

# **MAKING RIVERS MORE RESILIENT TO CLIMATE CHANGE: RESTORING NATIVE VEGETATION AND REMOVING OBSTACLES**

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*Hydrographic Confederation of the Júcar River Basin*

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- 1 Compliance with environmental objectives**
- 2 Problem description**
- 3 Inter-administrative coordination**
- 4 Case studies**
- 5 Collaboration of different social agents**

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COMPLIANCE WITH  
ENVIRONMENTAL OBJECTIVES

PROBLEM  
DESCRIPTION

INTER-ADMINISTRATIVE  
COORDINATION

CASE  
STUDIES

PURSUE OF  
SOCIAL CONSENSUS

# RESTORING LONGITUDINAL CONNECTIVITY & NATIVE VEGETATION

## • Water Framework Directive (WFD)

- good status of water bodies

## • EU Diversity Strategy 2030

- 25.000 km connected rivers



**Restore longitudinal connectivity**

**AMBER:** more than 1 million barriers!



**Restore native vegetation**

Spanish National Strategy for River Restoration





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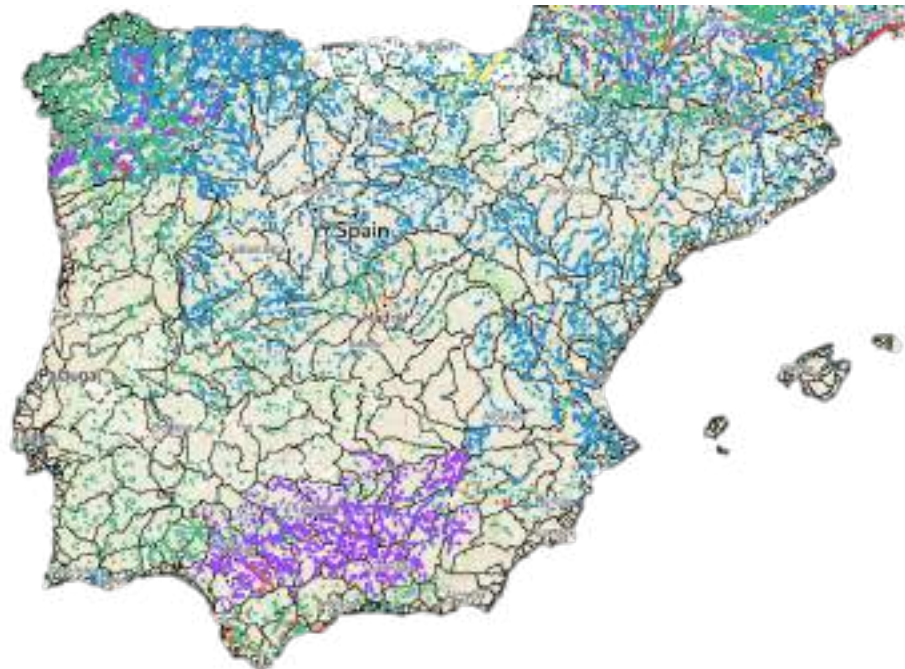
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## RESTORING LONGITUDINAL CONNECTIVITY

