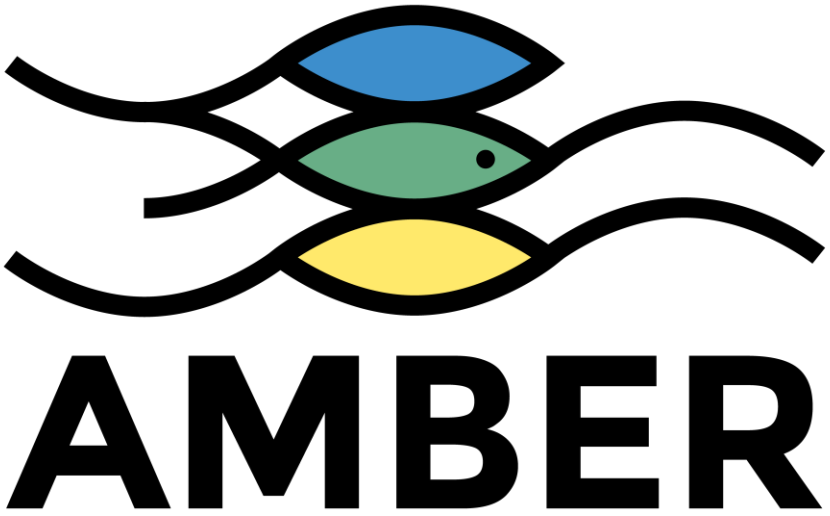

AMBER

Funded by the Horizon 2020
Framework Programme of the
European Union

Adaptive **M**anagement of **B**arriers in **E**uropean **R**ivers

a collaborative project for guidance on barrier location, removal and mitigation in Europe




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Dr. Luca Borger, Dr. Wouter van de Bunt

IRS

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Collaborative?

20 participant institutes:

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)

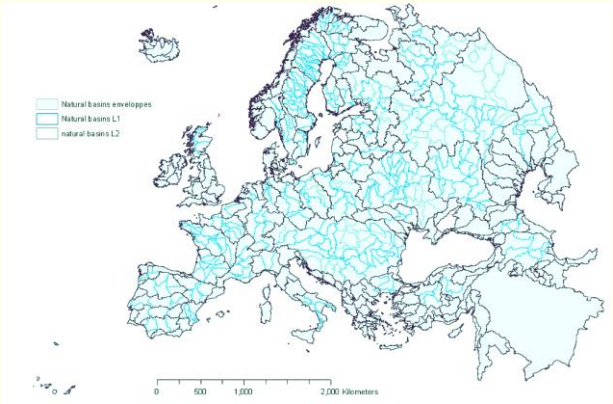
4 NGOs (WFMF (Netherlands), WWF (Switzerland), CNSS (France), AEMS (Spain)

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

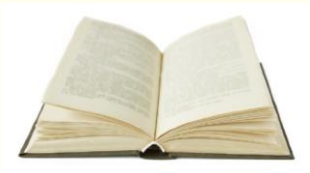
Adaptive **M**anagement of **B**arriers in **E**uropean **R**ivers




1. European Barrier Atlas



2. Barrier guidance
- strategic
- adaptive
- practical



removal

Planning (location)

