

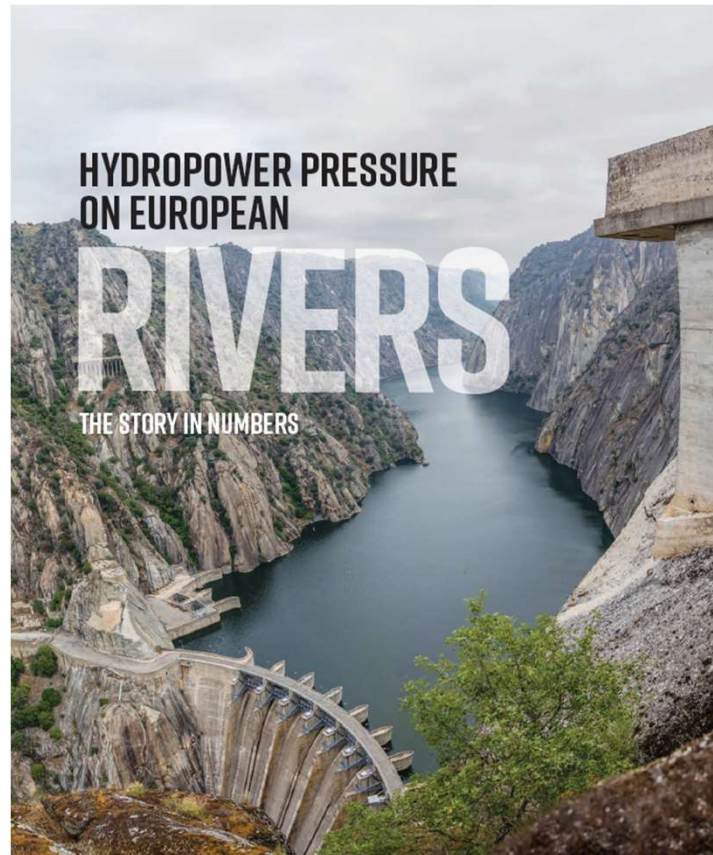
**8 July 2021**



**Hydropower : the "green" energy threatening  
the last natural rivers**





**Andrea Goltara  
Managing Director,  
Italian Centre for River Restoration**


# Hydropower is widely recognised as one of the most critical pressure factors on freshwater ecosystems






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**BRIEFING**

## Tracking barriers and their impacts on European river ecosystems

The importance of free-flowing rivers that allow free movement of water, sediment, fish and other organisms is increasingly recognised by EU environmental policy, in particular the Water Framework Directive and the biodiversity strategy for 2030. However, the large number of barriers on our rivers has resulted in a loss of river continuity. This briefing addresses the following questions: What is the density of barriers on rivers? What do we know about their impacts on rivers? How can we improve the European knowledge base on barriers in rivers?

[www.eea.europa.eu](http://www.eea.europa.eu) (8 febbraio 2021)