**EU Diversity Strategy 2030 → 25.000 km connected**



Dam



Weir



Culvert



Ford



Sluice



Ramp



Other

Source: <https://amber.international/european-barrier-atlas>

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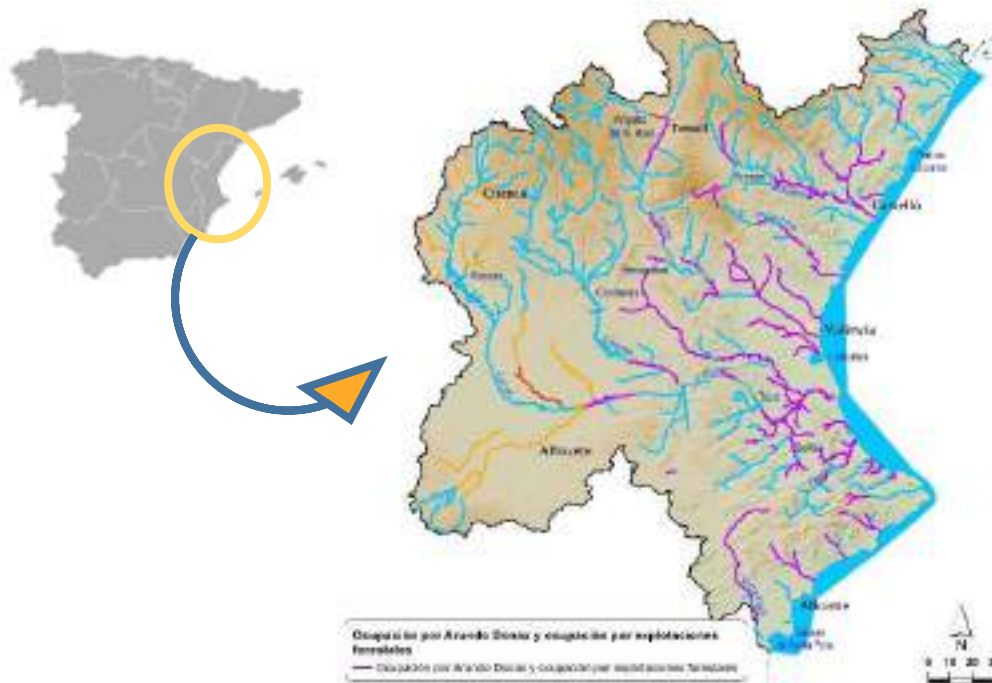
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# RESTORING NATIVE VEGETATION

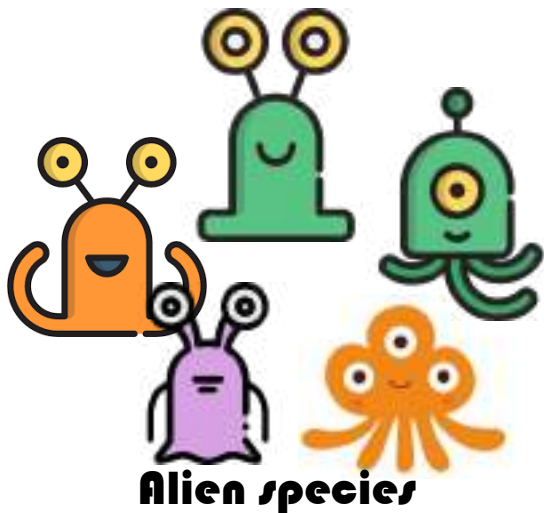
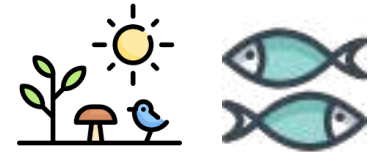
## Spanish National Strategy for River Restoration



# CLIMATE CHANGE

## ● Ecosystem protection is challenged by climate change

- ☀ Enhances alien species
- ☀ Droughts & Floods: more often & extreme → unmanaged obstacles can worsen impacts!
- ☀ Higher risk of wildfire: higher temperatures, dryer soil



**Climate  
change**





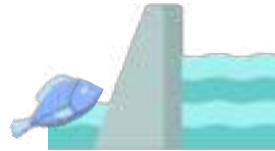
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## RIVER OBSTACLES

- **Barrier to fish migration**



- **Decrease of the water quality**



- **If poorly managed → higher risk of floods**



- **Many of them are abandoned → no maintenance**

- **Improper use of the infrastructures → risk to population**



## Arundo donax: the giant cane invasion

- **Wall effect increases impact of floods**
- **Cane avalanche causes destruction**



