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# The Case of Spain: emerging issues and potential solutions

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and Carlotta Valerio



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# Content

1. State of affairs
2. Diagnosis
3. What worked well with our current water right systems
4. What is not working well
5. Zooming in some topics (our work)

# State of affairs

## 1. Water urban supply systems:

- Reasonable/affordable price for consumers
- Broad penetration of secondary wastewater treatment
- Good quality service

## 2. Sound drought management:

- River basin drought management plans (first in 2007, revised in 2018)
- Protocols for urban areas prepared
- Participatory processes
- Legal basis, adequate for Water basins agencies'

# State of affairs

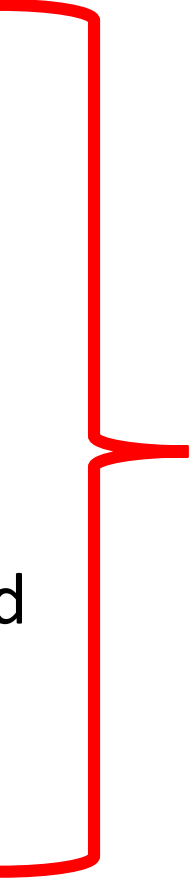
3. Freshwater ecosystems in poor status
  - Significant % of water bodies in poor status
  - Weak implementation/enforcement of environmental flows
  
4. Few new infrastructure developed in the last 10 years
  - Outdated wastewater treatment plants
  - Overdue investments in doubled water supply networks
  
5. A few fully appropriated basins

# What worked well with existing water right systems (1985 Water Law)

1. Increasing flexibility, without relying much on water markets (local solutions)
2. Users' acceptance of that flexibility
3. Consideration given to most economic and social circumstances
4. Some market exchanges
5. Revision of water rights in return of subsidised irrigation betterment projects
6. Some trade based on quality differences

# What is not working well

1. Poor status of freshwater bodies
2. Intensive exploitation of surface and groundwater
3. Insufficient water rates (lack of revenue for infrastructure)
4. Adjustments needed in the regulatory framework
5. Legal implementation hampered by complexity and lack of economic resources



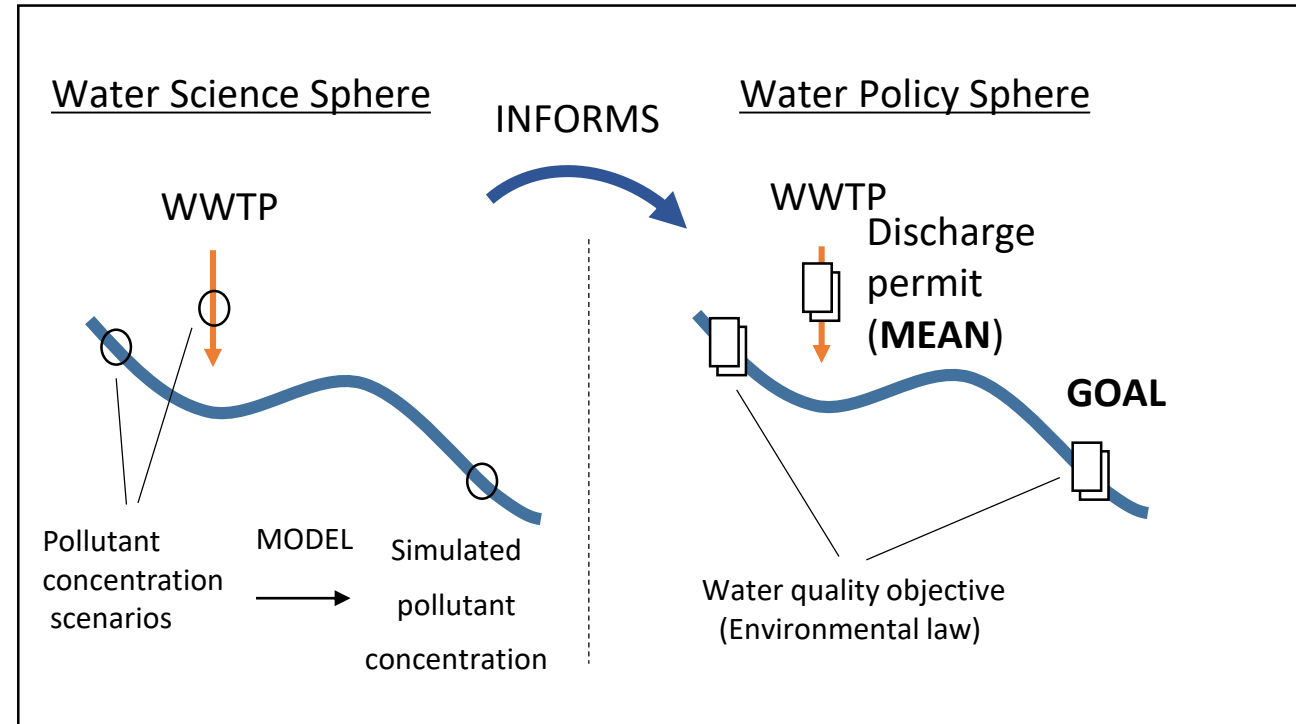
CC will exacerbate  
all these issues!

