Project Overview

AEMS Webinar 16/04/2018

AMBER

Carlos Garcia de Leaniz
& the AMBER consortium

Funded by the Horizon 2020 Framework Programme of the European Union

AMBER

www.amber.international

Adaptive Management of Barriers in European Rivers

H2020, €6.2 M, 20 partners, 11 countries 2016-2020

8 Universities - Swansea, Durham, Highlands & Islands, Southampton, Cork (Ireland), Oviedo (Spain), Milan (Italy), DTU (Denmark).

4 Industrial partners - hydropower – EDF (France), IBK (Germany), Innogy (Germany), Sydkraft (Sweden)

4 NGOs (WFMF (Netherlands), WWF (Switzerland), CNSS (France), AEMS (Spain)

4 Government organisations - IFI (Ireland), ERCE (Poland), SSIFI (Poland), Joint Research Centre (Italy)

Why AMBER?

Why AMBER?

4 H's threaten fish biodiversity:

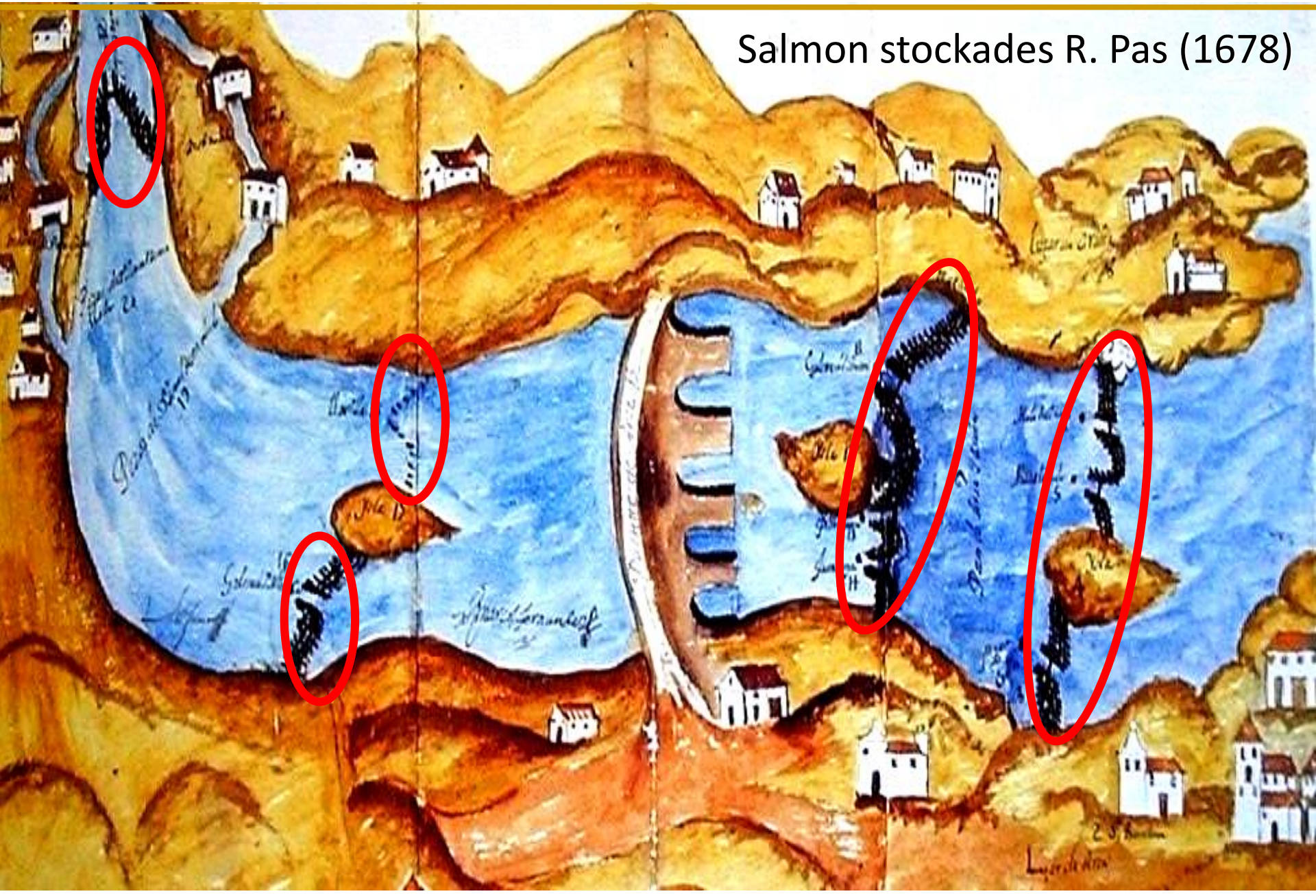
Harvest

Habitat

Hatcheries (AIS)

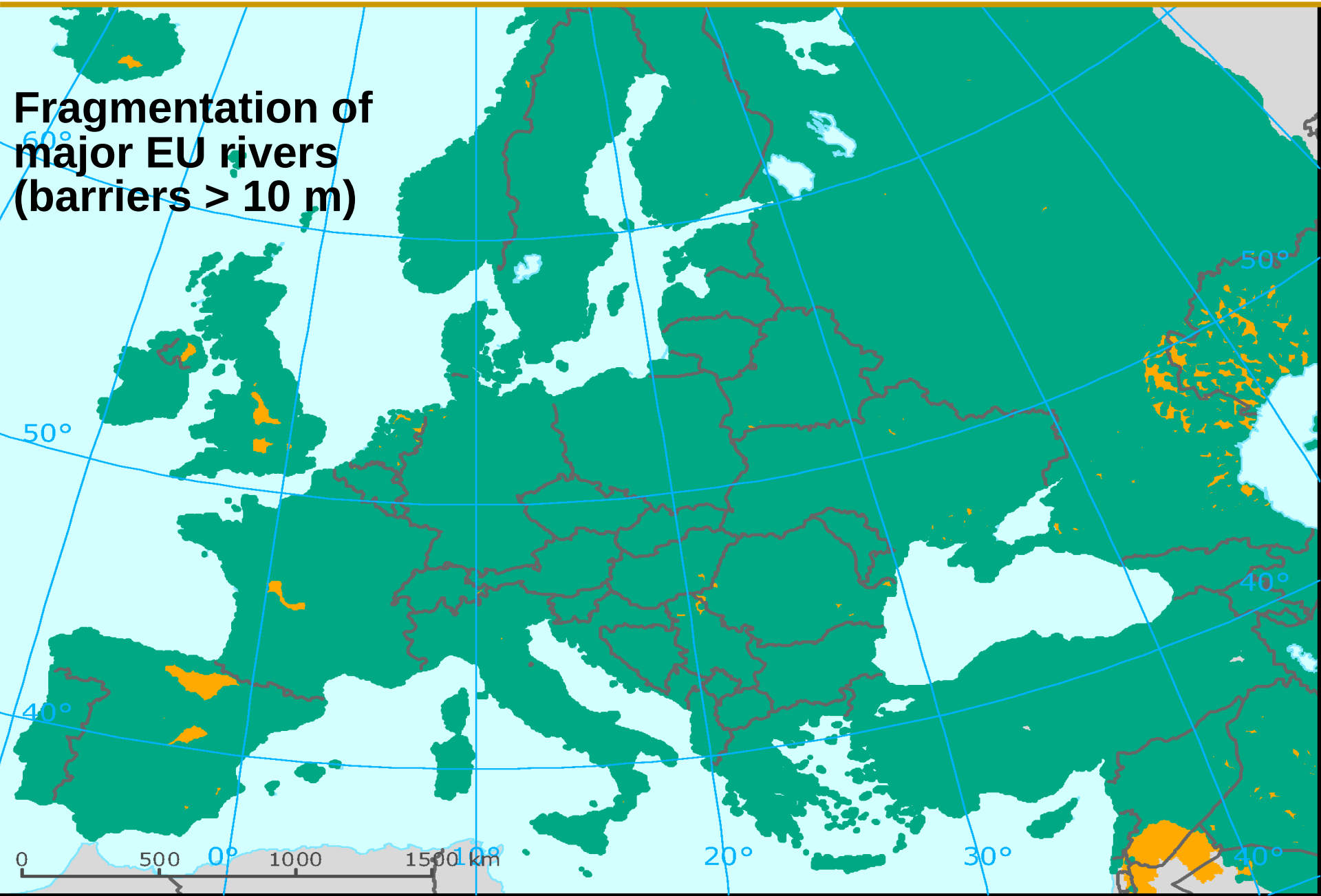
Hydro (Obstacles)