COMPLIANCE WITH  
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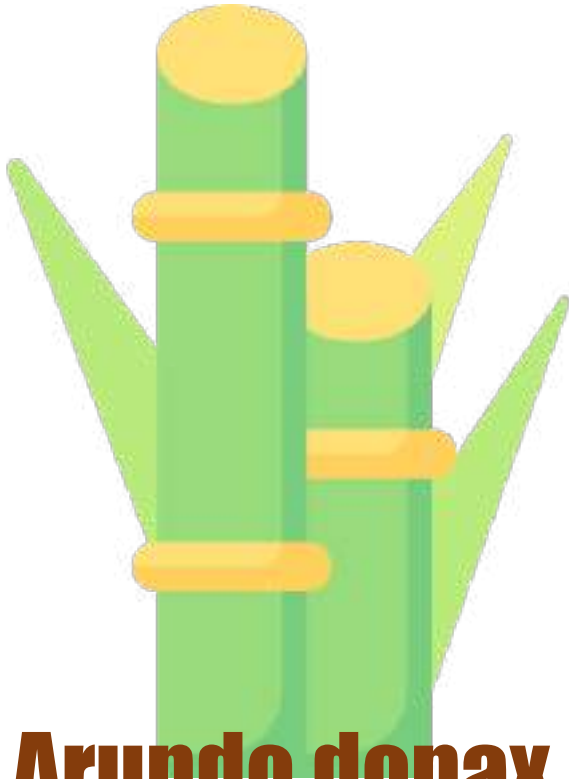
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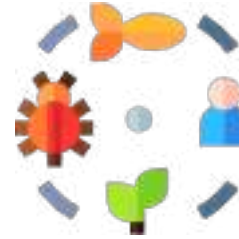
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## RESTORING NATIVE VEGETATION



**Arundo donax  
invasion**

- **Loss of biodiversity**
- **Low quality habitat for fauna**
- **Fire prone plant**
- **Higher water consumption**
- **Not interesting for herbivores**



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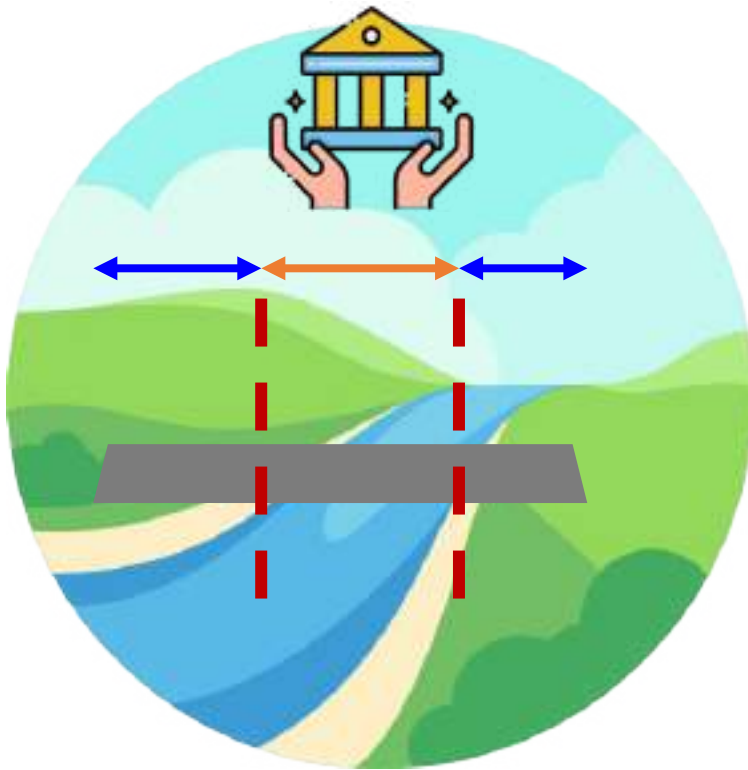
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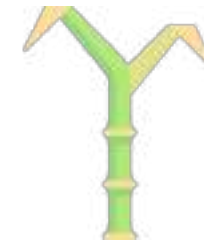
## HERITAGE AUTHORITY

**Which administration owns the heritage protection competence?**



## ENVIRONMENT AUTHORITY

- Compliance with forestry regulations
- Fire prevention
- Prevention of the spread of invasive alien species
- Protection of native flora and fauna



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## RIVER CONNECTIVITY: Weir demolition

**BEFORE**



**DURING**





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## RIVER CONNECTIVITY: Weir demolition