Zooming in some of these issues ....  
with our work in the Water Observatory

# 1. Enhancing the ecosystems' dimensions

## I. Increase the technical standards of wastewater treatment

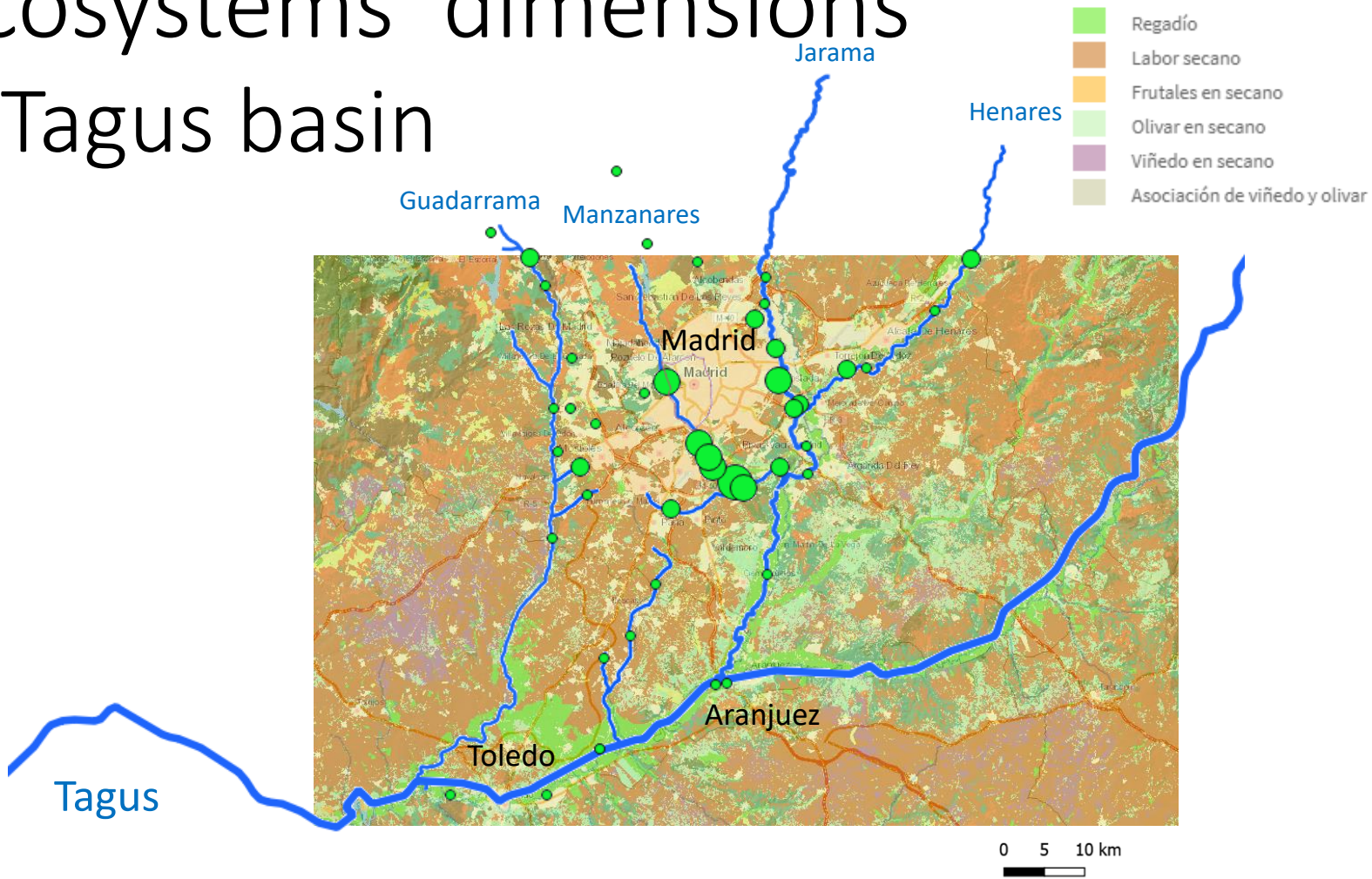
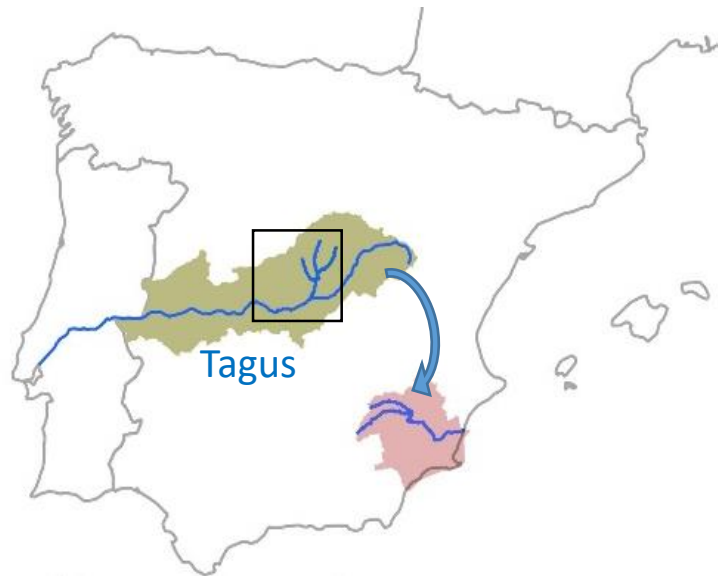
- WWTP discharge permits should be adapted to the **ultimate goal** of good status in the receiving waters
- We investigated a case study for a highly populated area discharging into a low flow river





