source: The Beacon News. Article about Glenn Palm Dam fatalities (IL, USA)



Source: North Dakota State Water Commission

3.3 Safety Reasons

DROWNING MACHINES

- ✂ 82 incidents (129 fatalities) were found in 16 countries
- ✂ It is highly probable that incidents at drowning machines will lead to fatalities. In 80.5% of the incidents there were at least one fatality
- ✂ The people involved in the incidents were engaged in different activities, like swimming, canoeing, rafting, fishing, or paddle boarding

Source: Dam Removal Progress 2023

Tragedia in Trebbia a San Salvatore, 26enne muore annegato FOTO foto

E' stato recuperato intorno alle 17 il corpo del giovane annegato in Trebbia a San Salvatore di Bobbio (Piacenza). Classe '89, il giovane era arrivato da Pontecurone in provincia di Alessandria

di Editore - 28 Giugno 2015 - 0:00

Commenta Stampa Invia notizia

Più informazioni su



Tragedia in Trebbia, alla diga di San Salvatore di Bobbio (in provincia di Piacenza), dove nel pomeriggio di domenica 28 giugno un giovane di 26 anni, Dario Triglione, originario di Pontecurone, in provincia di Alessandria, è annegato nelle acque profonde del torrente. in

3.3 Safety Reasons

Robledo de Chavela Dam (Madrid, Spain)

- Infrastructures that are not maintained **can end up breaking or collapsing.**



Photo: Tagus River Basin Authority (2014)

Photo: iAgua (2015)

3.3 Safety reasons

San Marcos Weir during removal works in 2013 (Leon City, Spain)



Photo: J.I. Santillán Ibáñez



Photo: J.I. Santillán Ibáñez



GOBIERNO
DE ESPAÑA

MINISTERIO
PARA LA TRANSICIÓN ECOLÓGICA
Y EL RETO DEMOGRÁFICO

CONFEDERACIÓN
HIDROGRÁFICA
DEL DUERO, O.A.

This is another example of an infrastructure removal due to safety reasons. This old weir was removed in summer of 2013 by Duero River Basin Authority in Leon City, Spain.

3.3 Safety reasons

Usual river flow ranges from 2-20m³/s (Leon City, Spain)