**BEFORE**



**AFTER**





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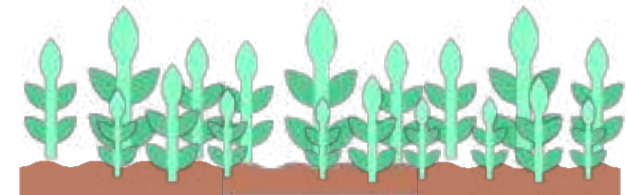
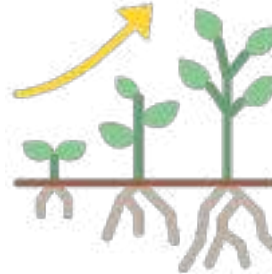
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## RIVER CONNECTIVITY: Fish scale



## WHY IS ARUNDO DONAX SO HARD TO KILL?

- **Exotic invasive specie (EEI)**
- **Great adaptation capacity:** types of soils, frosts, droughts
- **Very high growth rate**
  - Roots can outreach up to 4 m/year
  - Rivers work like a transport way
- **Monospecific colony trend**
  - High density of the root system & cane around 20t/ha





## Inefficient techniques: Clearing the cane

- **Hydro-illogical: why gardening when nature can do the hard work?**
- **High cost**
- **Frequent and repetitive works**





## Inefficient techniques: HERBICIDES & BURNING

### Herbicides

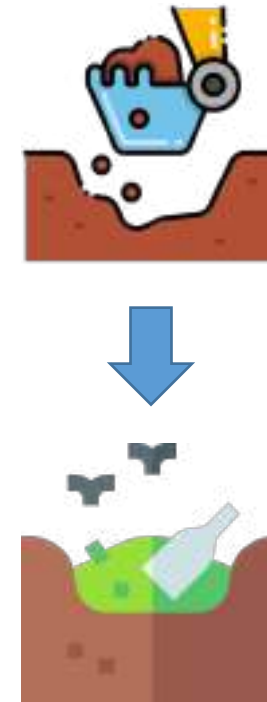
- Toxic
- Use only under exceptional circumstances

### Burning

- Fast regrowth
- Backfires. Helps the cane prevail over competitors

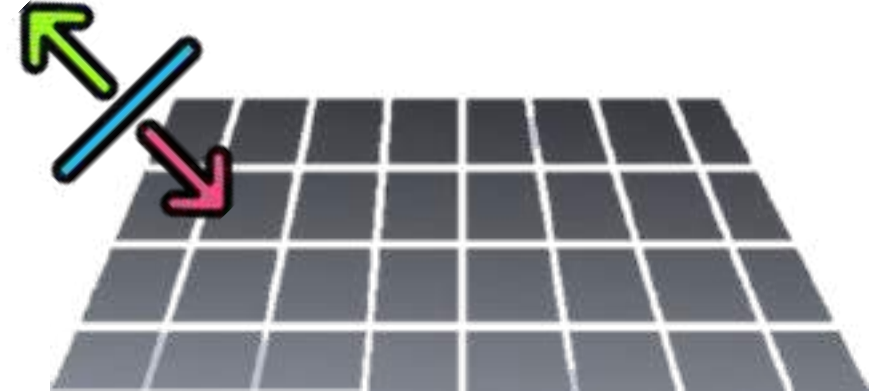
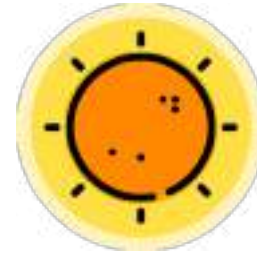
## Efficient techniques: ROOTSTOCK DIG

- Dig 0,5-1 m deep to remove the rootstock
- Complementary to covering technique
- Bury rootstock or placed it under the covering
- Avoid root scattering during soil transportation



## Efficient techniques: TEMPORARY COVERING

- Temporary opaque covering > 18 months
- Innovation: use of new biodegradable materials