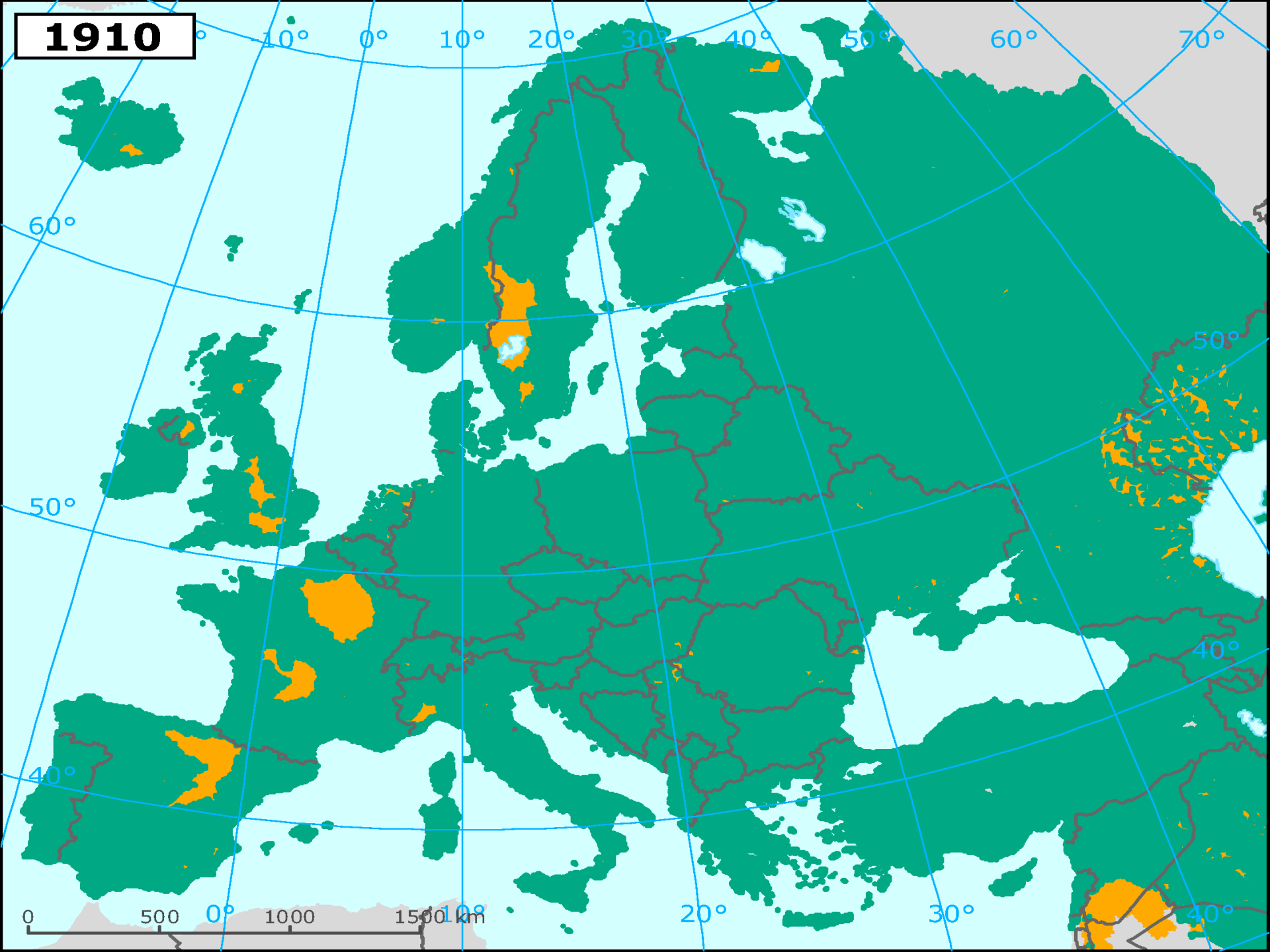
But stream barriers are not new….



1860

.... they just got larger

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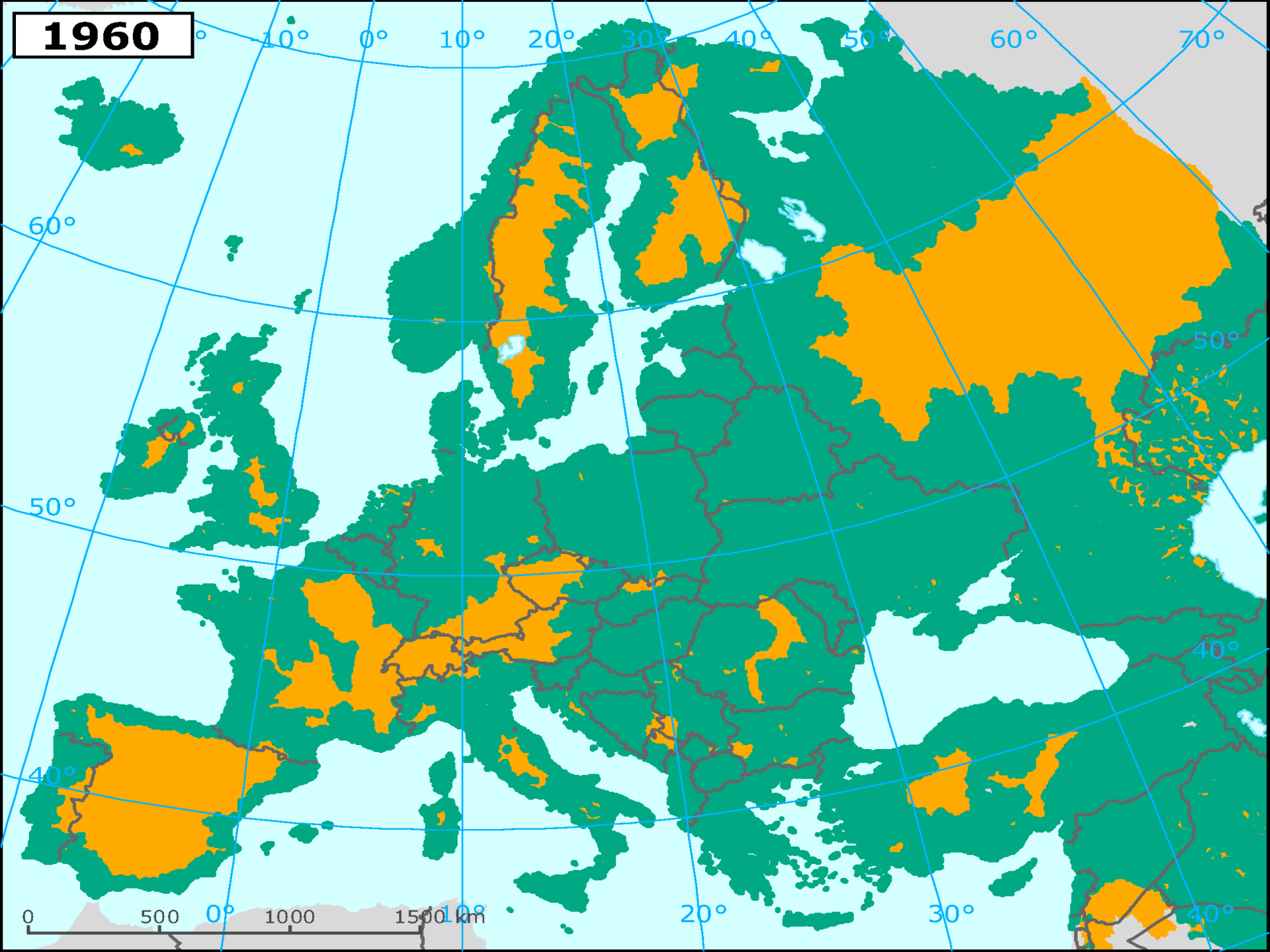
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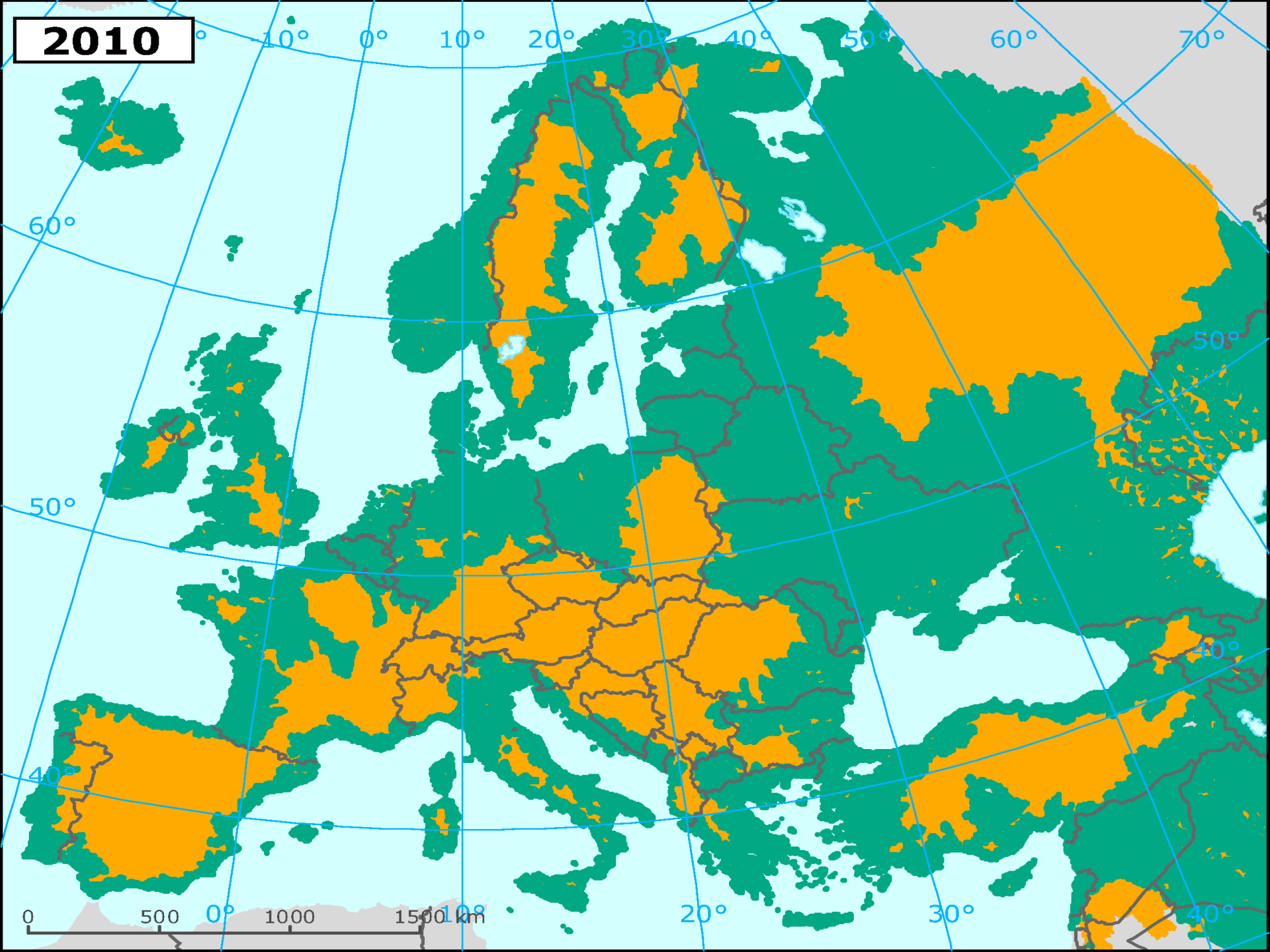
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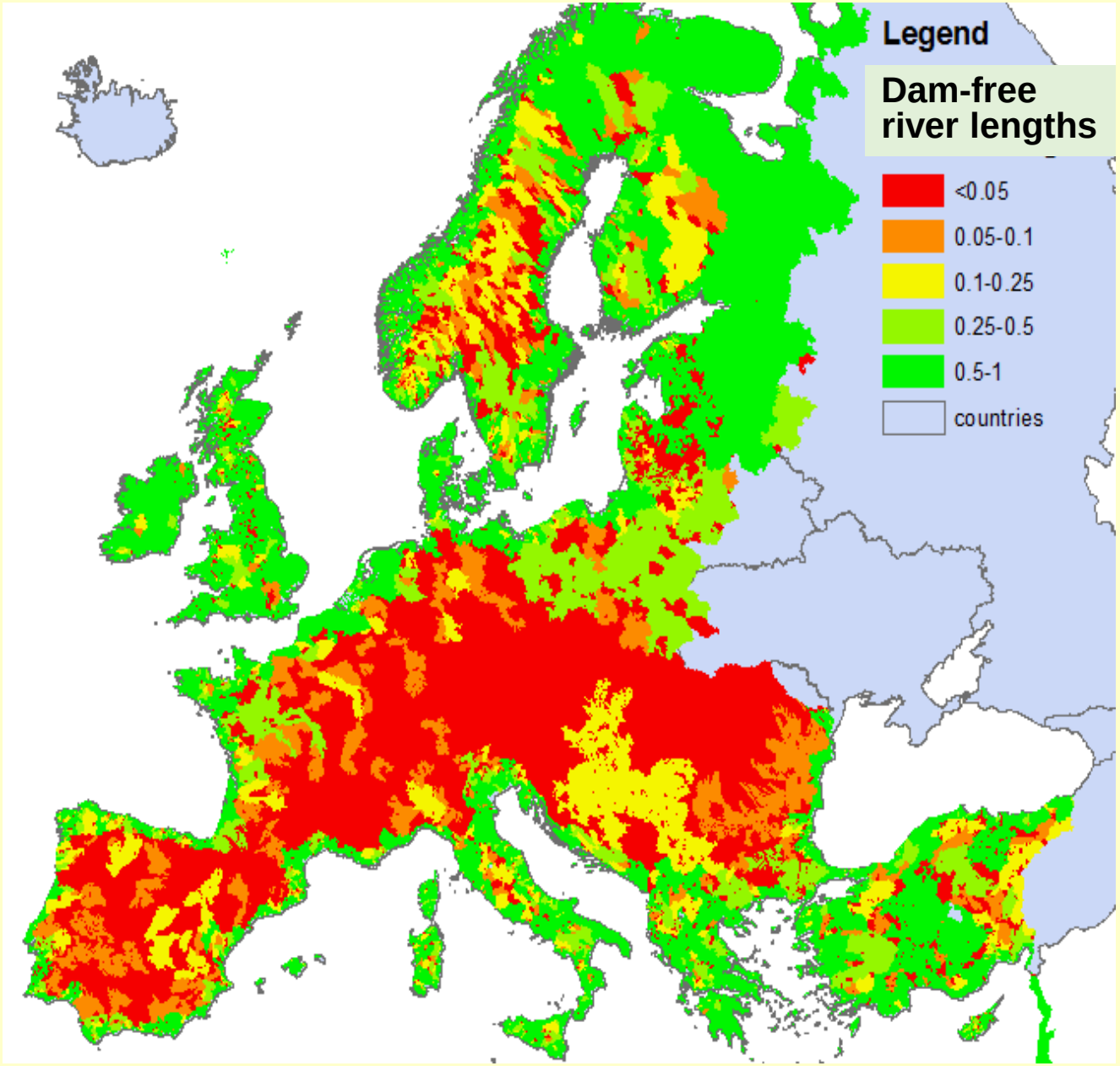
Extent of EU river fragmentation (Pistocchi et al 2017)