mitigation

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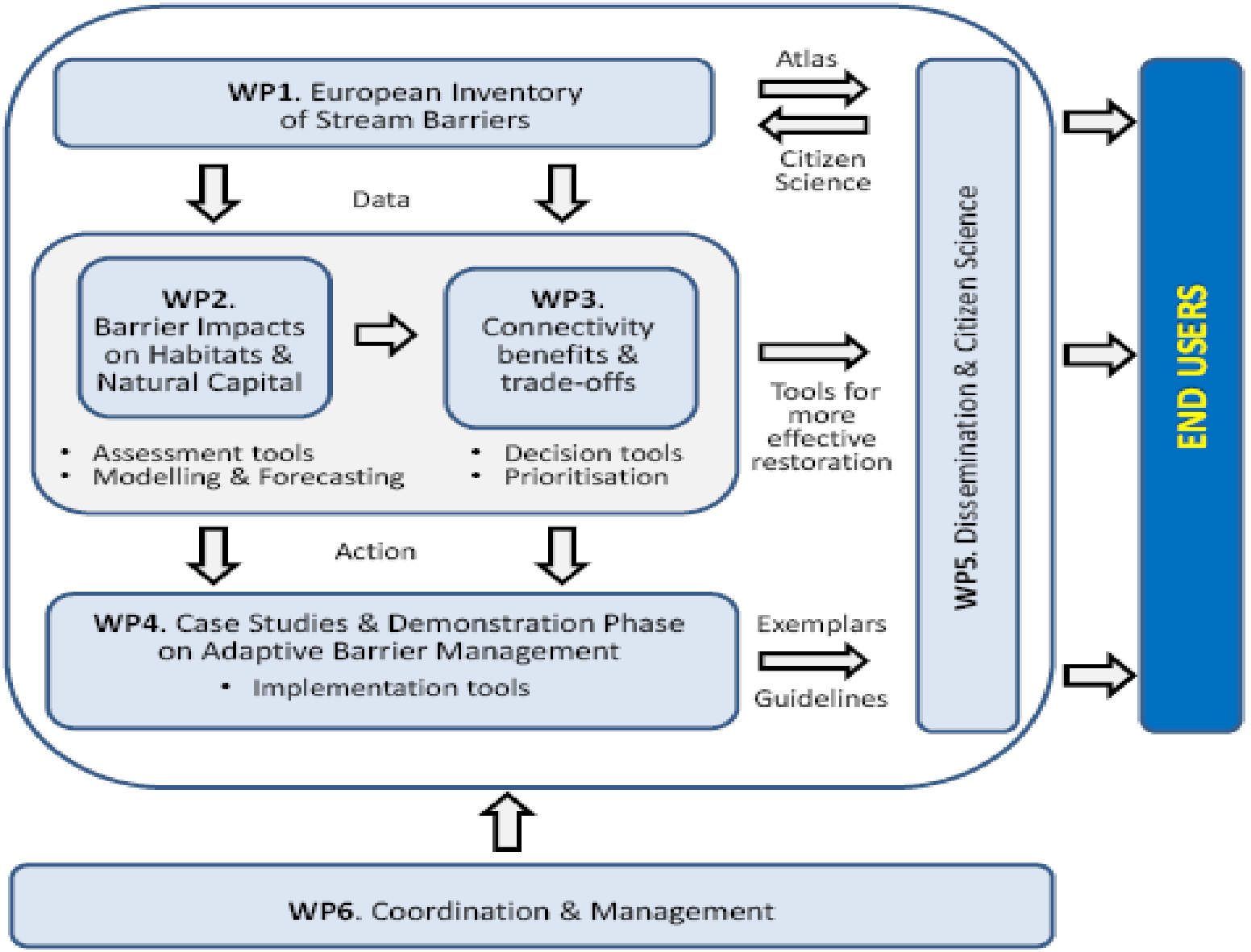
Objectives of AMBER

- Europe-wide atlas of barriers to the migration and movement of aquatic organisms.
- state of the art methods to monitor barrier passability and to manage barriers for impact reduction (planning, mitigation, removal).
- adaptive and comprehensive barrier management and decision making guidance for NGOs, regulators and industry based on:
  - ecological impacts,
  - cost-benefit analysis,
  - sociological and economic factors
  - and ecological/economic modelling.

AMBER Pert diagram



AMBER outputs

Figure 1. Adaptive Management of Barriers in European Rivers (AMBER) project outputs

Mapping

Pan-European maps:

1. Barrier Atlas (dams, weirs, culverts, sluices)
2. Fish community map
3. Atlantic Salmon status map
4. Assessment of barrier impacts on river ecology (modelled)

Dissemination

1. AMBER website (inc. link to Atlas, useable barrier planning models)
2. Education material
3. Peer-reviewed scientific publications
4. Biannual newsletters
5. Policy Briefings
6. Open-access data repository
7. Book: Guidance on Adaptive Barrier Management in Europe

Monitoring

1. Citizen Science barrier monitoring app
2. Barrier Surveying and Reporting Guide
3. eDNA protocol for biota monitoring
4. Method for habitat assessment using drones
5. Case Studies. Demonstration of:
   - Effects of barrier removal, mitigation, installation
   - AMBER tools
6. Ability of organisms to cope with barrier and pass hydrodynamics