## Two main types of hydropower schemes:

### 1) Storage



### 2) Run-of-the-river (no storage)



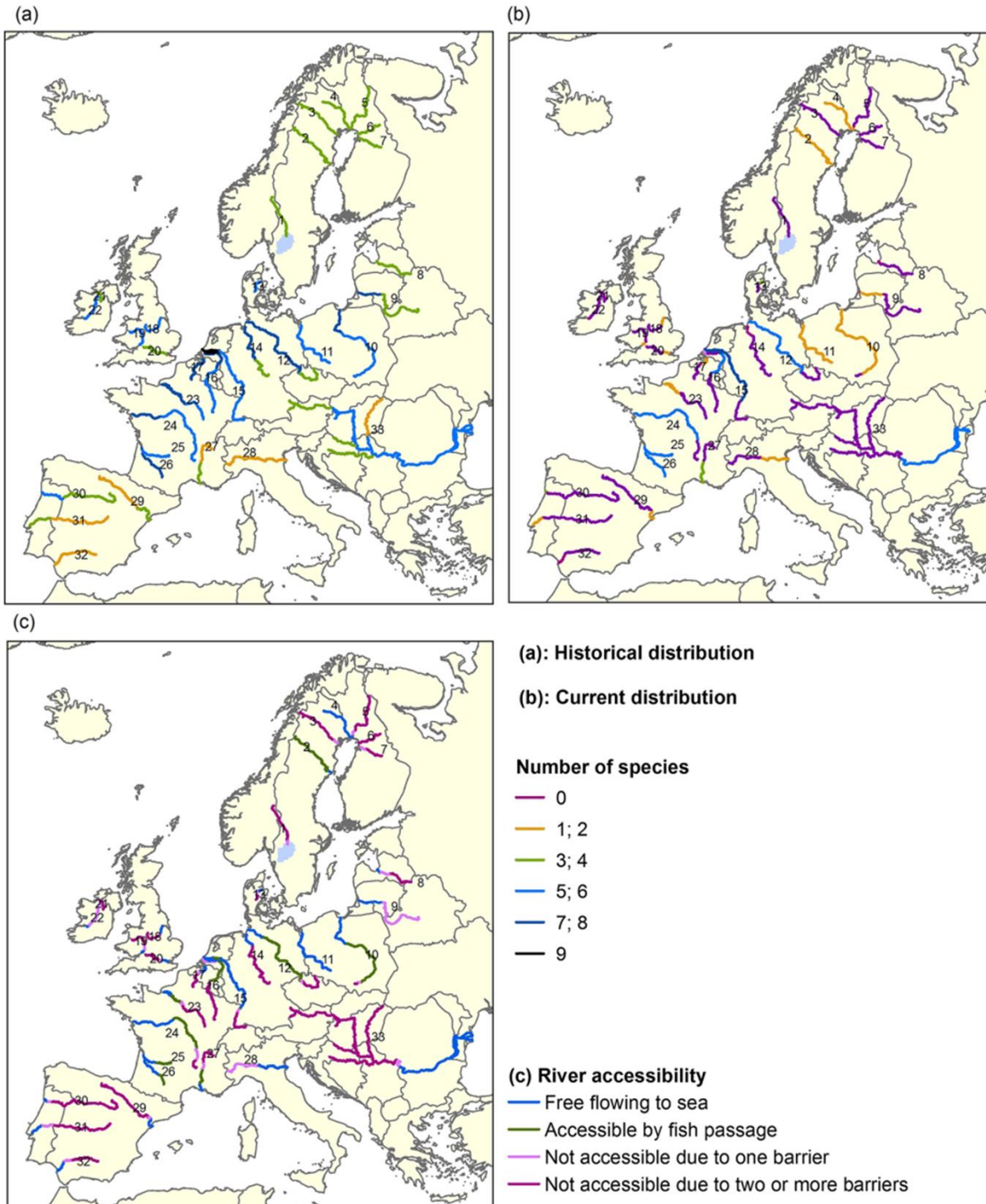


## The impacts:

### 1) loss of longitudinal connectivity for fish fauna



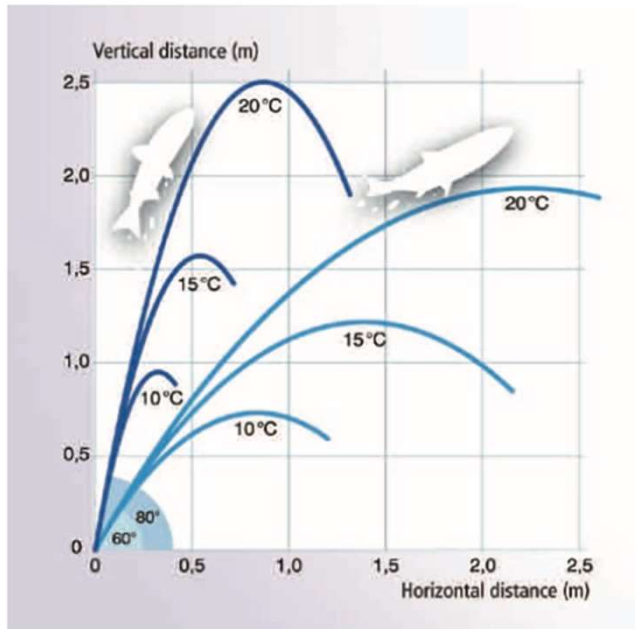
Storage	R o R
X	X



## Decline in the number of fish species in European river basins

van Puijenbroek, PJTM, Buijse, AD, Kraak, MHS, Verdonschot, PFM. Species and river specific effects of river fragmentation on European anadromous fish species. *River Res Applic.* 2019; 35: 68– 77.  
<https://doi.org/10.1002/rra.3386>

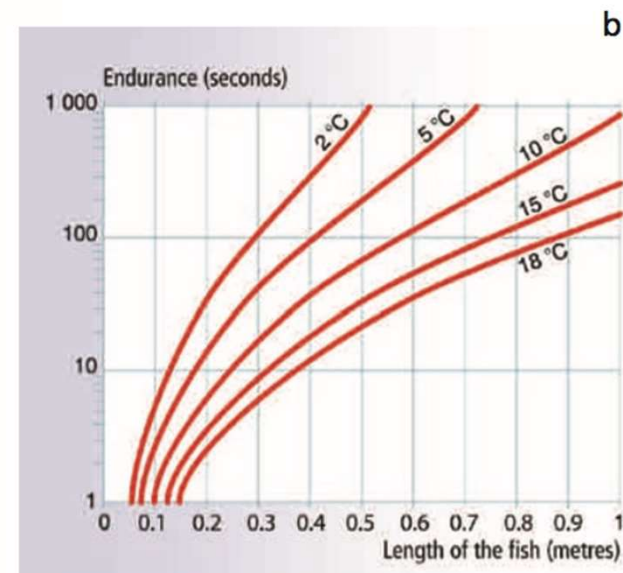
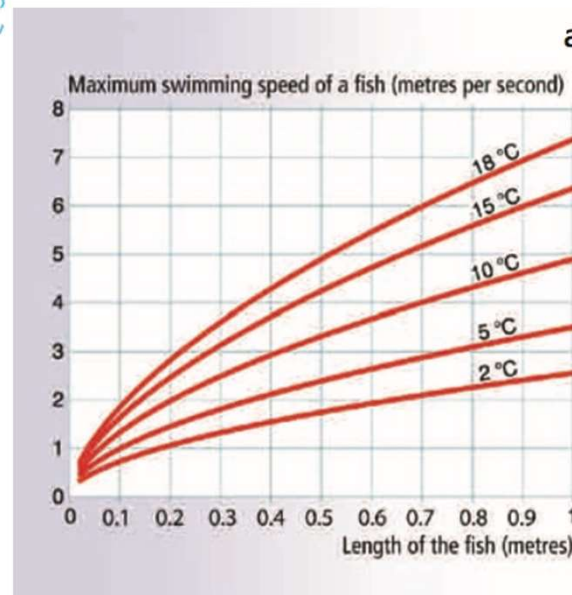
## By the way...not all fishes can jump!



Only some fish species can jump to overcome obstacles and the jump height and distance, as well as swimming speed and maximum duration vary with the species and environmental conditions (especially T)

**-> EVEN SMALL OBSTACLES CAN SIGNIFICANTLY DISRUPT CONTINUITY FOR MOST SPECIES**

ICE  
 Protocol,  
 2014





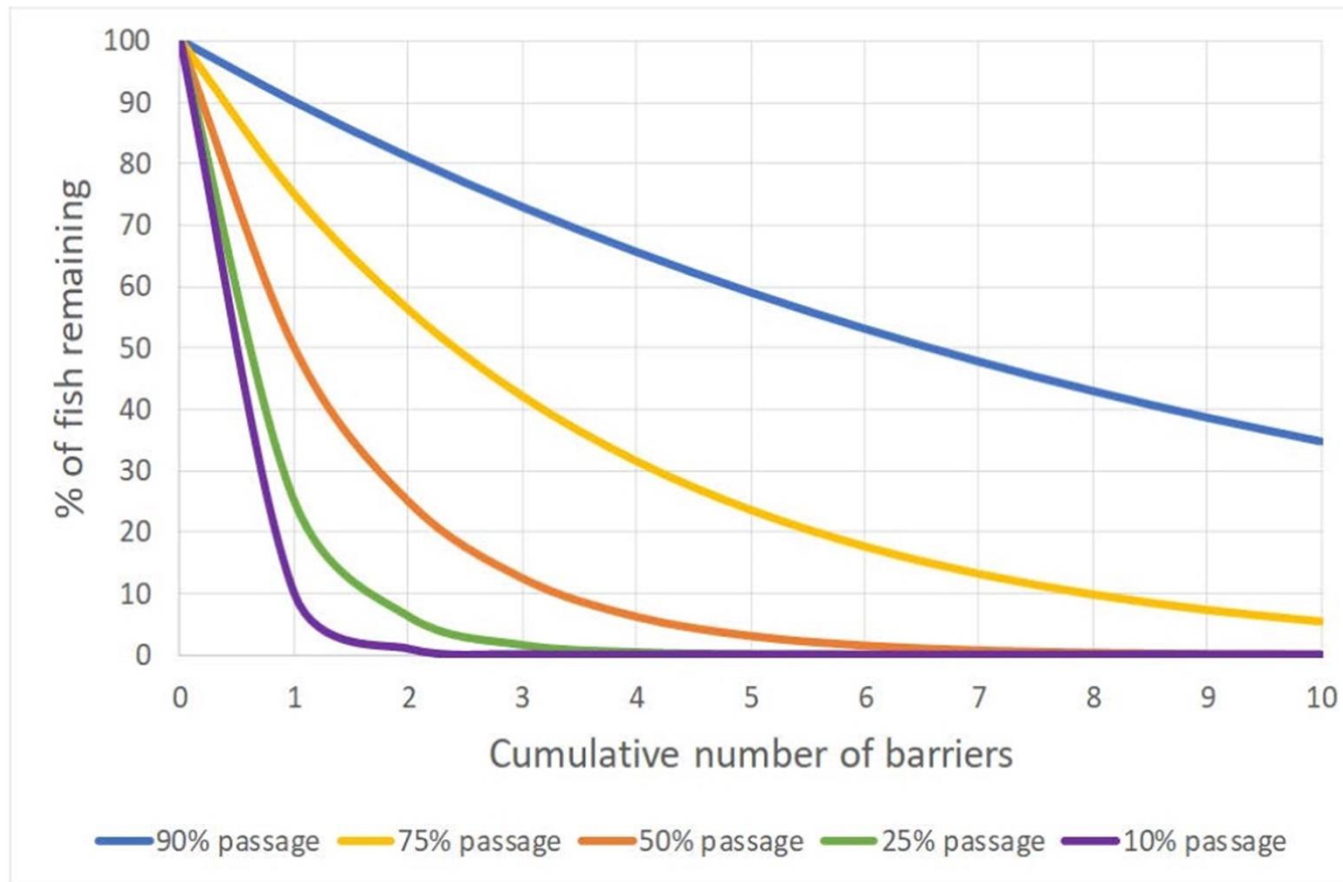
## Is building a fish pass enough ?