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## GIRONA RIVER RESTORATION

**Before**



**After**





COMPLIANCE WITH  
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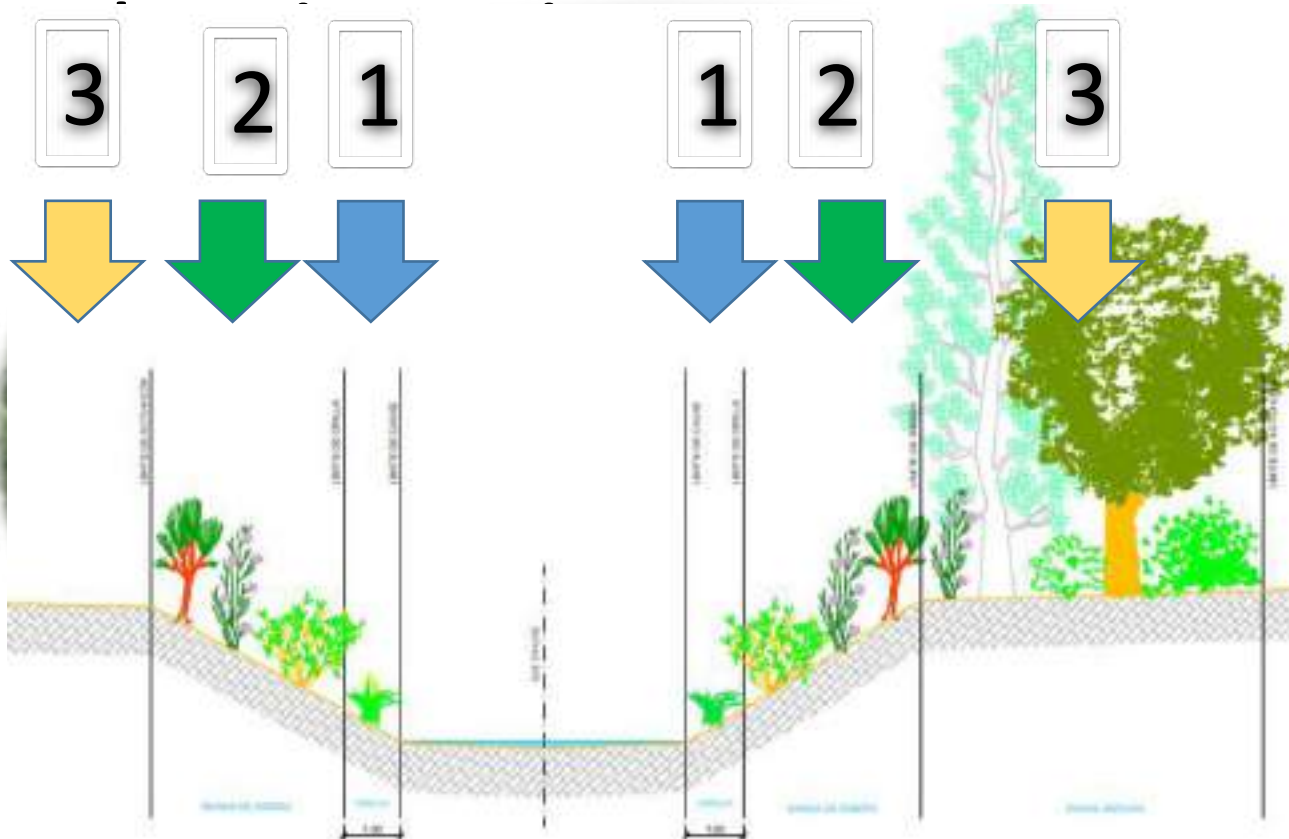
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# GIRONA RIVER RESTORATION



## 1. Edge Zone:

- 1 m wide strip
- Aquatic plants



## 2. Riverbank Zone:

- Within river swelling area
- Bushes plantation



## 3. Extended Zone:

- Outside river swelling area
- Bushes and trees



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## COLLABORATION WITH DIFFERENT SOCIAL AGENTS



- Inform about the Project
- Value different points of view.



**ECONOMIC SECTORS**

- Participation with social agents at an early stage when changes are feasible
- Inform about the decisions taken



- Inform on works kick-off and milestones

- Plan ahead & clearly distinguish responsibilities



**ENVIRONMENTAL GROUPS**



**LOCAL GOVERNMENTS**



# Thank you for your attention



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