Management

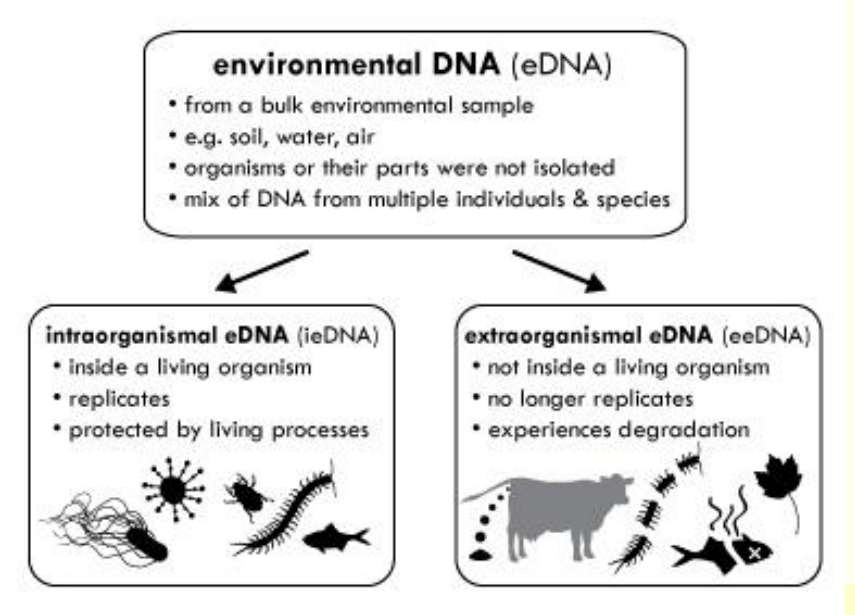
1. Cost-benefit analysis of river infrastructures (inc. natural capital evaluation) for strategic planning
2. Barrier management scenario model (habitat stress days) for decision making
3. Organism Passability vs. Hydropower tool
4. Agent Based Model & Dispersal Model to predict organism response to barriers and passes
5. Ecosystem Services required and delivered under climate change scenarios
6. Social attitudes to dams and reservoirs survey for stakeholder conflict resolution

Barrier decision support tool (removal, mitigation, planning). Local and strategic

New opportunities for restoring river connectivity

1. New technologies

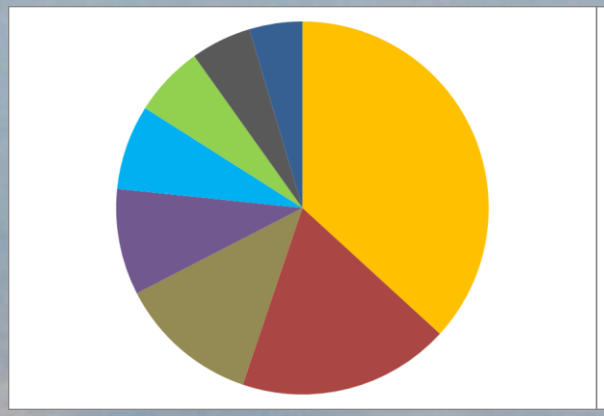
- eDNA/meta-barcoding



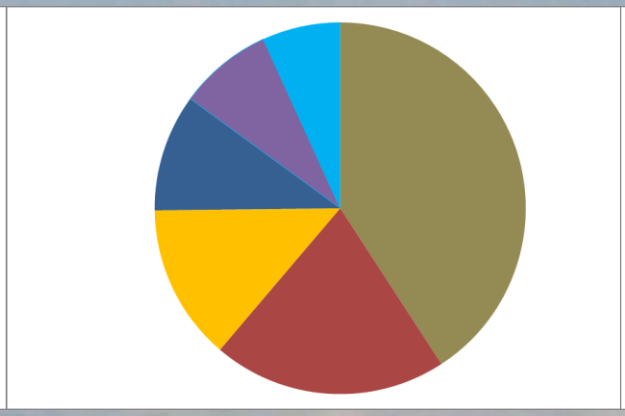
- Drones for quick surveying & remote sensing

- Modelling P/A (PREDICTS approach)