Provincia Autonoma di Bolzano



## A fish pass can usually restore only partially the connectivity for fish

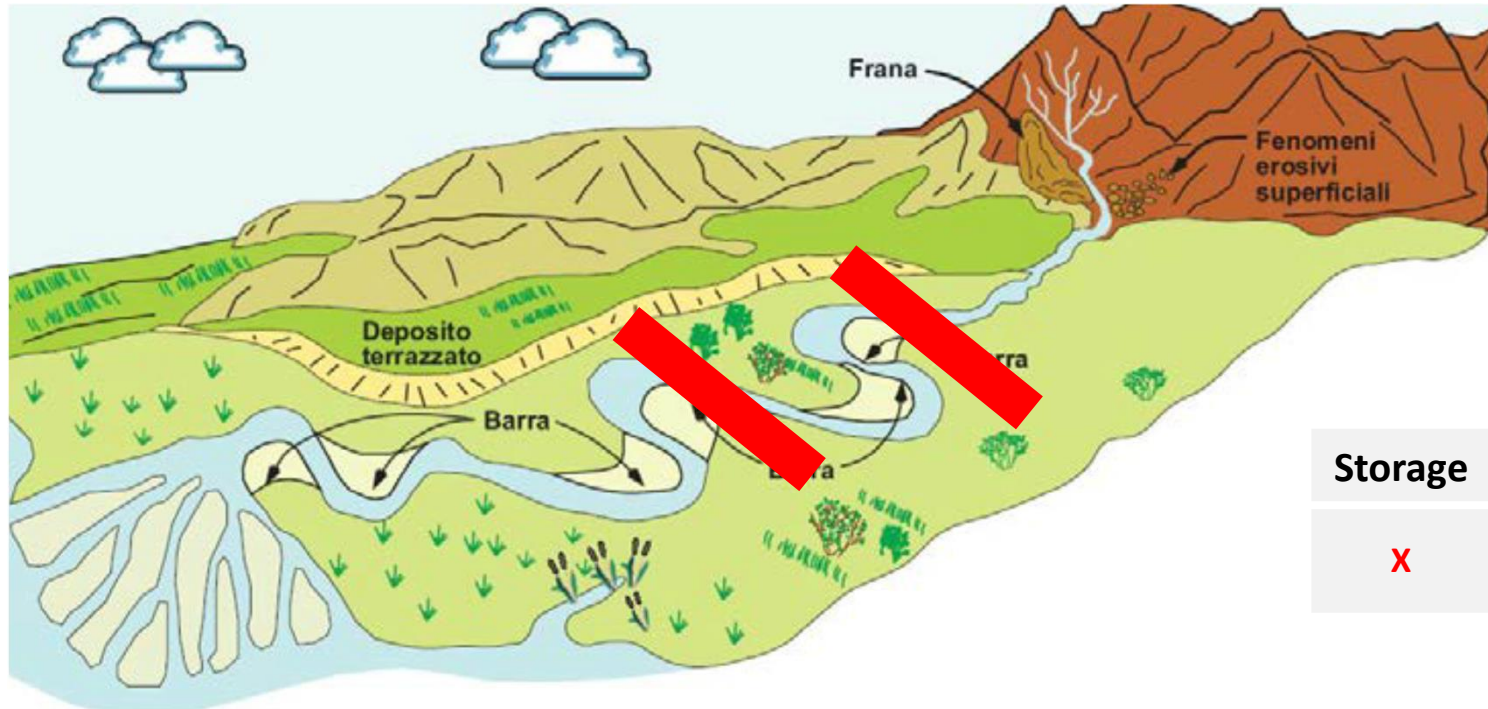


*Theoretical cumulative effect on fish fauna of the presence of several fish passes in series. Different curves represent different pass effectiveness (From NIWA, 2018)*

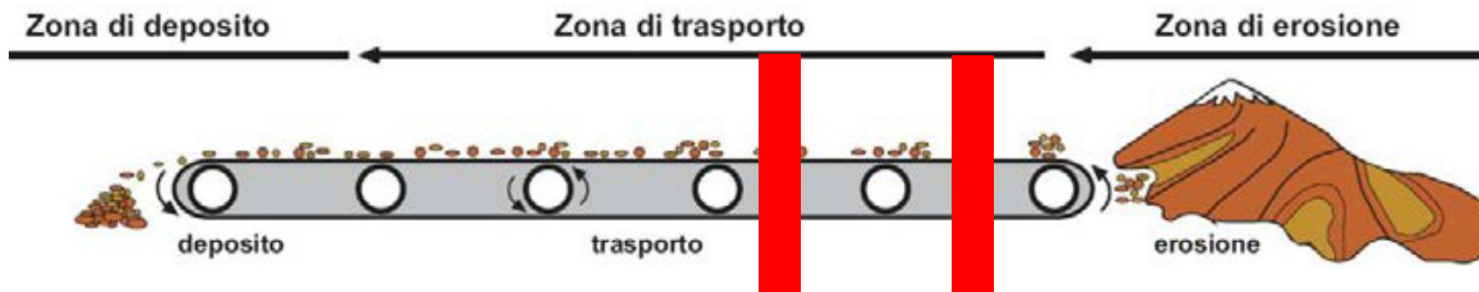
**In the usual case of several obstacles in series, even if equipped with well-designed fish passes, the overall connectivity soon becomes very low**