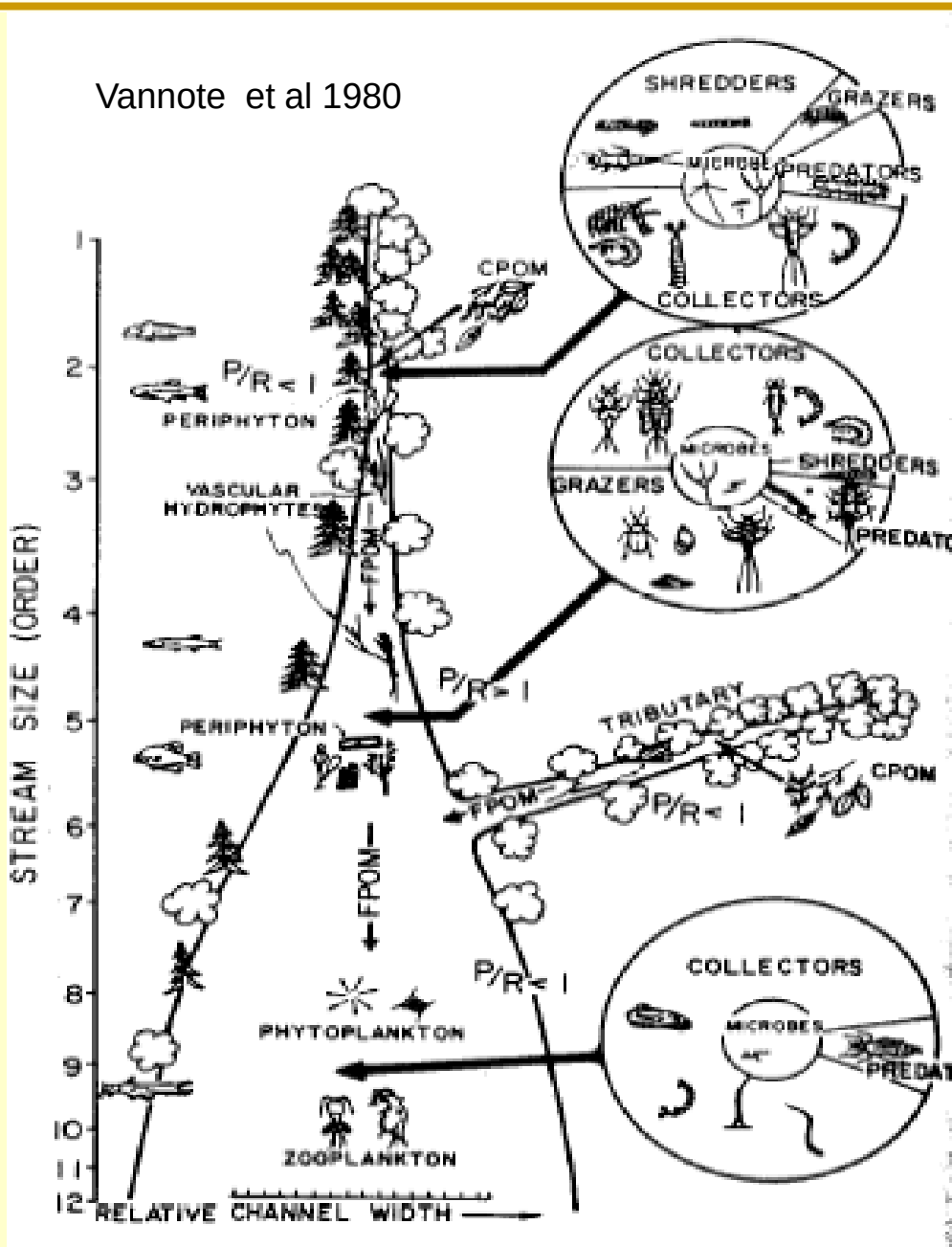
Despite EU legislation (WFD) all major EU rivers remain poorly connected and un-accessible to migratory fish

Why AMBER?

Many reasons:

1. Healthy rivers = Flowing rivers

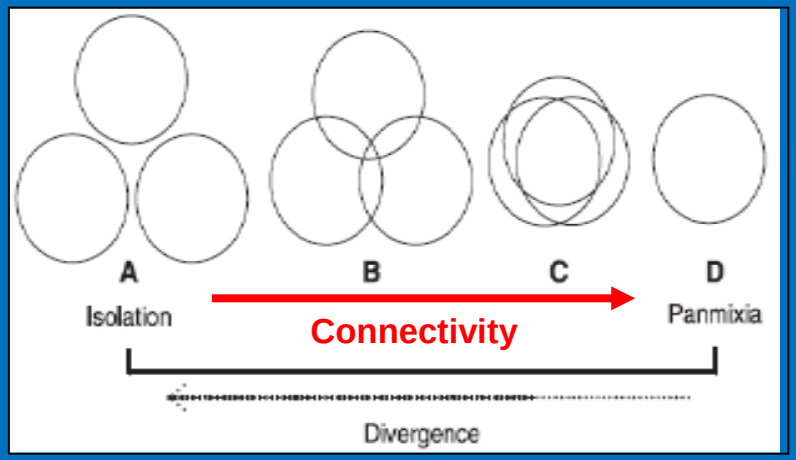
River continuum underpins structural and functional integrity of rivers



Why AMBER?