# 1. Enhancing the ecosystems' dimensions

## Case study: Middle Tagus basin

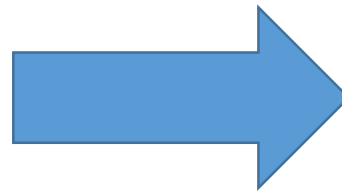
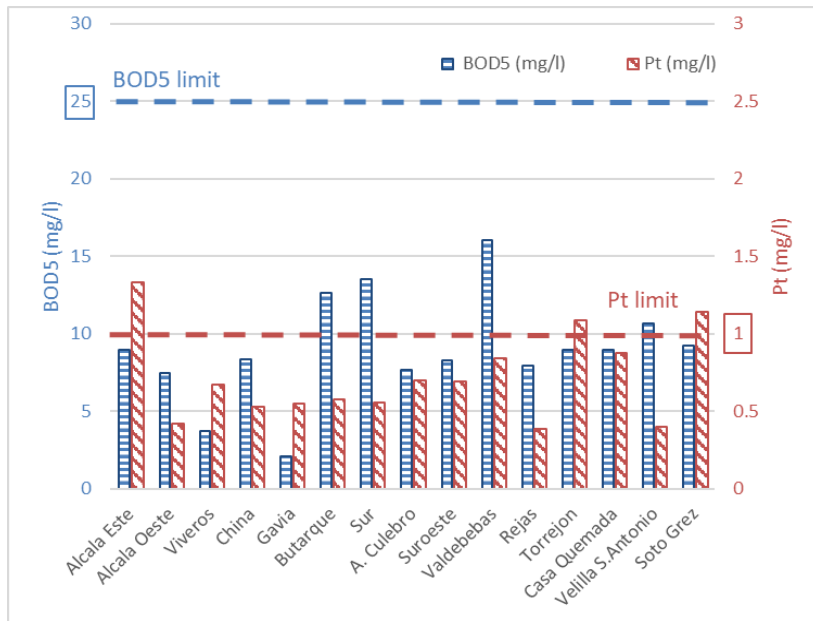


Mapa de Cultivos y Aprovechamientos de España 1:50.000 del año 2000 - 2010  
<https://sig.mapama.gob.es/siga/visor.html>