## The impacts:

### 2) loss of longitudinal connectivity for sediments

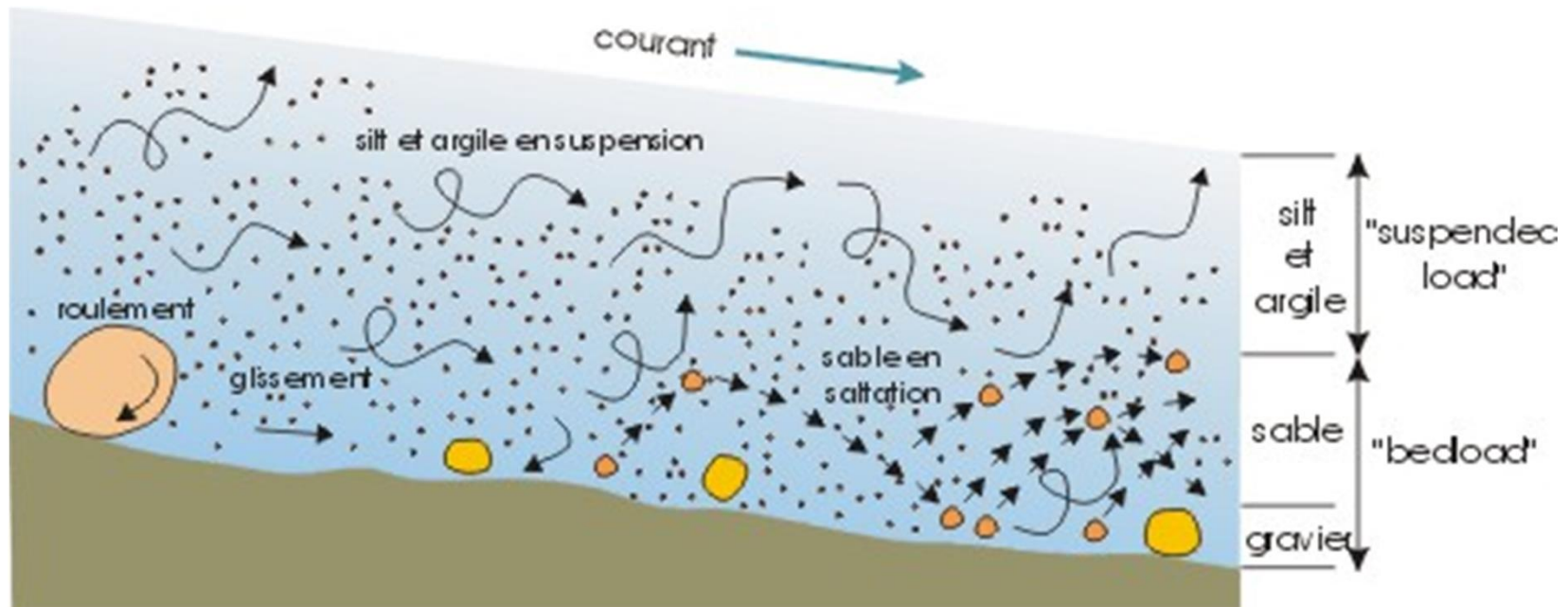


Storage	R o R
X	Less relevant

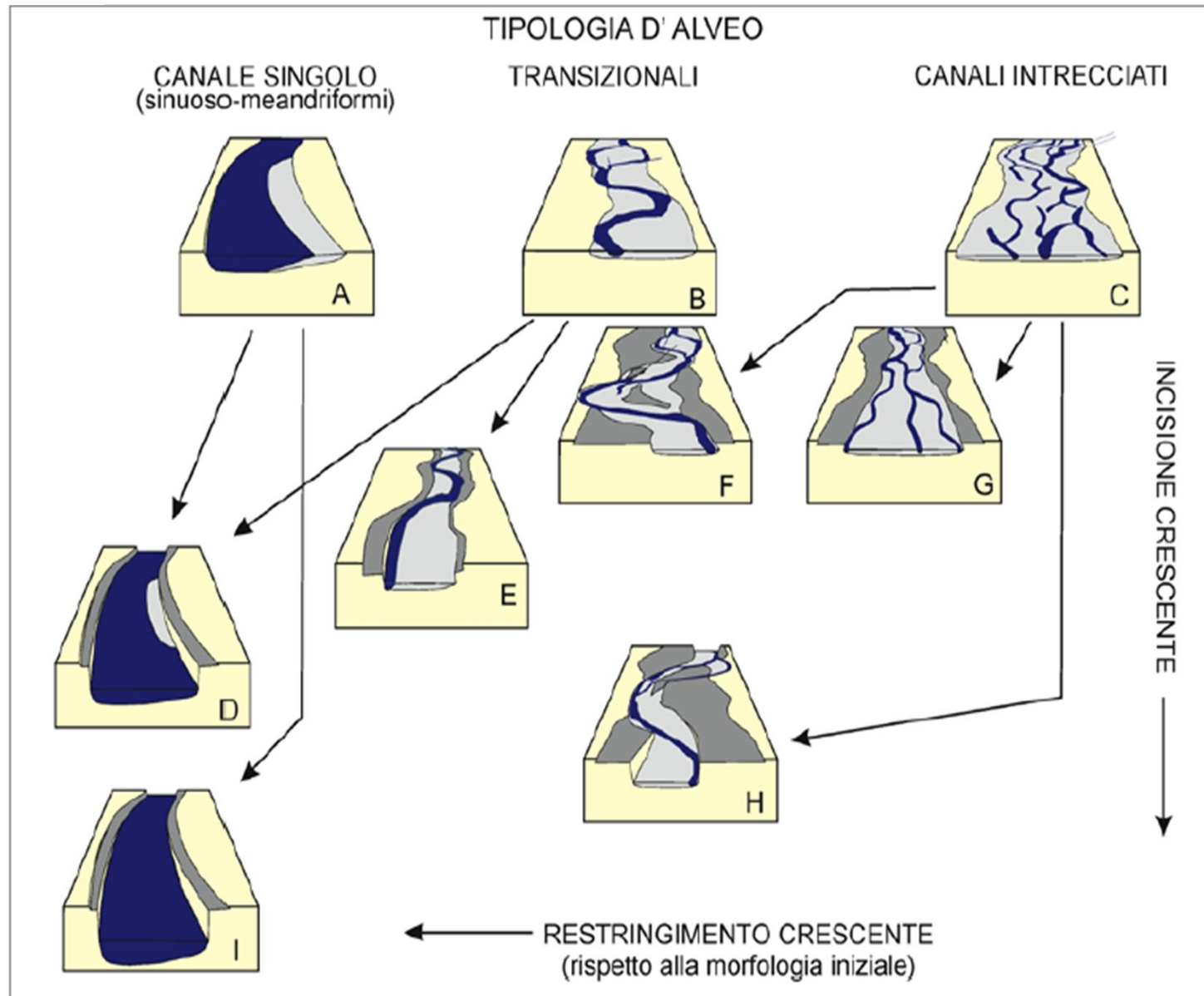




## 2.1 In particular: the alteration of bedload transport strongly affects river morphological dynamics!