Photo: J.I. Santillán Ibáñez

Before removal 2012: 165 m³/s



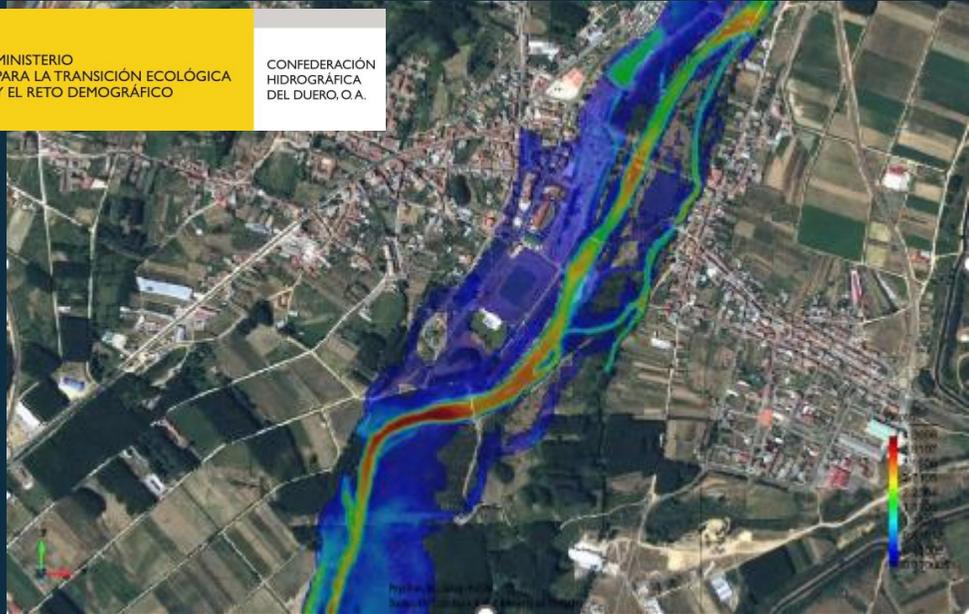
Photo: J.I. Santillán Ibáñez

After removal 2014: 307 m³/s

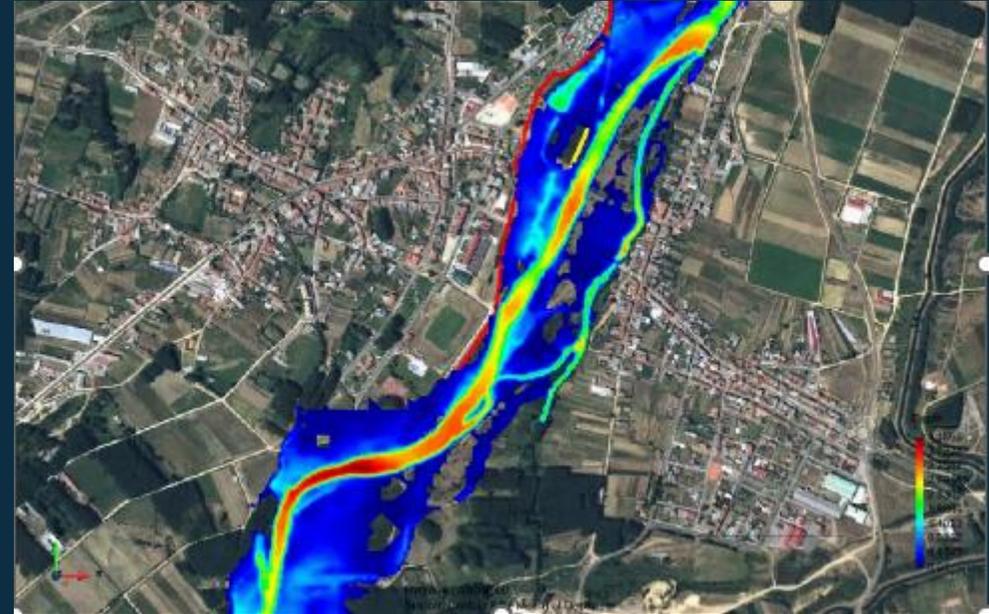
After the strong storms of 2014 and 2019, the Duero River Basin Authority confirmed that if the weir hadn't been removed, in 2014 and 2019 the city would have been flooded (2014 river flow reached 307m³/s and in 2019 reached 350m³/s). They also confirmed that the **cost of the weir removal** was lower than the cost of the damages that would have suffered the city in only one of the floods.

3.3 Safety reasons

Carrizo de la Ribera (Leon Province, Spain)



Before the removal and setting back levees



After the removal and setting back levees

This is another example, although not regarding transversal barrier removals but longitudinal barrier removals, which are also very important because these barriers can exacerbate floods in urban areas. This is a town in the province of León that used to suffer from floods from time to time. The levees along the river were built to “protect” the village from floods in the past, however it did the opposite. The Duero River Basin Authority **removed and pushed back the levees along the river**, and in the last 12 years, the village hasn’t suffered any flooding problems.

3.3 Safety reasons

Santa Marina del Rey (Leon Province, Spain)



Source: Spanish National TV channel, “El Escarabajo Verde” programme

Left image: Duero River Basin Authority, during a community meeting explaining the “levees” projects.

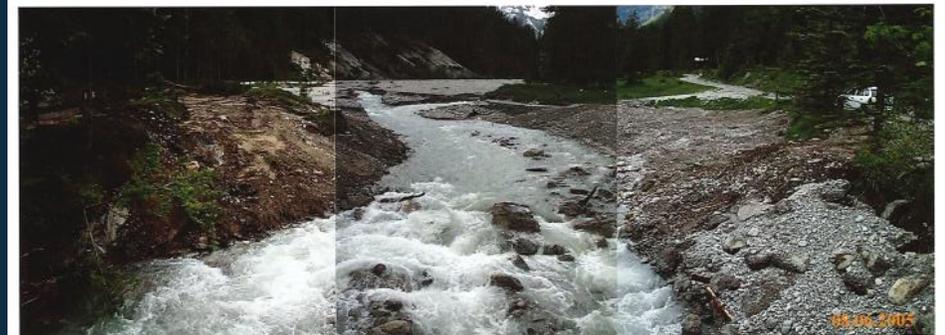
Right image: the Mayor of the village during an interview with the Spanish National TV, explaining why they were opposed to the removal and set back of levees project, as they thought the authority were taking away the protection against floods. However, 11 years later, they understand the importance of this project, as they have not suffered any more flooding.

3.4 Economic reasons

The Lech River, (Tyrol Region, Austria)



 Bundesministerium
Land- und Forstwirtschaft,
Regionen und Wasserwirtschaft



SCHWARZWASSERBACH Monitoring 2005

Absenkung der Sperre hm 57,72 um 2,0 m

The Lech River was going through severe riverbed degradation which was affecting the pillars of this bridge (digging up/unearthing the pillars). There have been 3 “checked” dam removals in two tributaries upstream and some other checked dams have been lowered, **releasing trapped sediment downstream**. Thanks to this sediment input, the erosion of the riverbed at the pillars of the bridge has improved.