● WWTPs

A. Bolinches

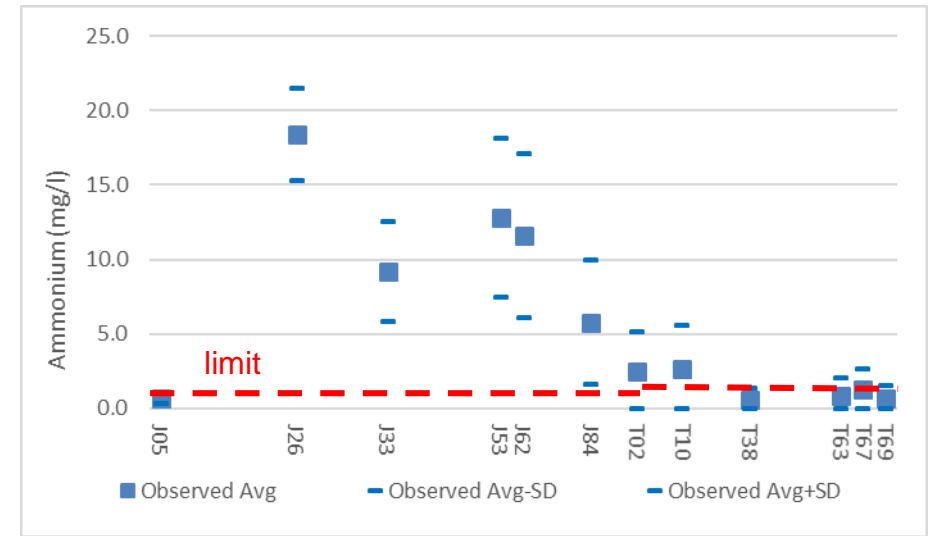
# Case study: Middle Tagus basin



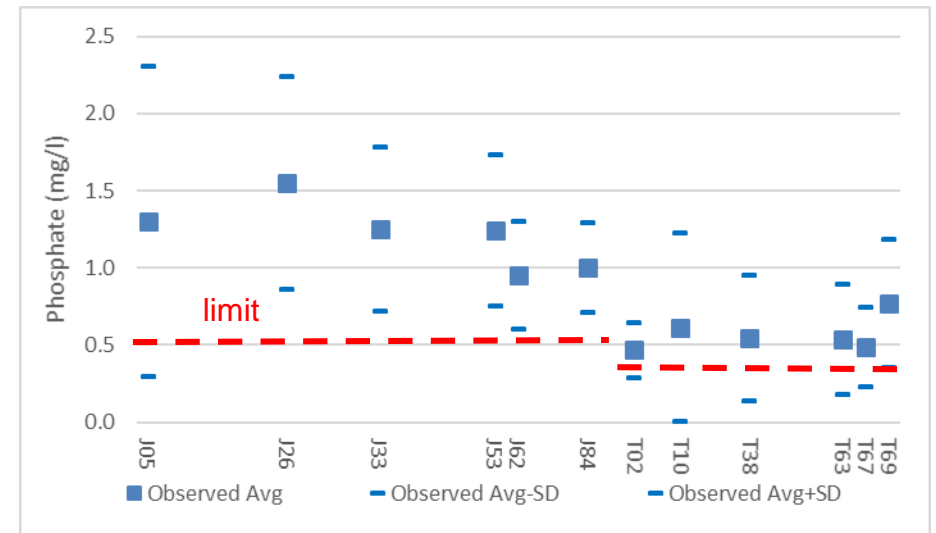
BUT receiving waters present concentrations above WFD limits

Wastewater treatment plants comply with explicit discharge legislation (defined at effluent)