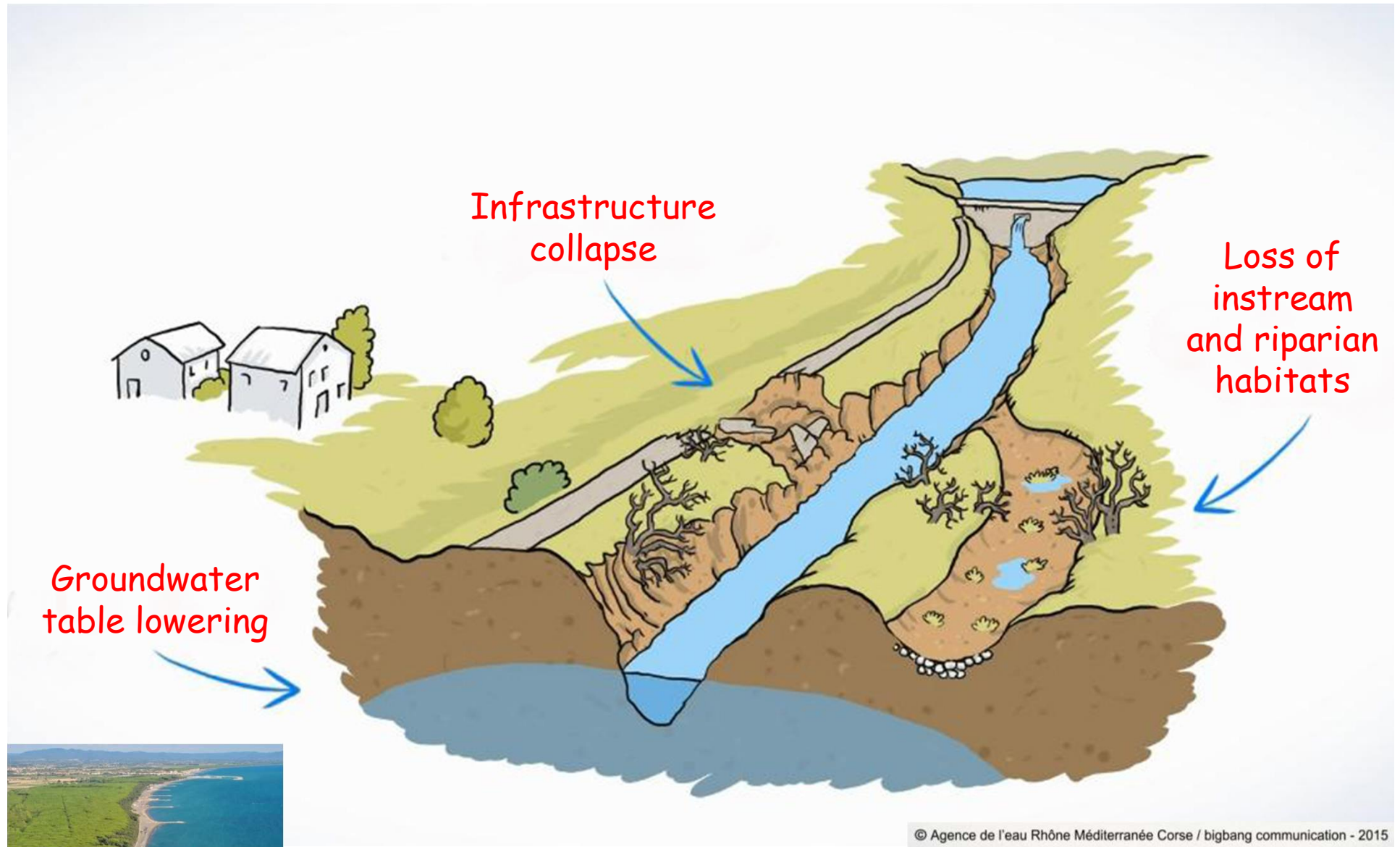


# Morphological alteration of rivers





## Riverbed incision downstream dams





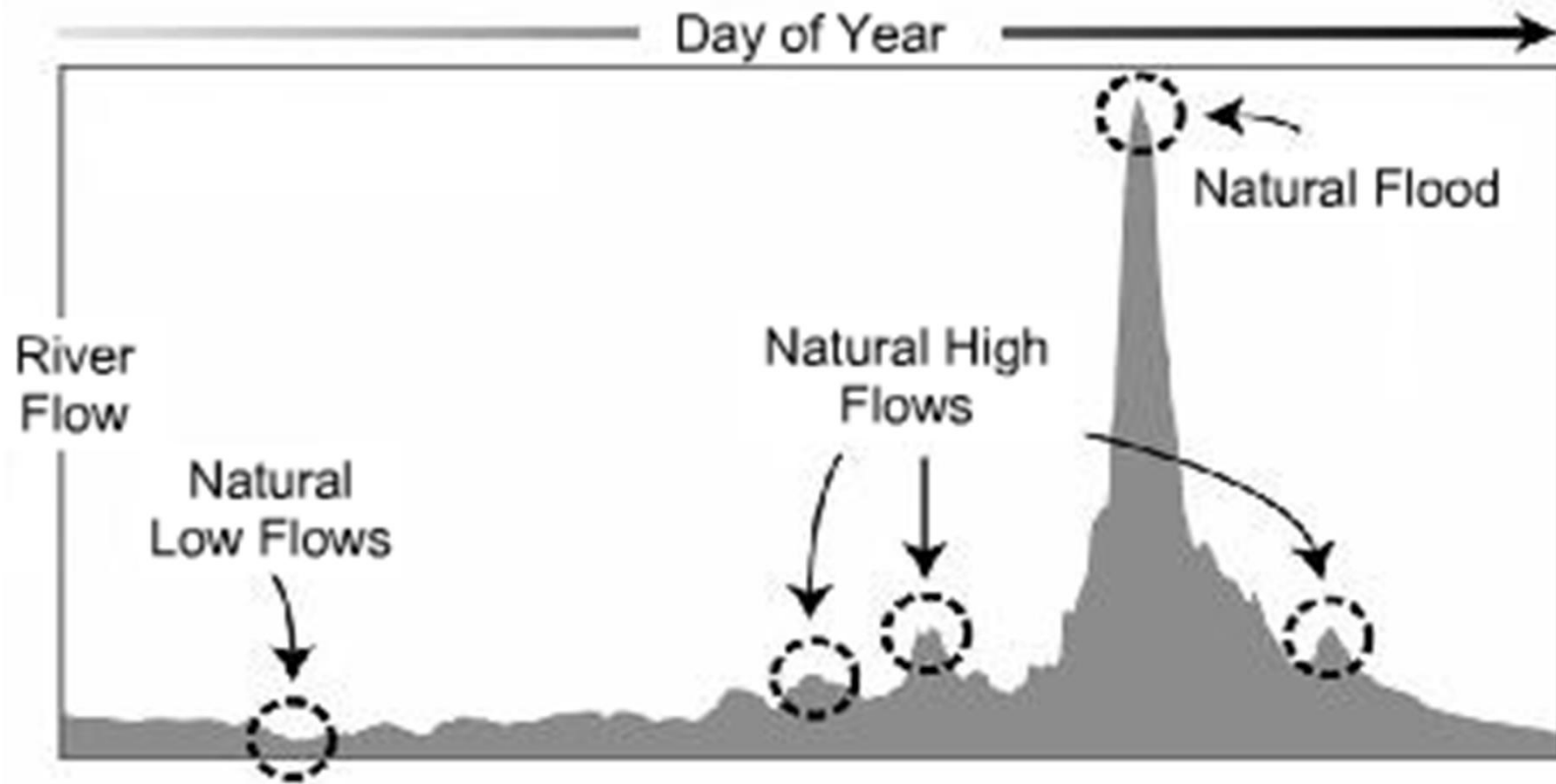
## 2.1 Impacts due to fine sediments management (flushing)