2. Movement = animal's reaction to adversity

- Individual fitness
- Metapopulation
- Resilience
- Portfolio effect



Recommendations of the meeting of the
European Platform for Biodiversity Research Strategy
Brdo, Slovenia, 15th -18th January 2008
WATER FOR LIFE: RESEARCH PRIORITIES FOR SUSTAINING FRESHWATER BIODIVERSITY

- Assess effect of **connectivity** of freshwater systems on biodiversity & resilience

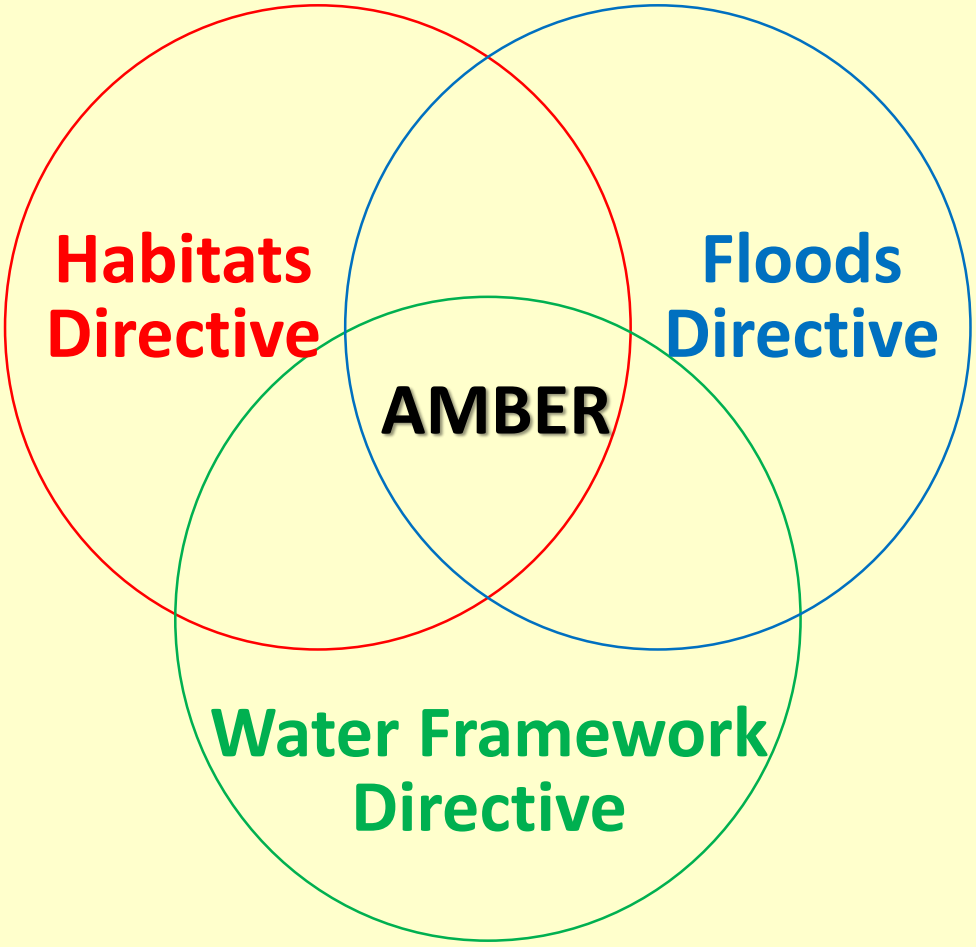
Why AMBER?

3. Natural capital (ES)

- ES contingent on having connected rivers
- Must benefit providers, as well as users
- Hence, watershed scales

Why AMBER?

4. Policy implications of stream barriers



Aims of AMBER

1. To develop ***more efficient methods of restoring stream connectivity***

2. This requires a shift towards **adaptive management**, one that **maximises benefits** and **minimises impacts** through system monitoring

Practical outputs of AMBER

1. The first global **Atlas** of stream barriers in Europe (**WP1**), making use of a citizen science programme (**WP5**)

2. A **novel toolkit** for assessing barrier impacts (**WP2**)

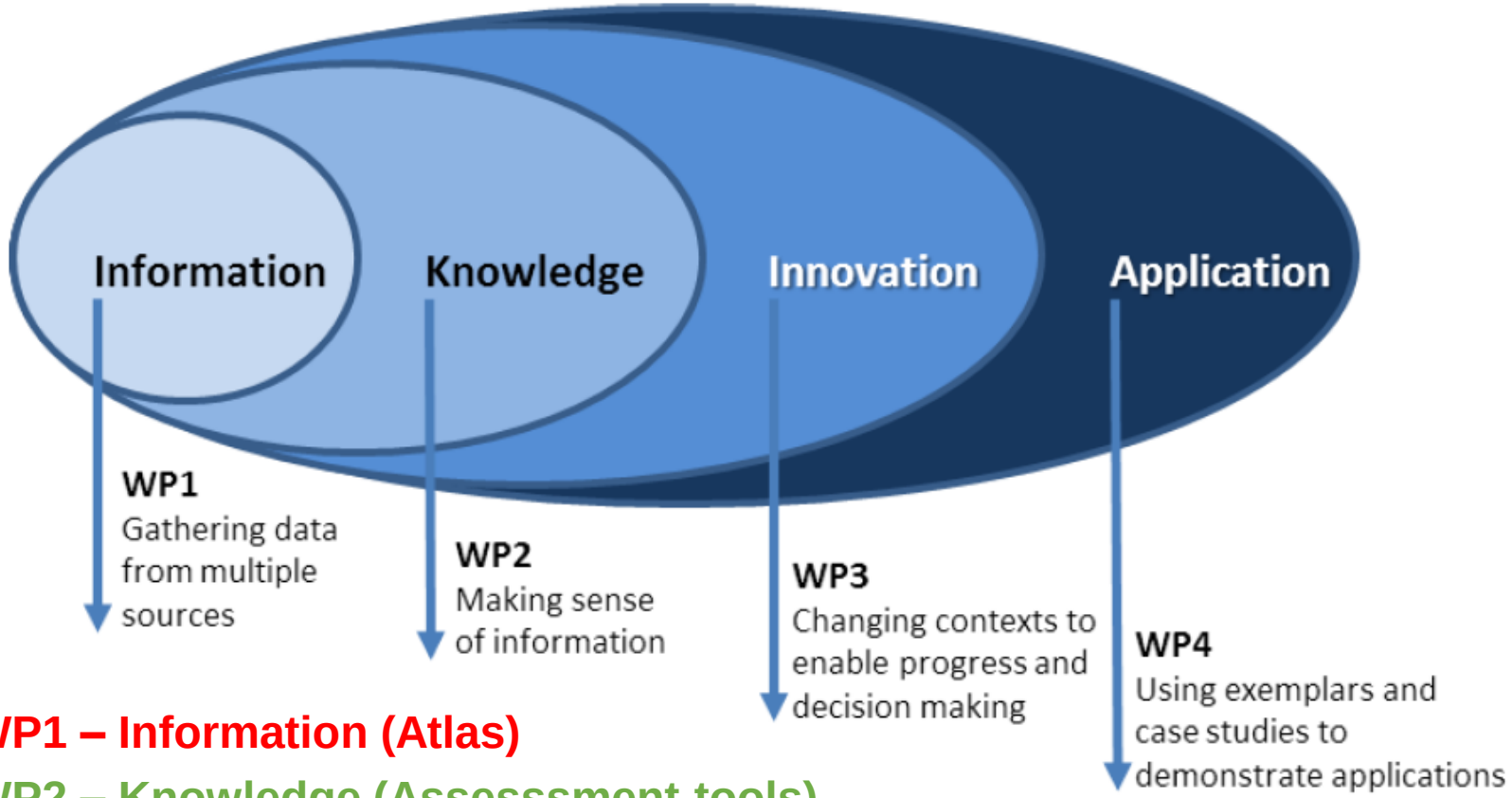
3. A **socio-economic evaluation** of barriers impacts on Ecosytem Services (**WP3**)

4. A **decision support tool** for monitoring of restoration of stream connectivity (**WP3**)

5. **Guidelines** and CBP based on **demonstration cases** (**WP4**)

6. A **dissemination strategy** to facilitate sharing of information and turn information into application (**WP5**)

Structure of AMBER



WP1 – Information (Atlas)

WP2 – Knowledge (Assesssment tools)

WP3 – Innovation (Decision tools)