Ammonium concentration



Phosphate concentration



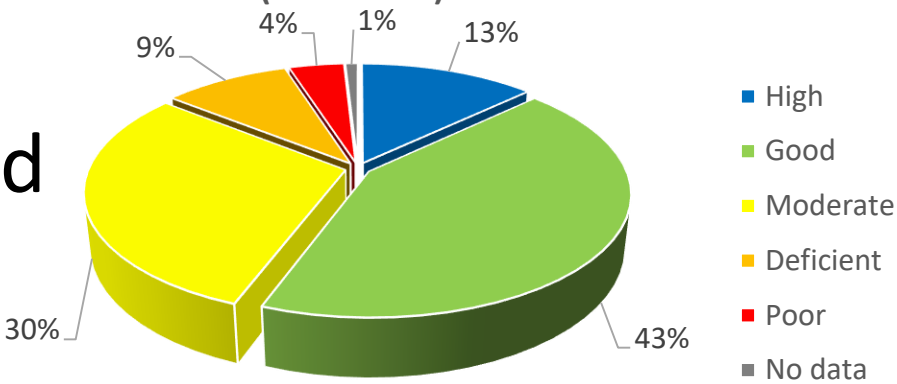
A. Bolinches

# 1. Enhancing the ecosystems' dimensions

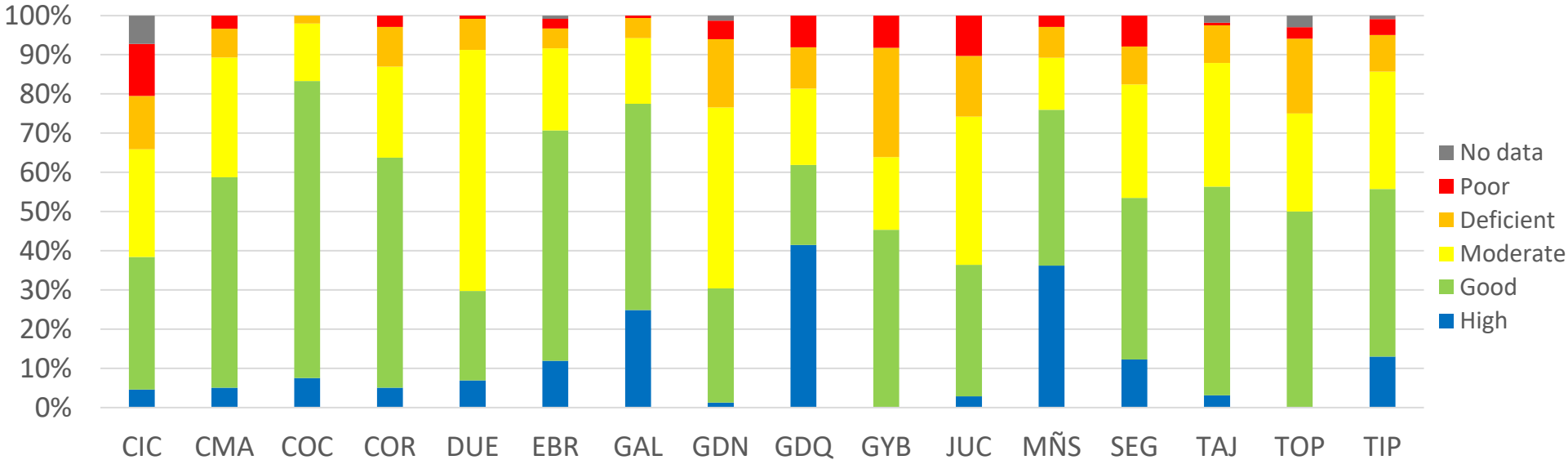
## II. Environmental services, still unprotected