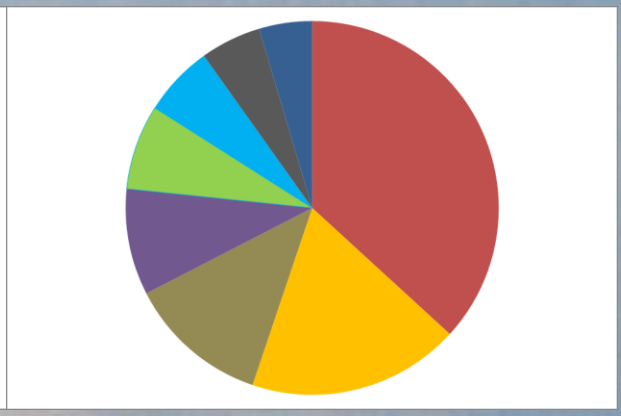
Target Fish Communities



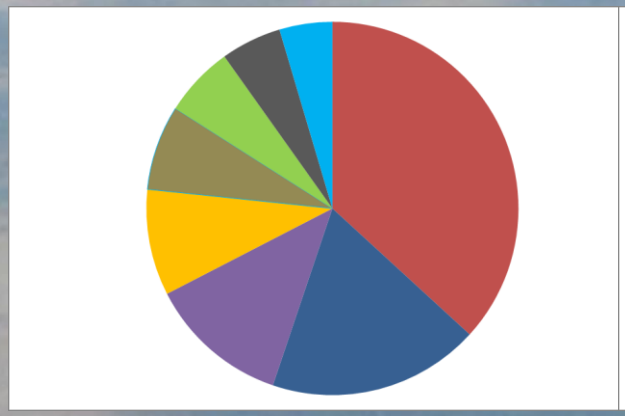
1: mountain rivers and streams



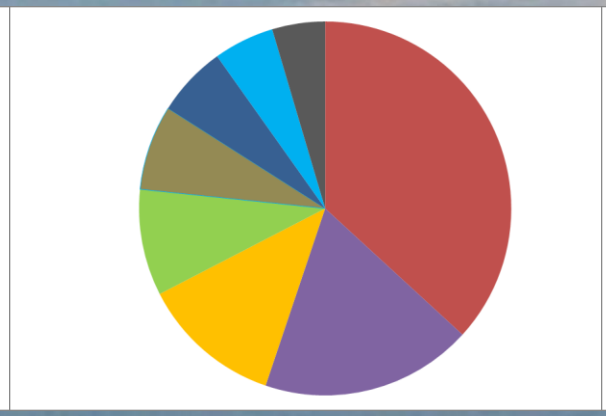
2: flysch rivers



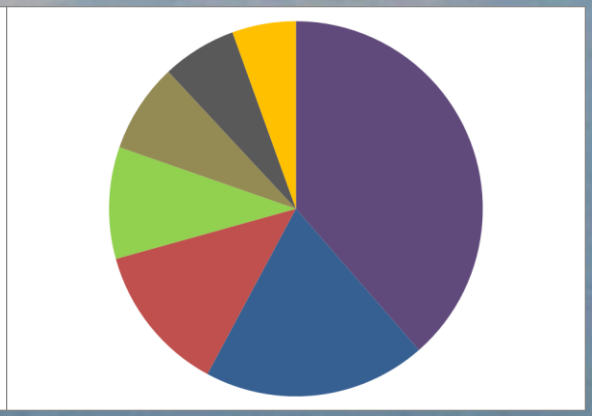
3: lowland streams



4: lowland rivers



5: lake connectors with salmonids