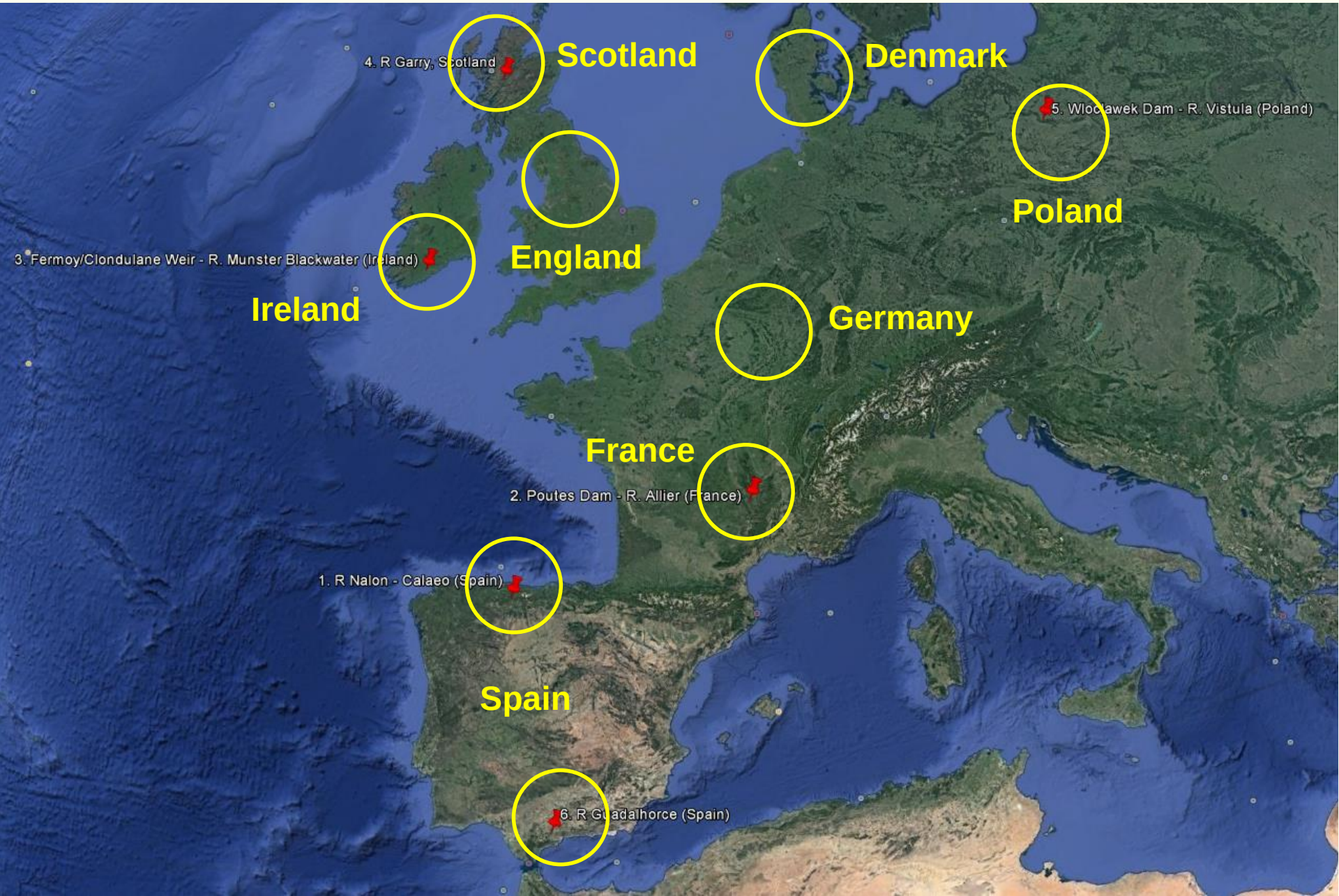
WP4 – Application (Case studies)

WP5 – Dissemination

WP6 – Management

WP7 - Ethics

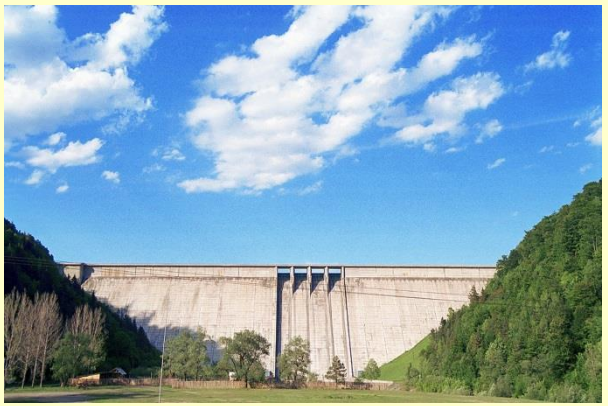
AMBER Case Studies



Challenges for restoring river connectivity in EU

1. Number of barriers in EU rivers is unknown

- Definition of 'barrier', country coverage, scale

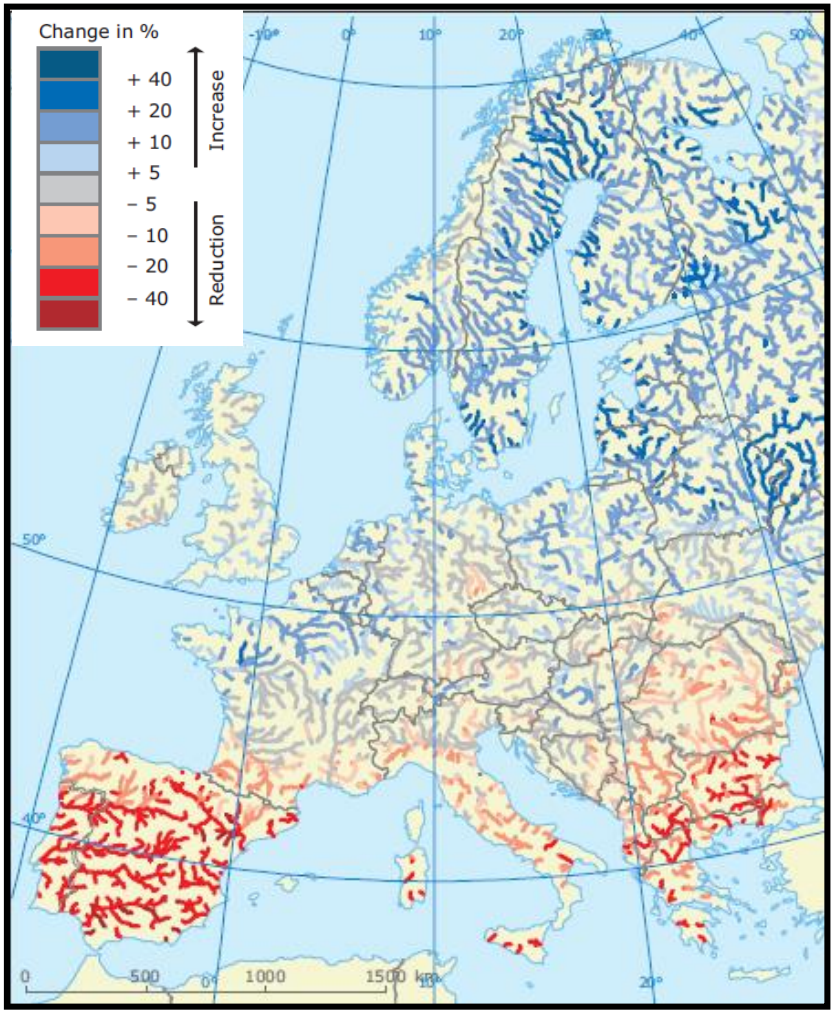


2. … but certainly more than we can mitigate for

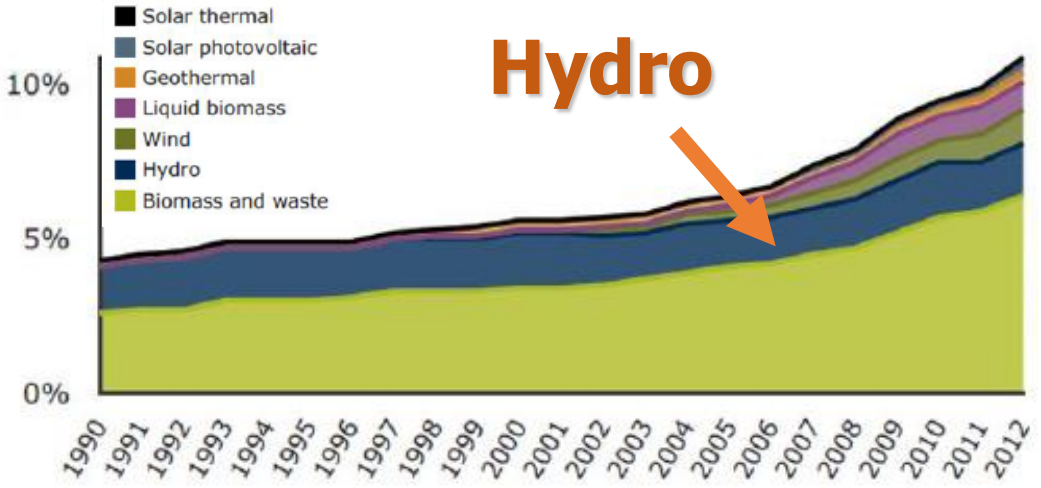
- Best estimate (based on regional data) =

0.6 to 1.8 million dams & weirs!

3. An Atlas of barriers in Europe is needed!



Projected changes in river flows over baseline values (EEA)