- Significant % of water bodies in poor ecological status

Ecological status of water bodies in Spain (2015-2021)



Ecological Status of water bodies in each River Basin District



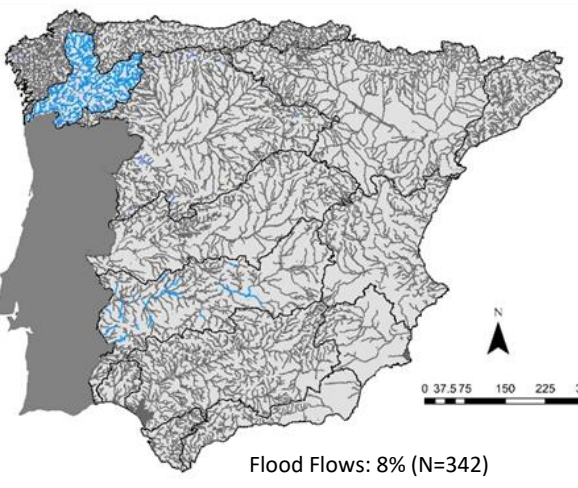
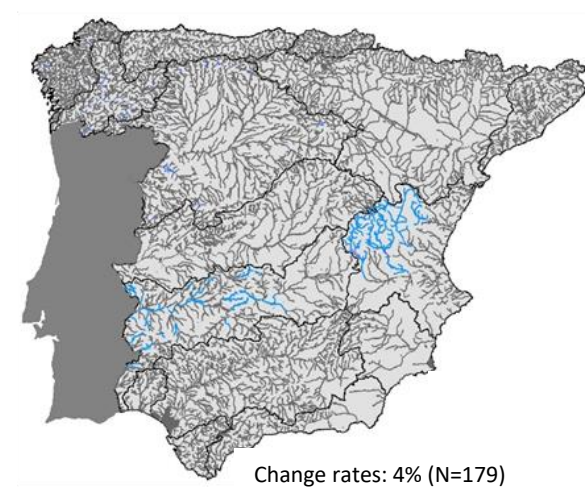
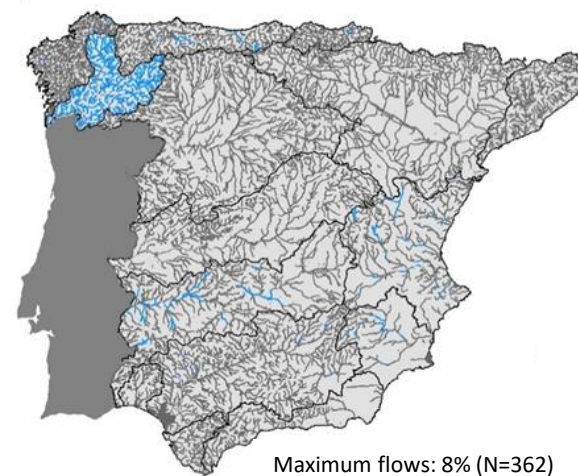
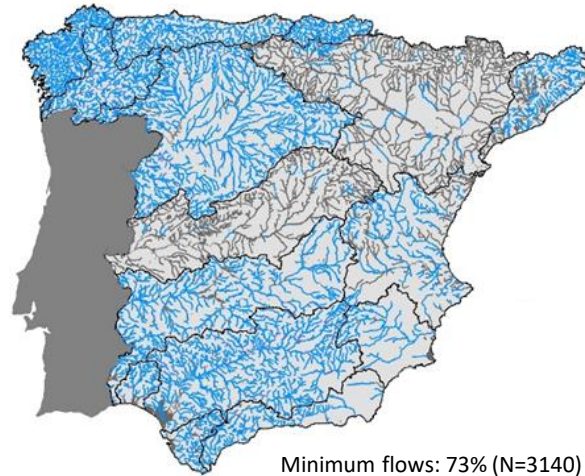
44% of water bodies have an ecological status worse than good