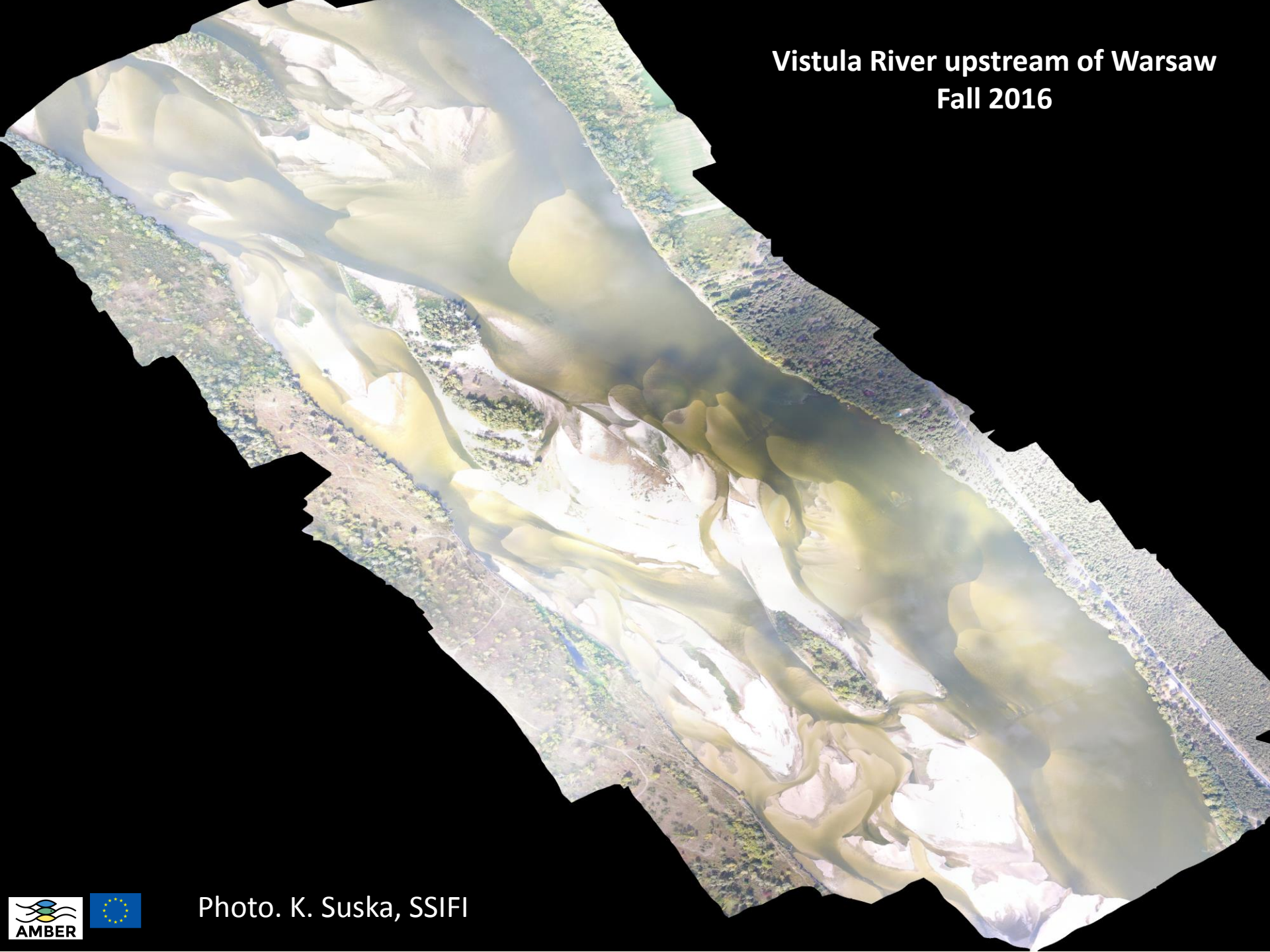
6: river connecting lakes, peat bogs and estuaries

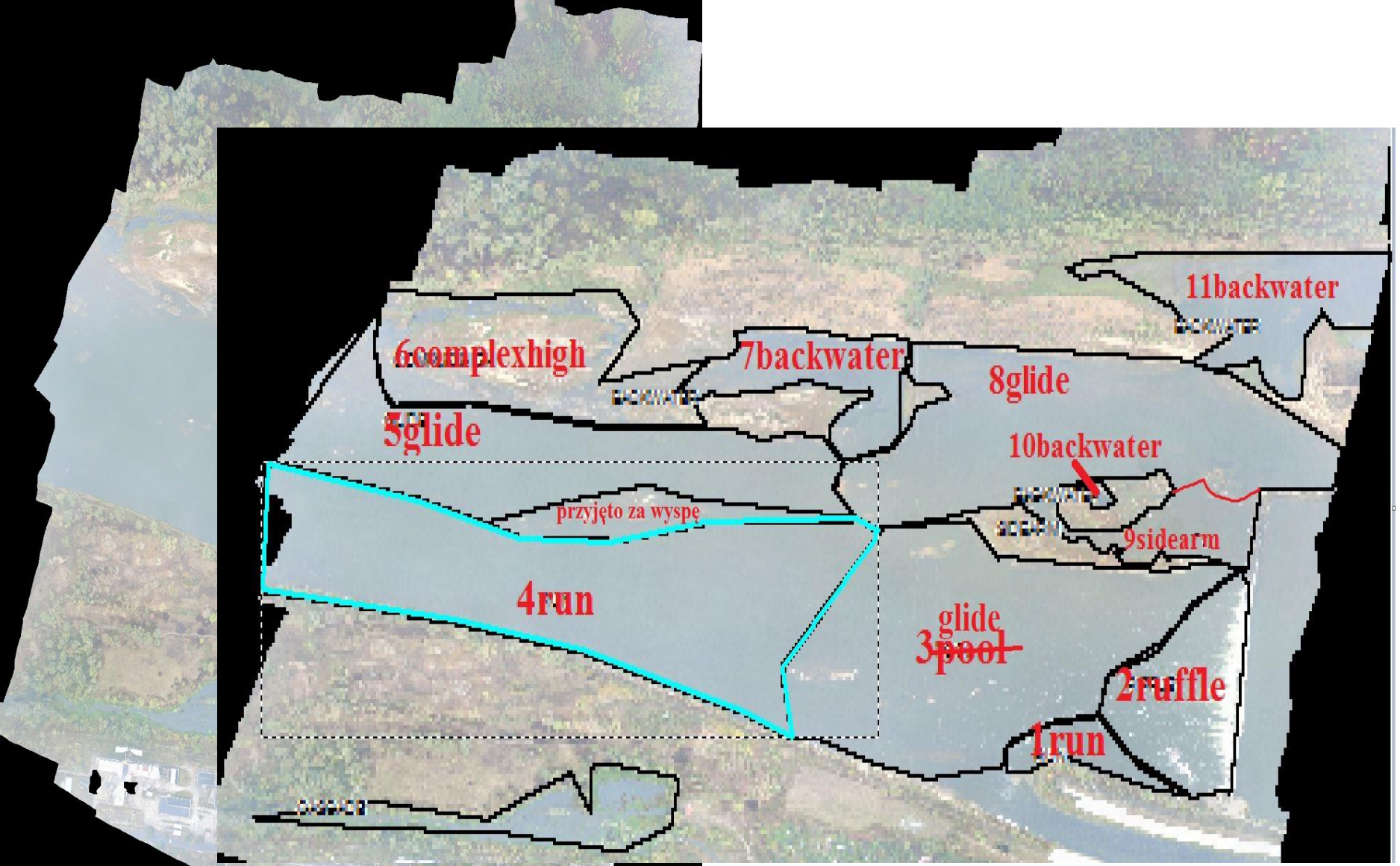
- Strongly rheophylic
- Rheophylic – gravel bed
- Sand- detritus bed
- Associated with sand and mud
- Rheophylic sand-gravel bed
- Generalist
- Associated with macrophytes
- Deep water body