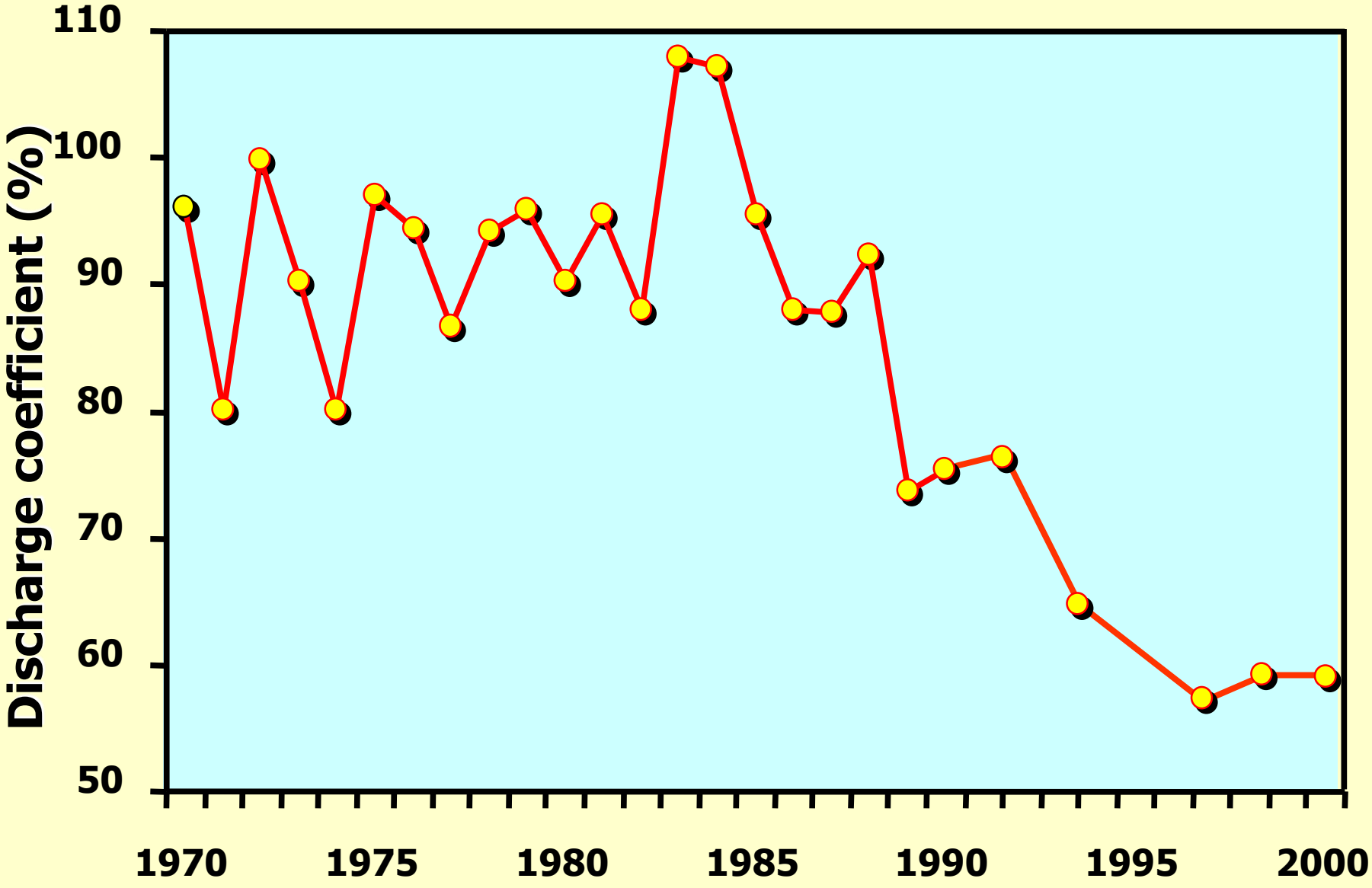
Breakdown of renewable energies/total

4. River flows will decrease, ...where water is most needed!

5. Increase in hydro to meet EU energy targets

6. Impacts of barriers will worsen

Many rivers carry less water….(like for like)



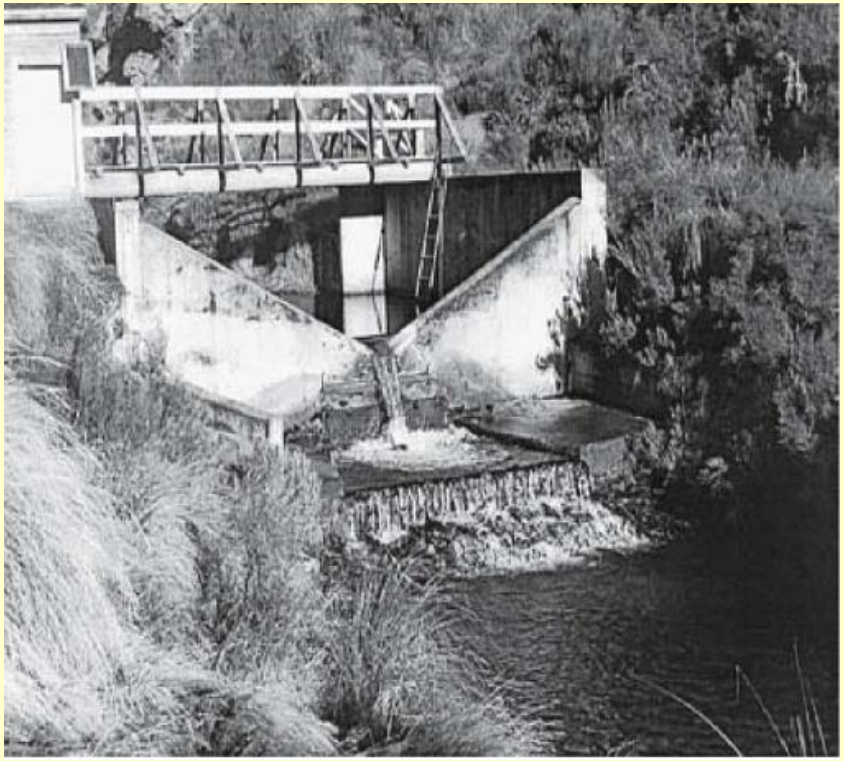

... and this makes them more fragmented

7. Much is known about restoring fish [salmonid] passage, little about other taxa or fluvial processes

8. Not all barriers can – or should – be mitigated

i.e. Aquatic Invasive Species

topmouth gudgeon



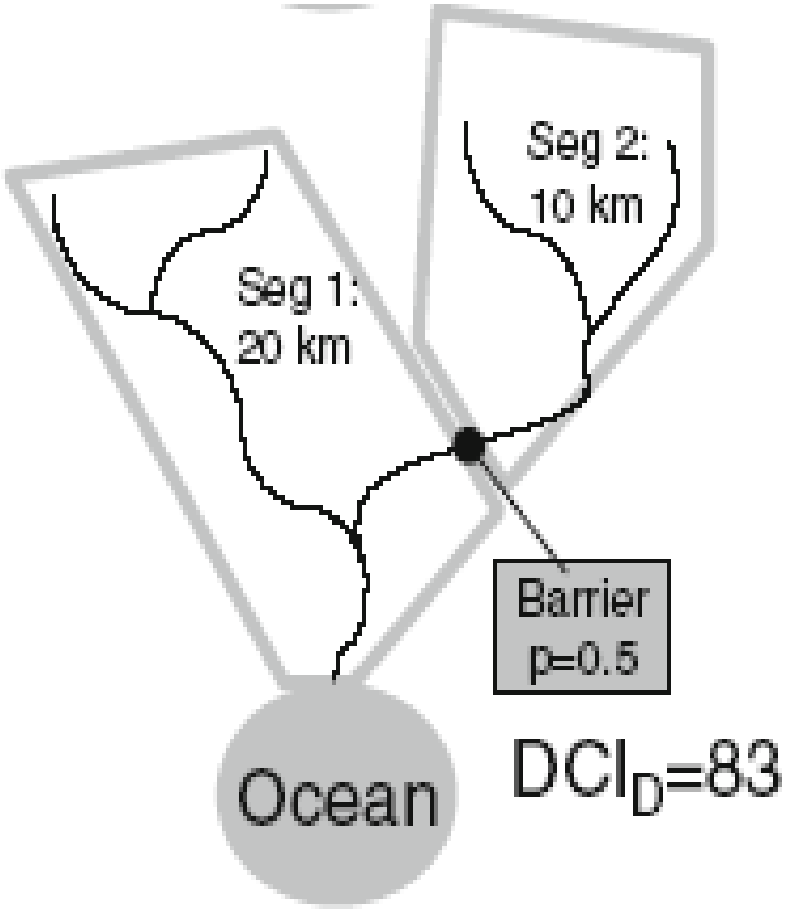
Barrier to prevent immigration of invasive salmonids (NZ)

8. Not all barriers can – or should – be mitigated

i.e. cultural heritage

Roman bridge (Cangas de Onis, R. Sella)

9. Better **decision & prioritization tools** are needed!



Dendritic connectivity index

Barrier Impacts:

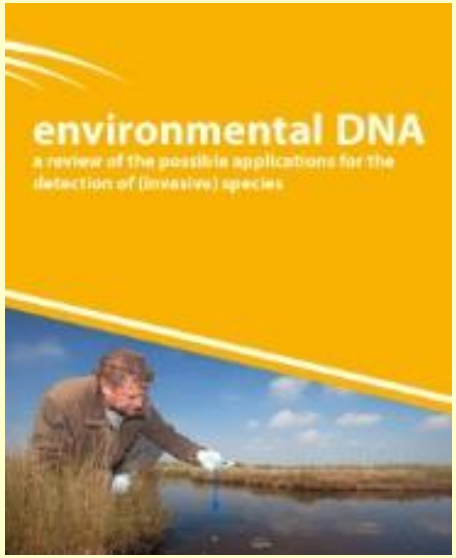
- Number
- Location
- Passability (?)

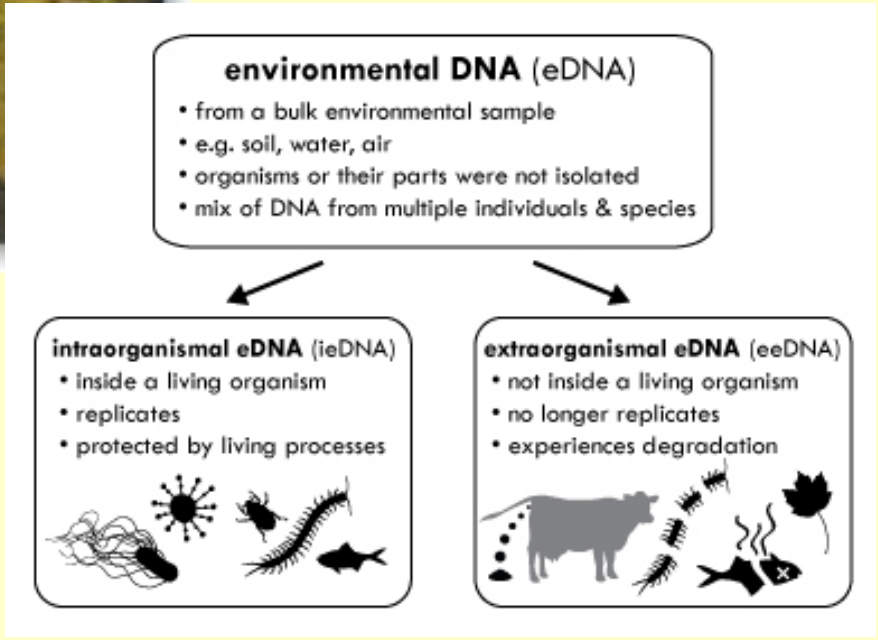
Barrier Mitigation:

- Cost
- Opportunity
- Benefits (?)