G. Mezger



# 1. Enhancing the Ecosystems' dimensions

## II. Environmental services, still unprotected





# 1. Enhancing the Ecosystems' dimensions

## III. Finding the most appropriate set of measures:

Implement advanced techniques (machine learning/ IA models) to:

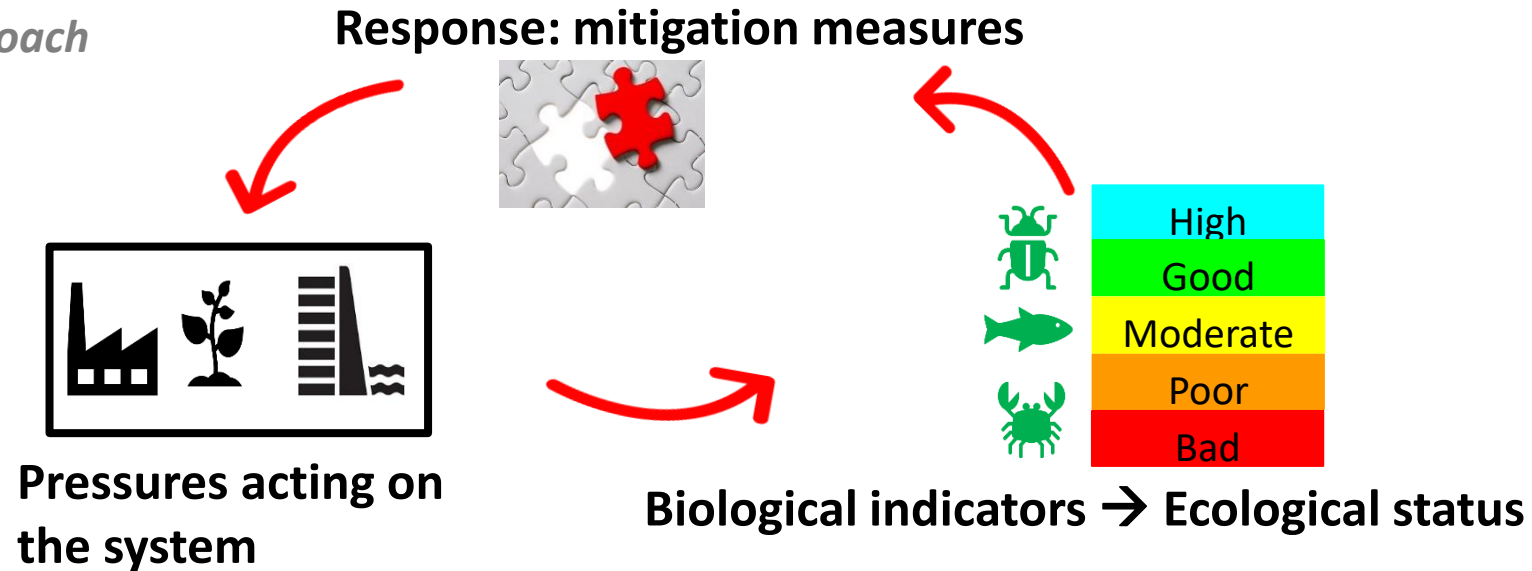
- Identify explanatory factors of the observed water quality and ecological status
- Identify management actions