Habitat suitability criteria

Guild	Species	Depth [m]	Velocity [m s^{-1}]	Choriotop	HMU type	Cover
Strongly rheophylic	Salmo truta ff	0.1-1.5	0.3-1.2	mega-, macro-, meso-, microlithal	riffle, ruffle, cascade, rapids, fast run, run, pool	boulders, unercut banks, woody debris
	cottus gobio					
	cottus poecilopus					
	Salmo trutta m. trutta					
	salmo salar					
	hucho hucho					
Rheophylic gravel bed	barbus barbus	0.3-2.0	0.15-0.7	macro-, meso-, **microlital**, psammal	riffle, ruffle, cascade, rapids, fast run	boulders
	barbus petenyi					
	barbus meridionalis petenyi					
	vimba vimba					
	thymalus thymalus					
	chondrosomus nasus					
	acipensarus oxyrinchus					
	Phoxinus phoxinus					

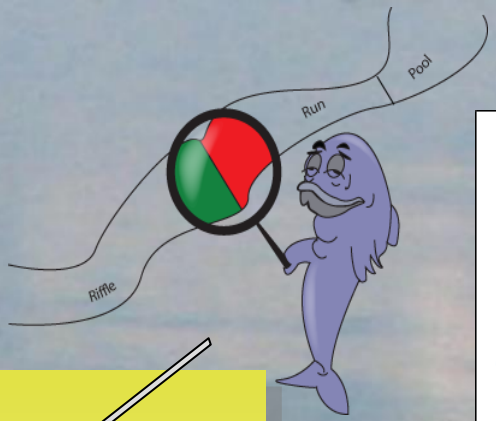
...