3.4 Economic reasons

“The catalogue of measures for Hydromorphology”

Maßnahme	Kosten	
	Mittelwert	Bandbreite
Entfernen des Querbauwerks	24.000 € / hm	2.000 - 109.000 € / hm
Umbau zu aufgelöster Rampe	88.000 € / hm	2.000 - 241.000 € / hm
Umgehungsarm	90.000 € / hm	15.000 - 219.000 € / hm
Umgehungsgerinne abh. von Dotation+Lage Einstieg	70.000 € / hm	5.000 - 271.000 € / hm
Naturnaher Beckenpass abh. von Dotation+Lage Einstieg	39.000 € / hm	2.000 - 129.000 € / hm
Raugerinne	59.000 € / hm	14.000 - 131.000 € / hm
techn. FWH (Vertical Slot) abh. von Dotation+Lage Einstieg	74.000 € / hm	6.000 - 398.000 € / hm
Wiederherstellung naturnaher Mündungsbereiche bei aufgrund Eintiefung abgetrennten Zuflüssen	139.000 € (Gesamt)	5.000 - 1.273.000 € (Ges)

The Ministry of Agriculture, Forestry, Regions and Water Management of Austria published in 2017 the “Catalogue of measures for Hydromorphology”. In this report, they did a comparison of effectiveness concerning morphological measures: construction of different type of fish passages versus barrier removal.

The conclusion is that removing barriers is working better and is much cheaper.



3.4 Economic reasons

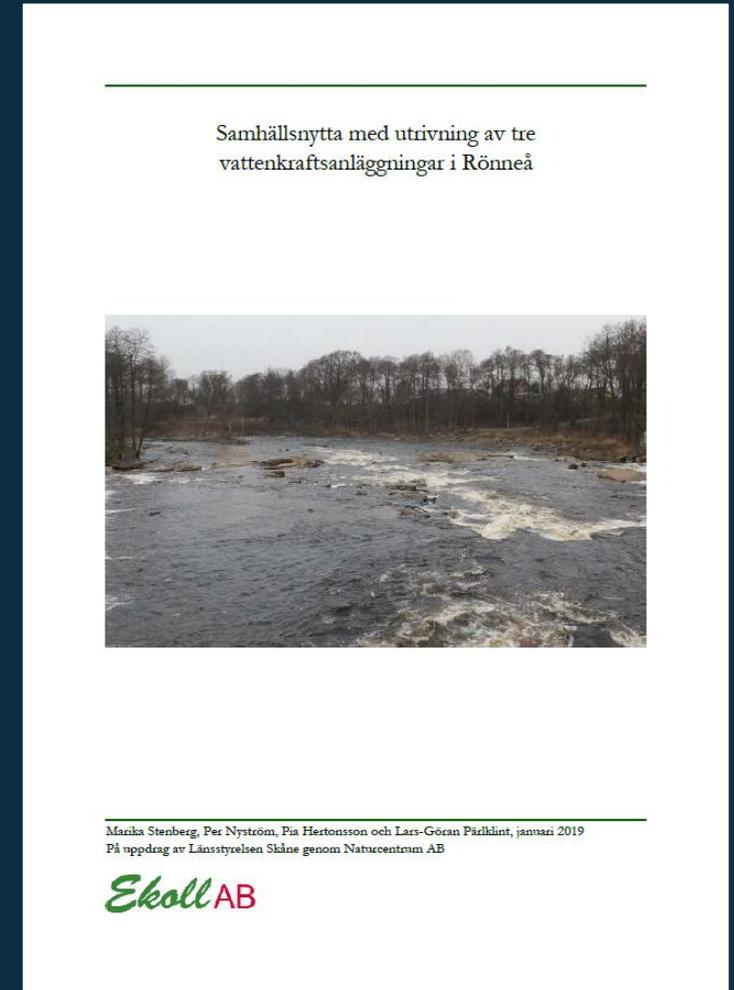
“Societal benefits of demolishing three hydropower plants in Rönneå”

Klippan Municipality (Sweden)

Conclusions of the Socio-Economic potential benefits after the future removals of 3 dams:

- The estimated costs of the project are about 46,8 million SEK (4,1 million Euro)
- After two years, the costs of the project will be balanced.
- The overall analysis of the total benefits are about 850 million SEK (75 million Euro) after 20 years.

Source: Klippan Municipality and County Administrative Board of Skåne.
Full report can be downloaded [HERE](#).