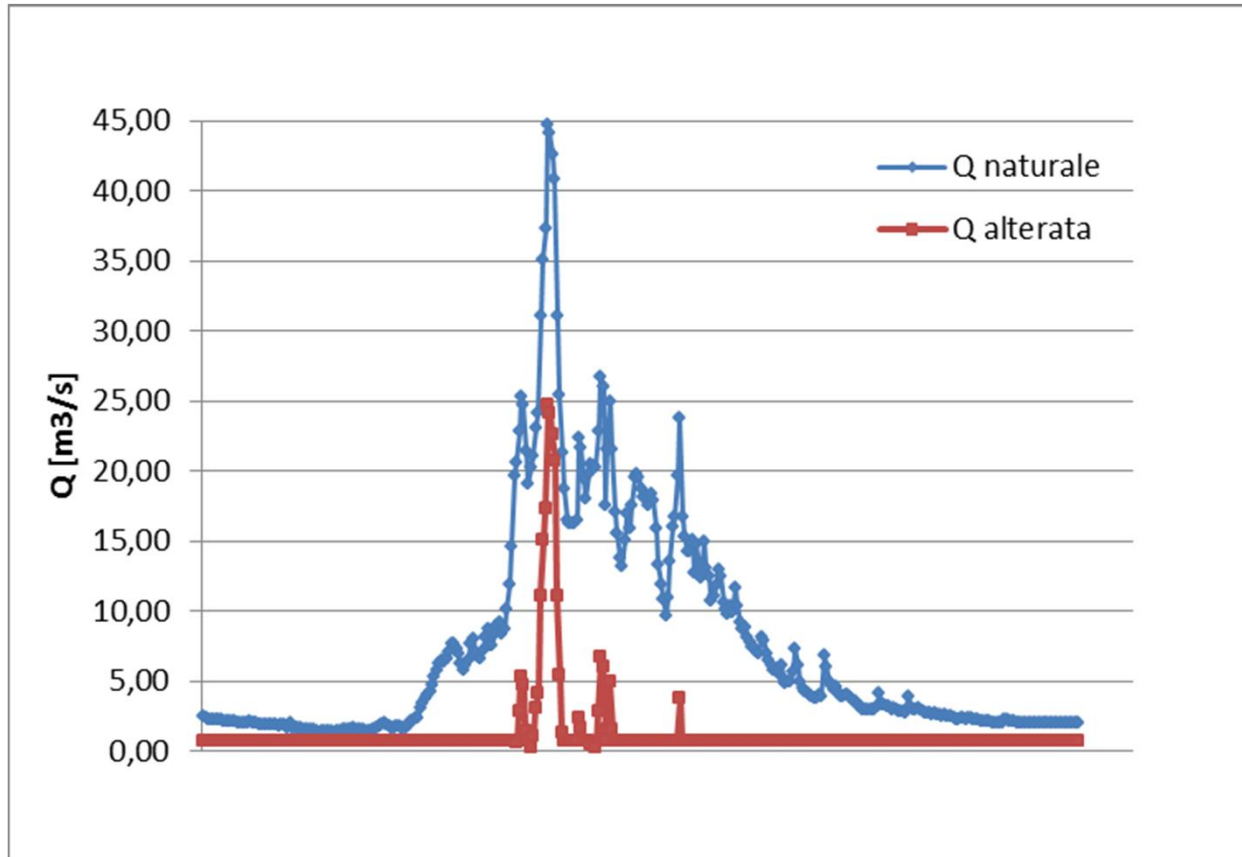
## The impacts:

### 3) Alteration of the hydrological regime



Storage	R o R
X	X

## Ecological flows ?



**This is still the most common situation in the bypassed reaches...**

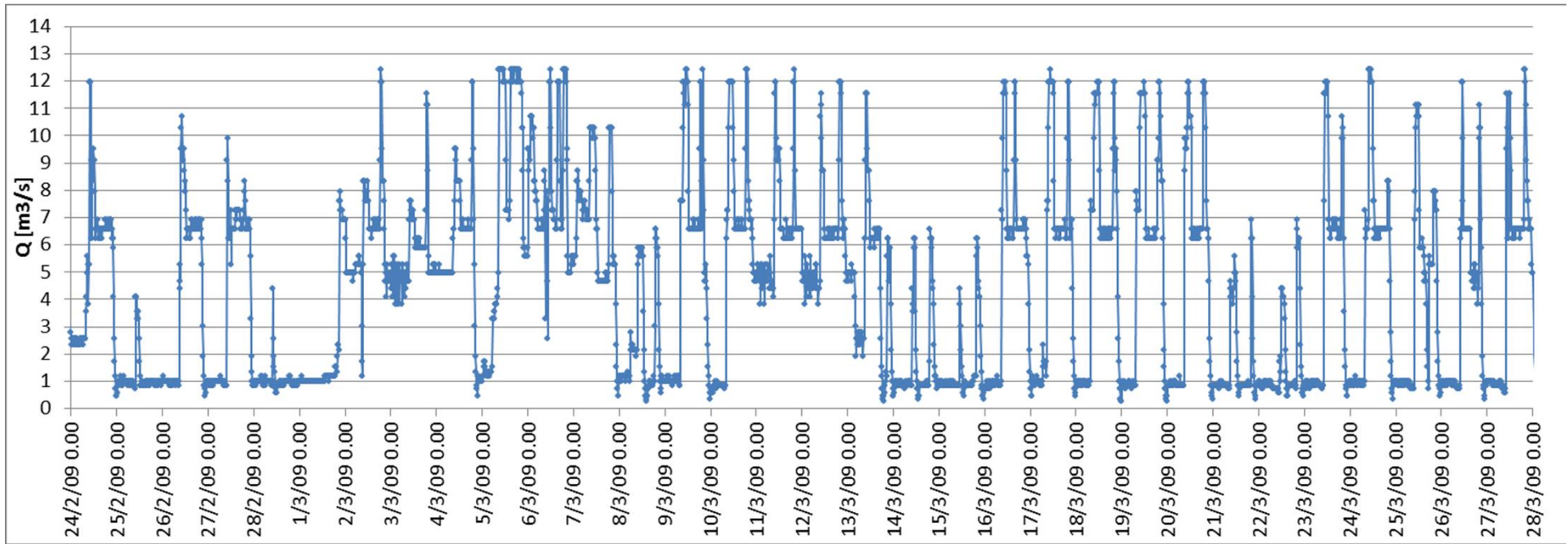
**-> the physical and ecological processes linked to the complex and context-specific flow variability with time are disrupted**