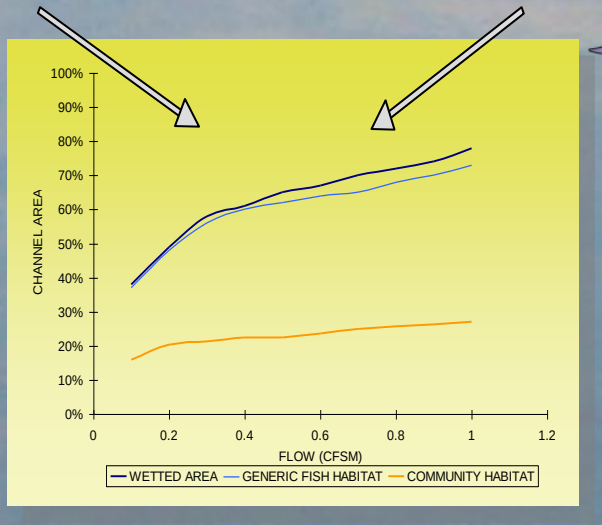

Vistula River upstream of Warsaw
Fall 2016
Photo. K. Suska, SSIFI
AMBER

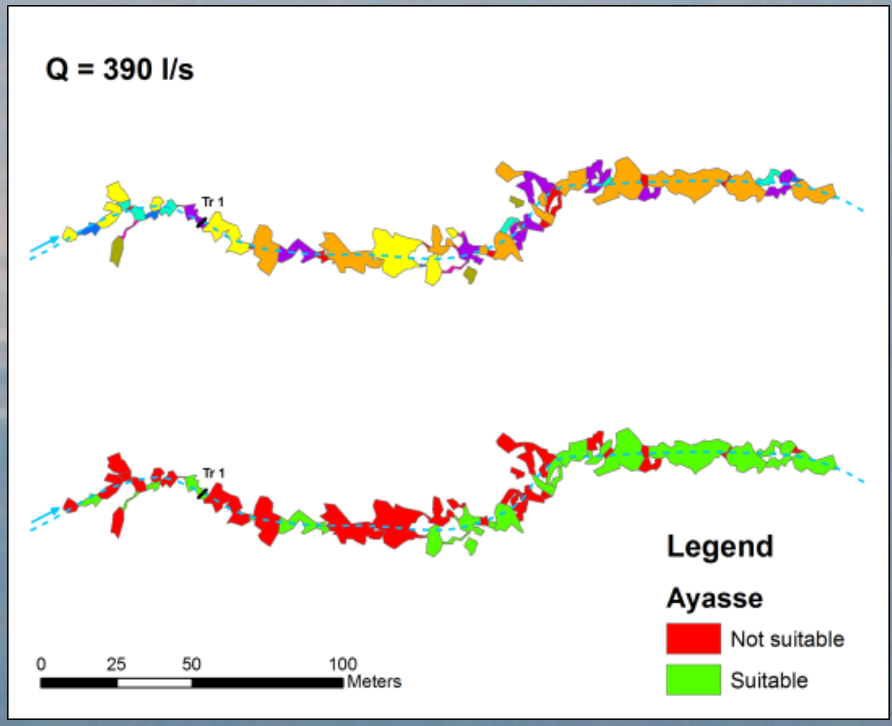


Wisła, Włocławek, 03.10.2017

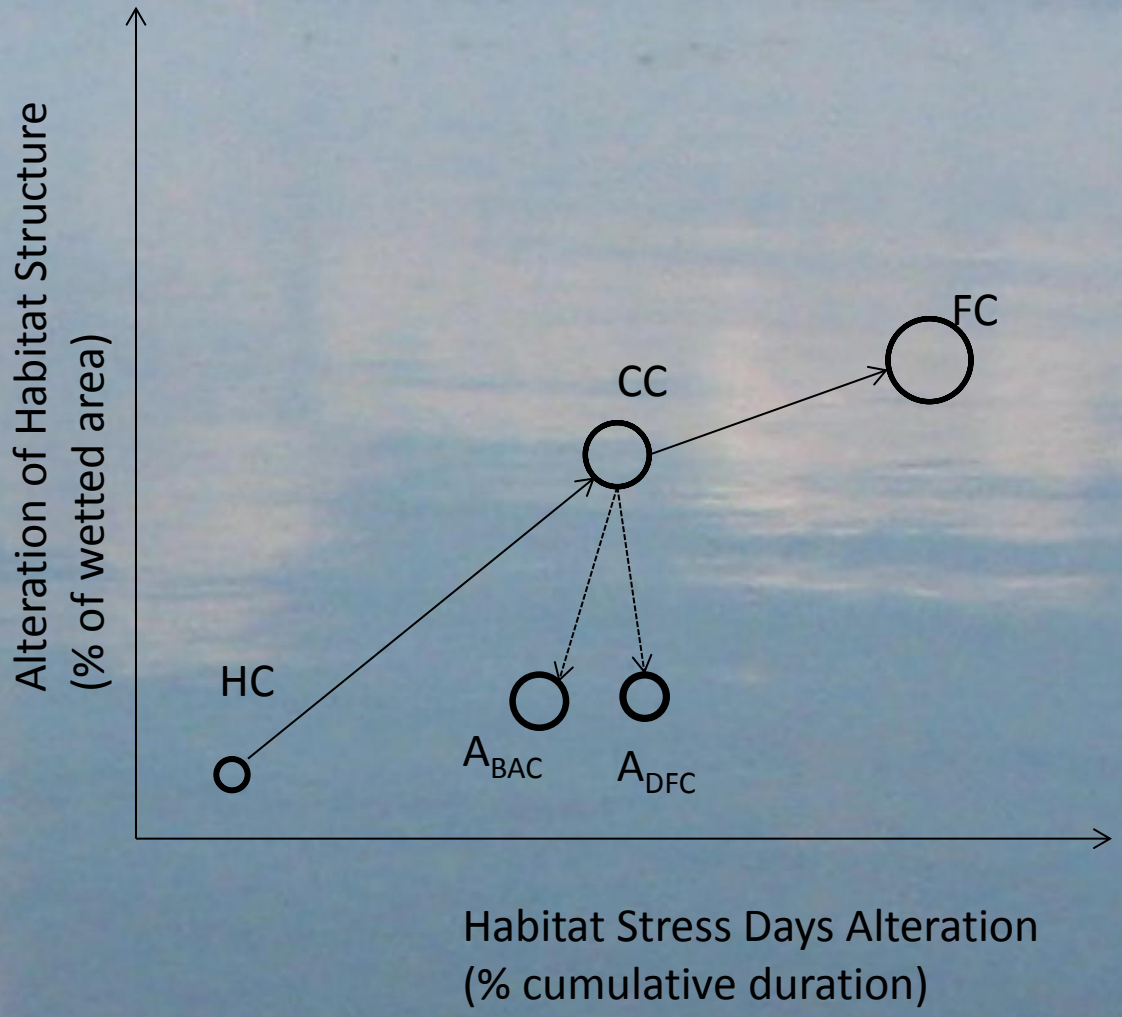

pool
riffle
rapid


Pool
Run
Riffle


CHANNEL AREA
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
0
0.2
0.4
0.6
0.8
1
1.2
FLOW (CFSM)
WETTED AREA
GENERIC FISH HABITAT
COMMUNITY HABITAT


Q = 390 l/s
Tr 1
Tr 1
Legend
Ayasse
Not suitable
Suitable
0
25
50
100
Meters