3.4 Economic reasons

Sindi Town, Tori Municipality, 7 weir removals in Pärnu River (Estonia)



Author: Helen Parmen (Flirk Tori Municipality)



Author: Ministry of Environment of Estonia

3.4 Economic reasons

Sindi Town, Tori Municipality, 7 weir removals in Pärnu River (Estonia)

There were 7 weirs removed, and all the Pärnu River Basin, over 3,300km connected again with the sea. After the dam removals, the municipality has built a **Rapids Center**, for kayaking and will offer **fishing expert guide tours**, as wild migratory fish species are back in the whole basin.

Since the project was executed, Tori Municipality is the only municipality in all the county that:

- has increased the **number of inhabitants**,
- the **real state market** is improving,
- The job offers and increasing, as the eco-tourism has increased.

Photo: Kairi Lumberg (July 2022)



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TRAVELGUIDE



Pärnu, Estonia

3.4 Economic reasons

Vigo Bay (Galicia Region, Spain)

Decline of fisheries and shellfish harvesting disappearing



Left: Shellfish catchers working in Vigo Bay.
Right: Fifth generation of shellfish catcher.
Images taken from DamBusters documentary

Susi (spokesperson of the shellfish catcher's community, right picture) and Agustín Reguera, the mayor of the municipality (next slide) explain how important is the shellfish/seafood industry in Galicia (one of the most important in this Spanish Region) and the fact that many shellfish species have disappeared (like oysters and cockles) due to sediments and nutrients trapped behind dams. The economic loss is higher than the economic benefits from many of these old dams.

3.4 Economic reasons

Vigo Bay (Galicia Region, Spain)



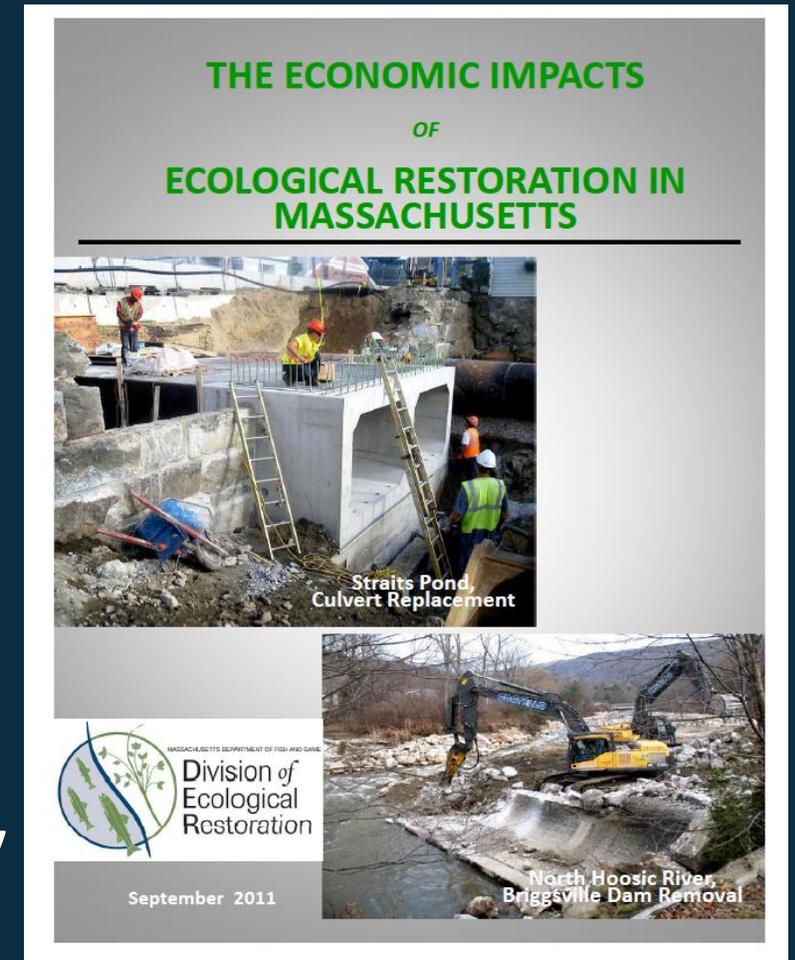
Left: Mayor of Soutomaioir. Right: Galician Regional Newspaper article. Images taken from DamBusters documentary

3.4 Economic reasons

Conclusion of three economic studies done by the Division of Ecological restoration (State of Massachusetts, USA):

*“Restoration projects **generate equal to or greater economic benefits** than other types of projects such as road and bridge construction”.*

They call this “Restoration economy”





€42,5 millions to demolish river barriers through Great Europe

Open Rivers Programme

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