New opportunities for restoring river connectivity

1. eDNA/meta-barcoding





New opportunities for restoring river connectivity

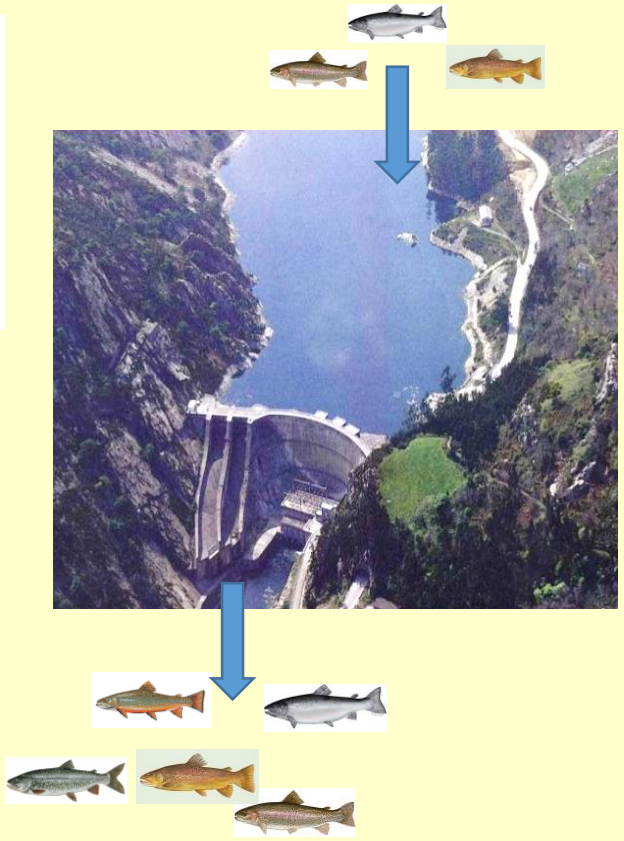
Case study (R Nalon, Spain; 5 dams, 5 species)

PeerJ

An extremely sensitive nested PCR-RFLP mitochondrial marker for detection and identification of salmonids in eDNA from water samples

Laura Clusa[1], Alba Ardura[2], Sara Fernández[1], Agustín A. Roca[1] and Eva García-Vázquez[1]

Figure 2 **Nalón River basin.** Dams along the river are shown; from downstream to upstream they are Valduno (D1), Priañes (D2), Furacón (D3), Rioseco (D4) and Tanes (D5). The fish farms are pointed as F1 to F7 and finally the sampling points are numbered in red from 1 to 16.



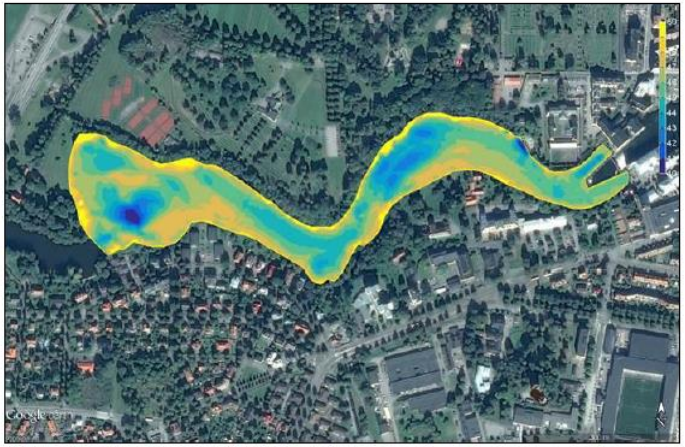
eDNA can help identify discontinuities

New opportunities for restoring river connectivity

2. Drones & Remote sensing for quick surveying

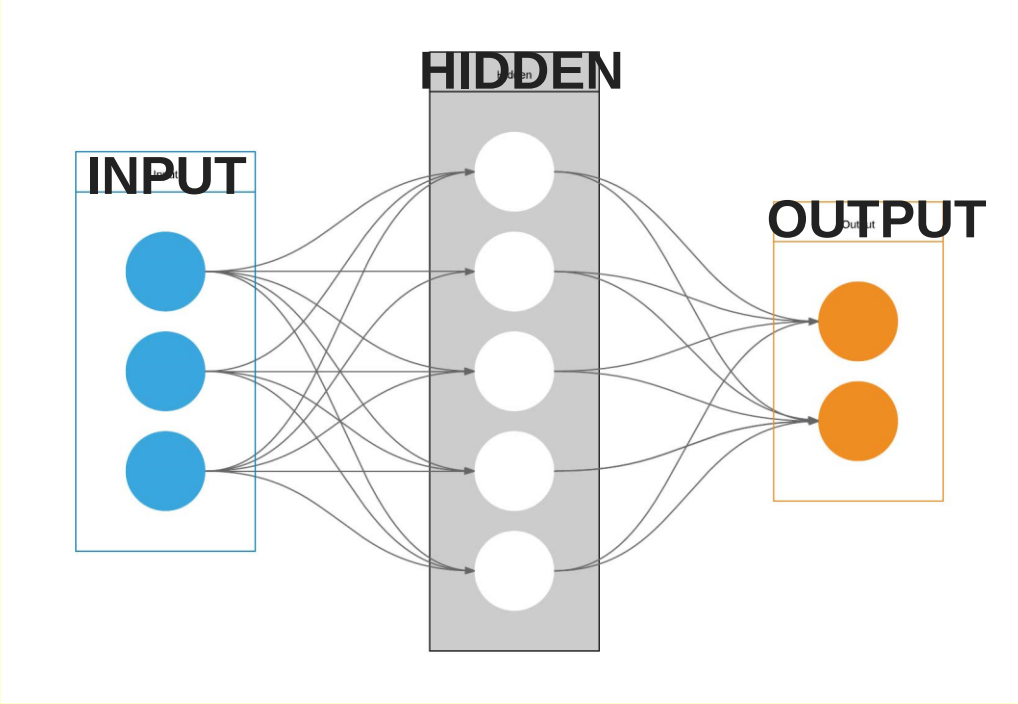
Quantification of hydraulic conditions common at river infrastructure (T3.2.1)

University of Southampton's ArcBoat – RTK GPS linked to ADCP provides high resolution flow velocity and bathymetric data.



New opportunities for restoring river connectivity

3. Better use of P/A data (Predictive modelling)



Interconnected nodes in artificial neural networks

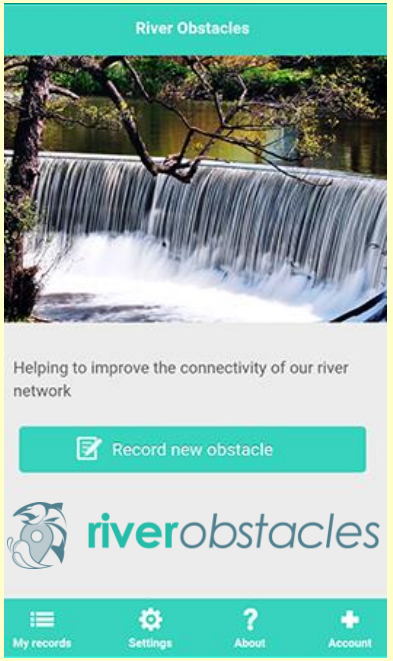
Makes full use of heterogenous data from river surveys and barrier location to:

1. **Better quantify barrier effects**
2. **Make better decisions**

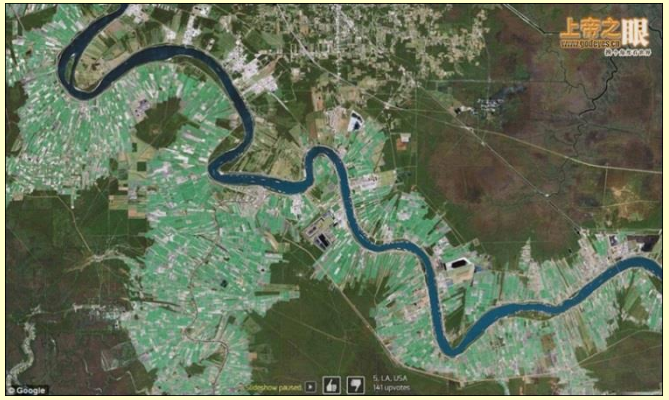
New opportunities for restoring river connectivity