Restoration Alternatives Analysis (RAA)

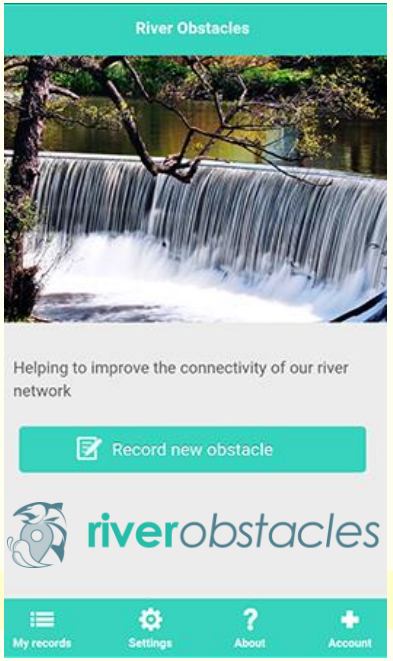


6 Main Case Studies

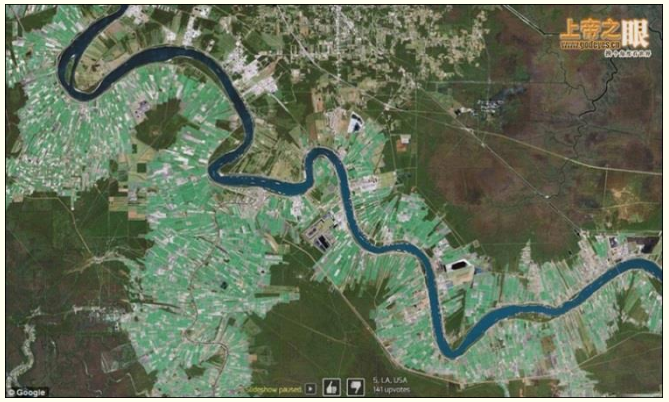
New opportunities for restoring river connectivity

2. Citizen science & local engagement

- Smartphone apps/ CS portals



- Google Earth



Social media:

AMBER website
http://www.amber.international/

AMBER public facebook page
https://www.facebook.com/AMBERtools/

AMBER linked in page (River Connectivity Network)
https://www.linkedin.com/groups/1215847/profile