# The impacts:

## 3.1) Alteration of the hydrological regime

### - hydropeaking



Storage	R o R
X	

## Stranding due to hydropeaking



Drava river; U





## Other impacts (reservoirs):

- Accumulation of pollutants in fine sediments
- Physico-chemical and thermal alteration of released water
- Loss of water due to evaporation...

Storage	R o R
X	

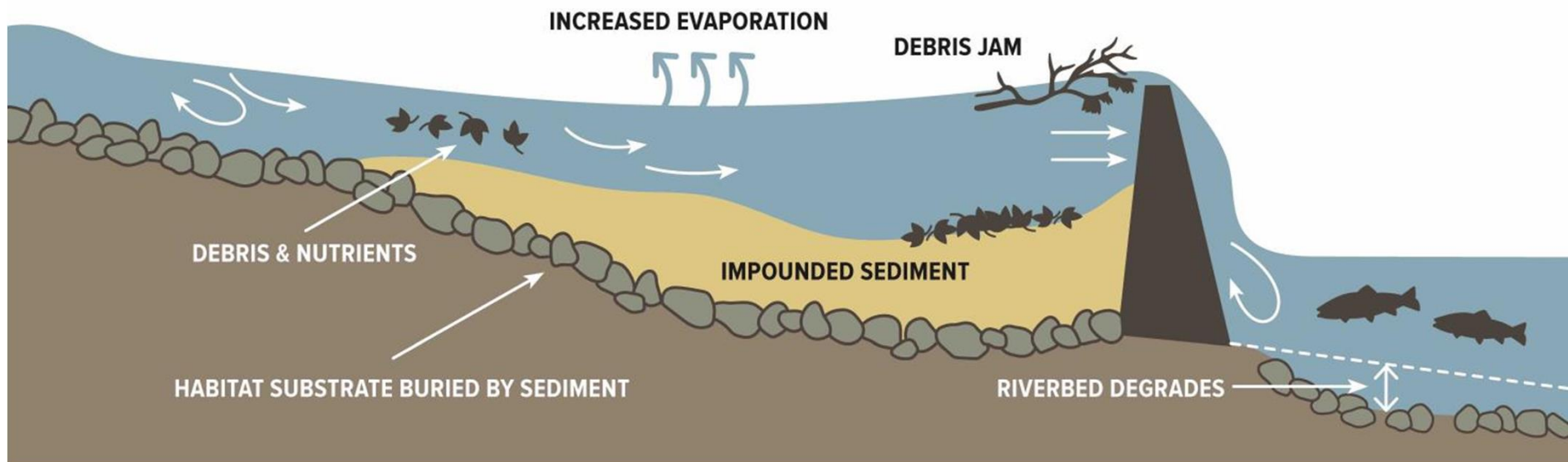
### DAM IMPACTS

#### Upstream

- Reduced natural function, water quality, oxygen, turbidity current and available habitat
- Increased pollutant accumulation, stratification, temperatures and algae blooms
- Loss of natural transport of sediments, nutrients and debris
- Altered floodplain

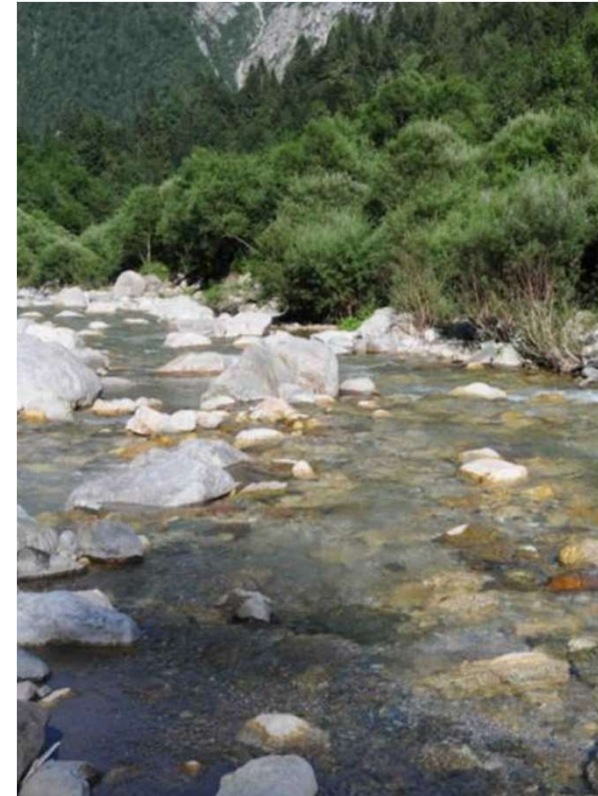
#### Downstream

- Warmer water flowing downstream
- Unnatural riverbed elevation changes
- Altered flow regime and temperatures
- Starved of sediment, nutrients and debris