Implementation of the EU  
Water Framework Directive



# Bridge pressures- ecological status

*WFD approach*

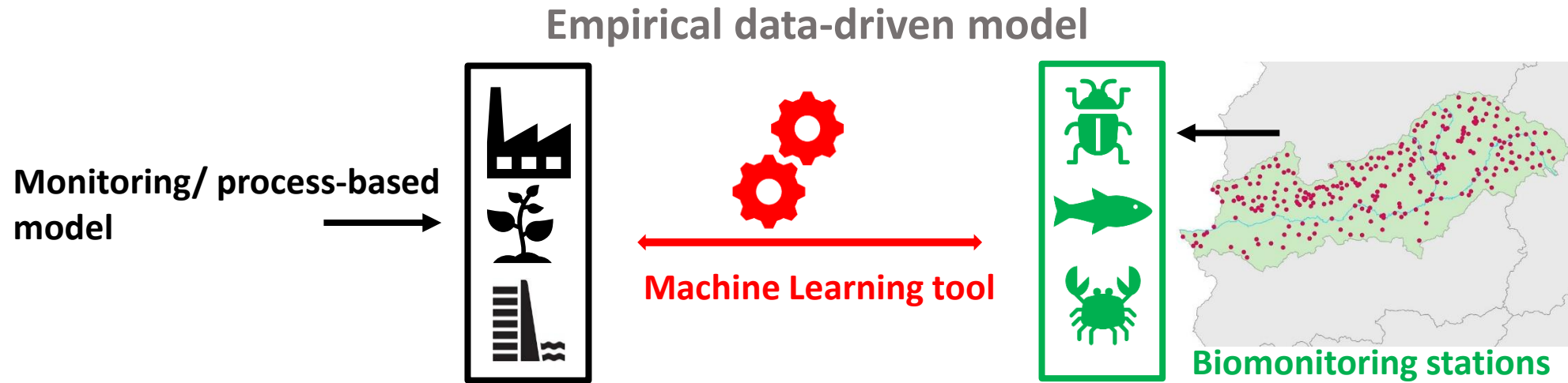


**Poor understanding of the relationships between pressures and effects on the ecosystem. This makes it difficult to design effective mitigation and corrective measures**

Main challenges:

- Link hydrological/morphological pressures with the ecological status
- Multiple stressors context: how do they interact?
- Difficult to define transferable quantitative relationships: site-specific approach is needed

# Possible approach



- Approach: empirical data-driven model, based on a certain ML technique, with the pressures (usually computed with a processed based model) as explanatory variables of the model, and the measured biological data as dependent variables.
- Aim: describing the current situation and using the trained model to simulate the effects of mitigation strategies.

## 2. Raising Citizens' awareness and conscious

### IV. Reconnect citizens with their water sources, intellectually and emotionally:

- Raise awareness about the role of freshwater ecosystems in our society
- Awareness is needed for citizens to get interested in water management, ask for and support policy makers for measures and investments needed to improve freshwater ecosystems on the long term.





# In conclusion

1. Implementing the polluter-pays and users-pay principles
2. Developing innovative PPPs
3. Integrating water-quality and resource-based dimensions in the domain of the regulatory framework



1. WWTPs & Water quality status
2. Users, responsible for impacts
3. Information transparency
4. Political responsibility
5. Need to prioritise policy initiatives using AI

Climate change, coupled with the emerging issues, can't wait until a broad political consensus is gathered

Actions needed now!



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