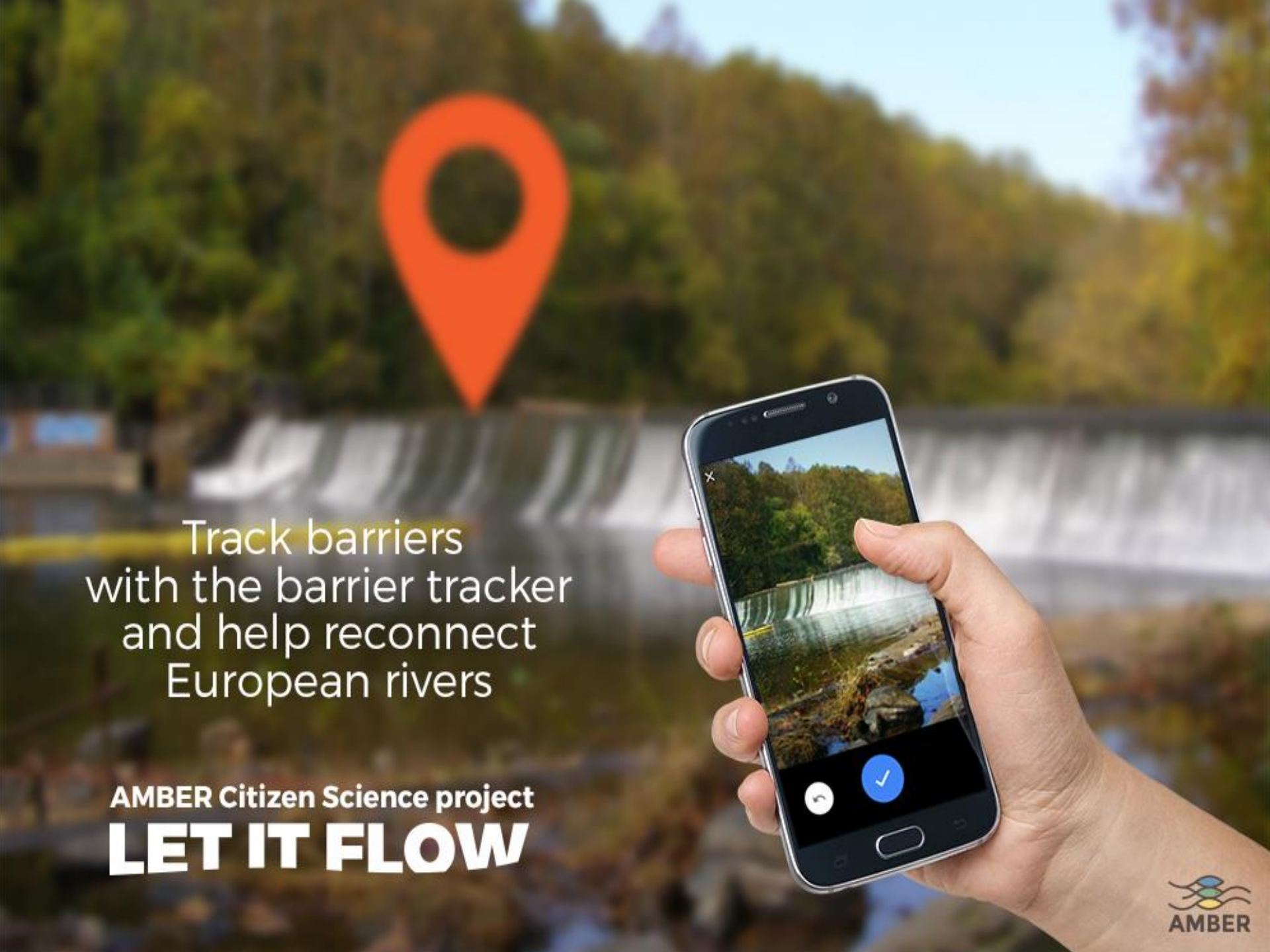
4. Citizen science & local engagement

- Smartphone apps/ CS portals



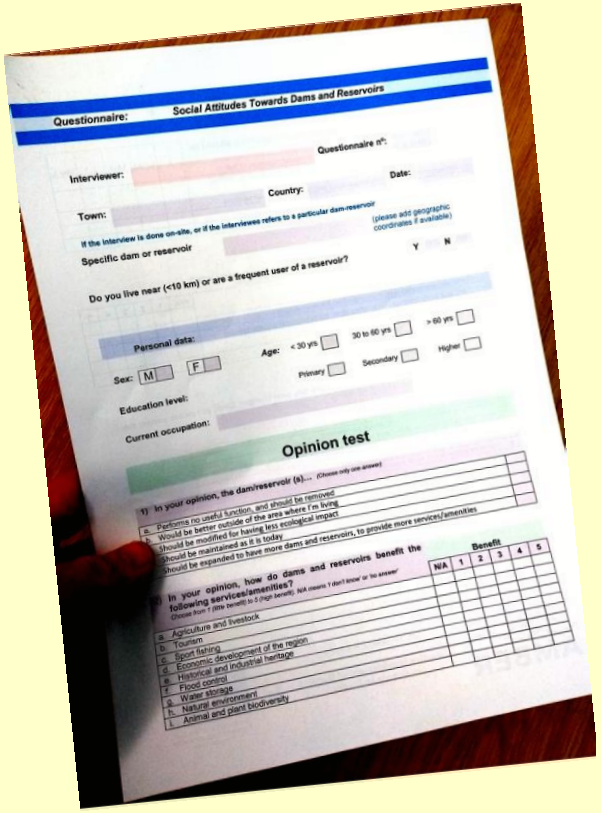
- Google Earth

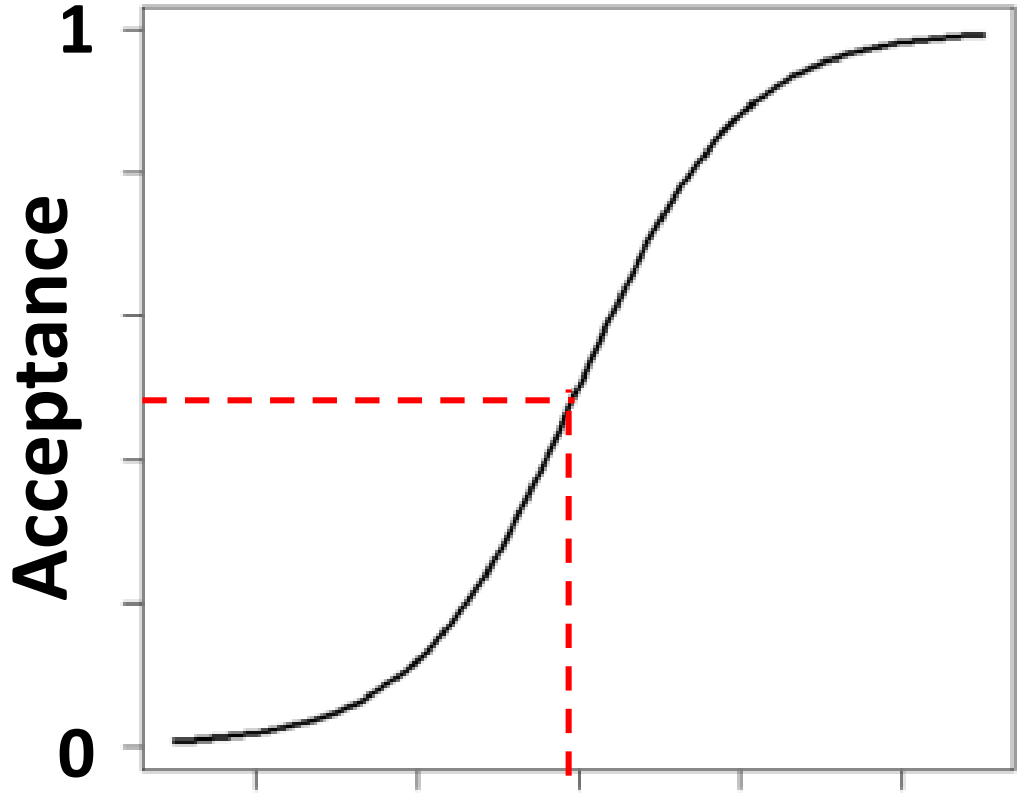



Track barriers
with the barrier tracker
and help reconnect
European rivers
AMBER Citizen Science project
LET IT FLOW
AMBER

Understanding people's attitudes to dams

- Questionnaire to assess attitudes & economic value
- Economic cost-benefit models (ES)

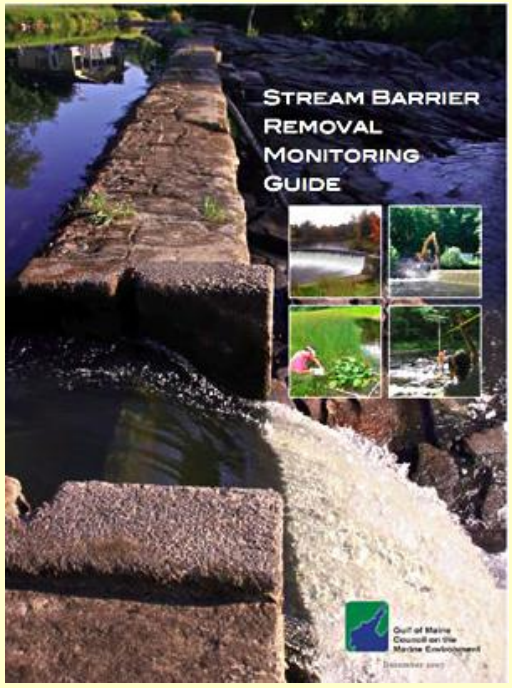


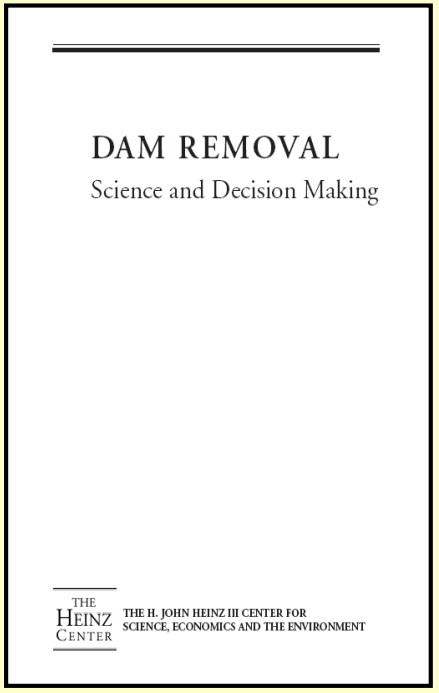


Predictors (age, income, distance to reservoir, etc..)

New opportunities for restoring river connectivity

Advances in science of dam removal





Adaptive management & redesigned configuration

Adaptive management & redesigned configuration

Proposed change: lower head configuration

- 4 m height, 300 m impoundment
- 90% electricity maintained
- Cost = +40 M€

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 689682.

Cooperation AMBER and FIThydro

AMBER:

Adaptive Management of Barriers in European Rivers

More effective ecosystem restoration in the EU

FIThydro:

Fishfriendly Innovative Technologies for Hydropower

Developing the next generation technologies of renewable electricity and heating/cooling

Joint session planned for 2020 World Fish Migration Day (Lisbon) with joint publication and guidance

Any Questions?