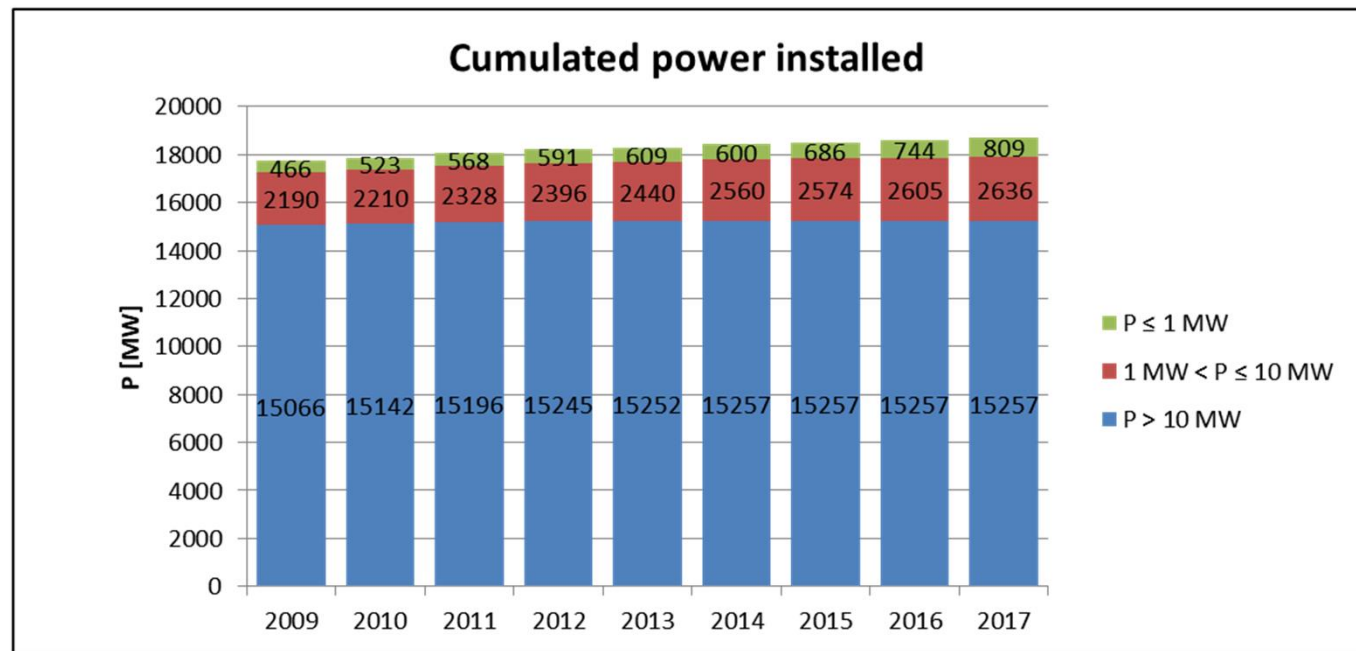
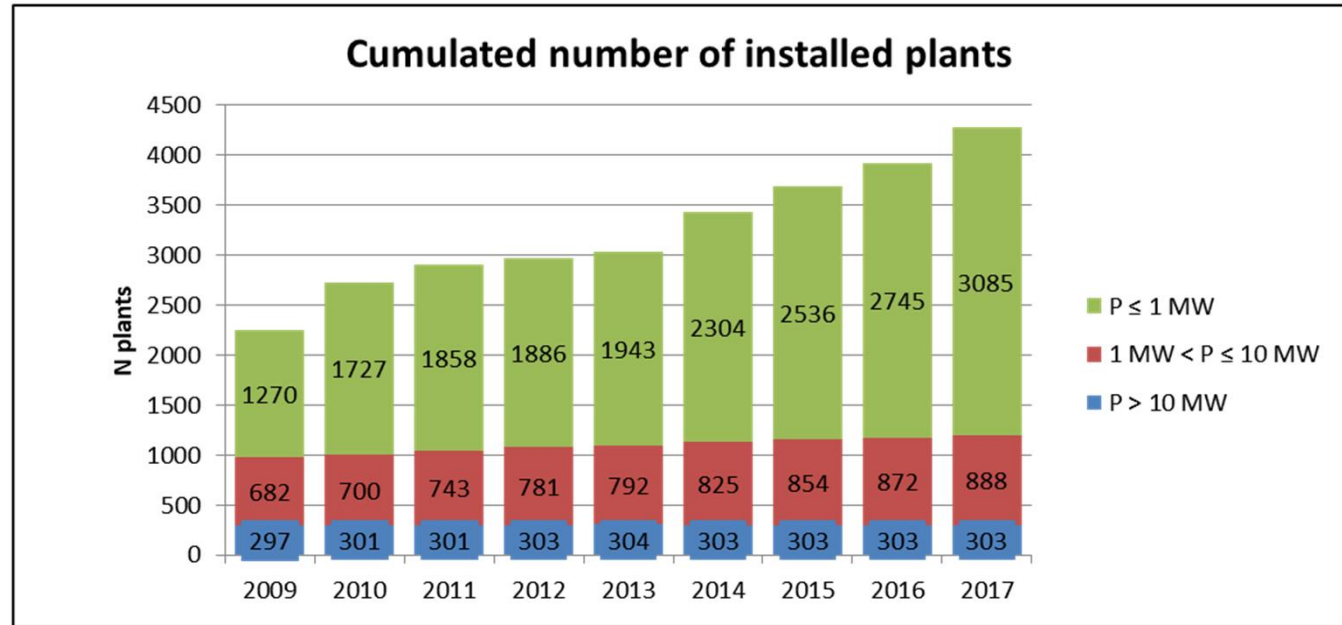


In Italy (and other MS with highly exploited hydro potential) massive increase of demands for new HPPs (hundreds still pending!), almost only due to incentives



In Italy new plants are SMALL (mostly  $< 0,5$  MW) and located at increasingly high altitudes and in increasingly smaller and often pristine streams

Between 2009 and 2010 the number of HPPs  $P < 1$  MW + 36% (1270 -> 1727) but only + 0,3% (compared to total hydro in 2009) in terms of additional installed power!



L'energia "verde" che fa male ai fiumi

Qualità dei corsi d'acqua e produzione idroelettrica in Italia: un conflitto irrisolto



Settembre 2014

## The creepy story of the public subsidies to hydro in Italy

In 2018, after several national campaigns and years of parliamentary work, the Italian government eventually decided to **exclude new hydropower in natural rivers** from the draft decree on subsidies for RES, which is sent to the EC.

BUT...last minute intervention from DG Competition: the subsidies have to be restored, “not to hamper competition between different RES” (?????)

DG ENV takes no position at all

...Italian consumers are still paying subsidies for useless new hydro in their energy bills





European  
Commission

## Bringing nature back into our lives

EU 2030 Biodiversity strategy

May 2020  
#EUGreenDeal



*"Making nature healthy again is key to our physical and mental wellbeing and is an ally in the fight against climate change and disease outbreaks. It is at the heart of our growth strategy, the European Green Deal, and is part of a European recovery that gives more back to the planet than it takes away."*

Ursula von der Leyen, President of the European Commission



Climate change, the unprecedented loss of biodiversity, and the spread of devastating pandemics are sending a clear message: it is time to fix our broken relationship with nature.

The Biodiversity Strategy will put Europe's biodiversity on the path to recovery by 2030, for the benefit of people, climate and the planet.



## Restoring 25,000 km of free-flowing rivers !

Great and let's go for it, but how many thousands of km would still be free-flowing if just we had stopped the incentives few years ago...?

...and how many new barriers will be built while we struggle to remove some of the existing ones?



**Historic opportunity to restore rivers...or fast track to widespread additional artificialisation ?**

The current strong calls for reforms to speed up and simplify the approval of new infrastructure are not very promising... the role of the EC in this phase will be crucial

**8 July 2021**



**Thank you for your attention**

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