

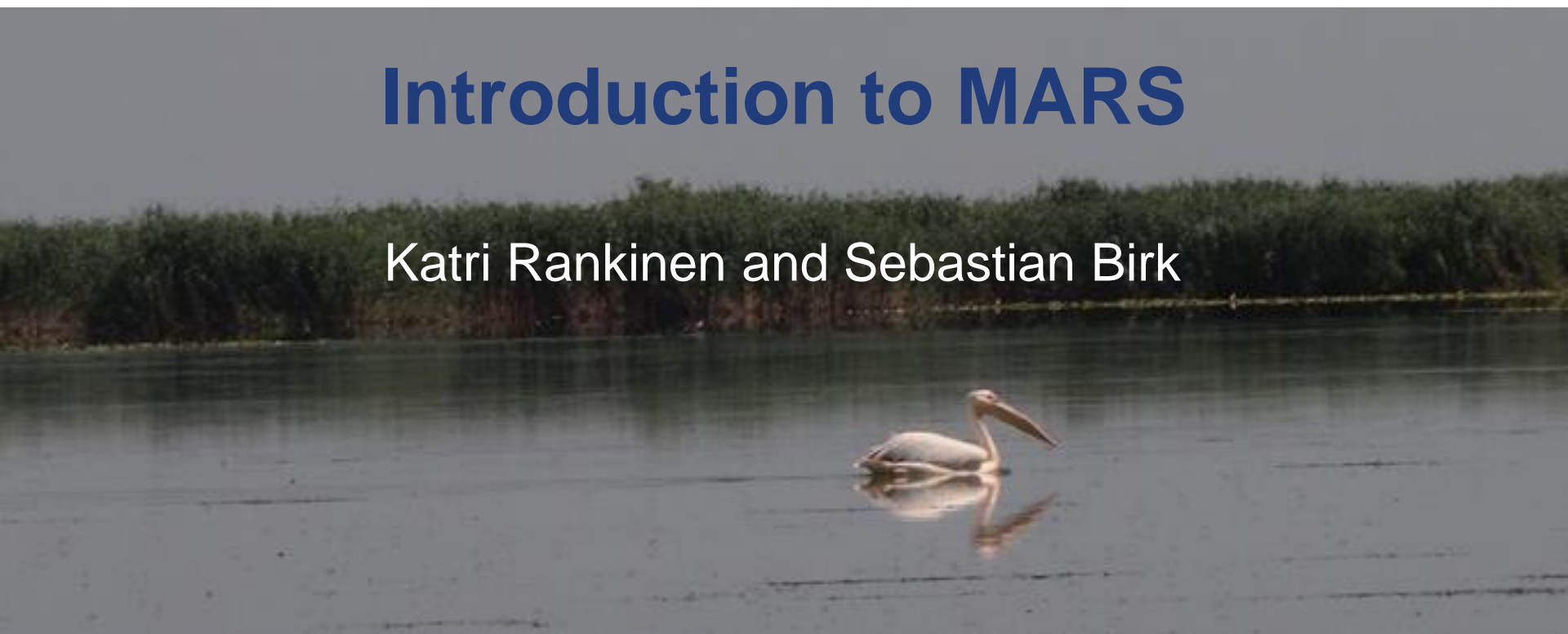
**Towards recovery  
of Europe's waters**

**MARS  
PROJECT**

Managing Aquatic  
ecosystems and  
water Resources  
under multiple Stress

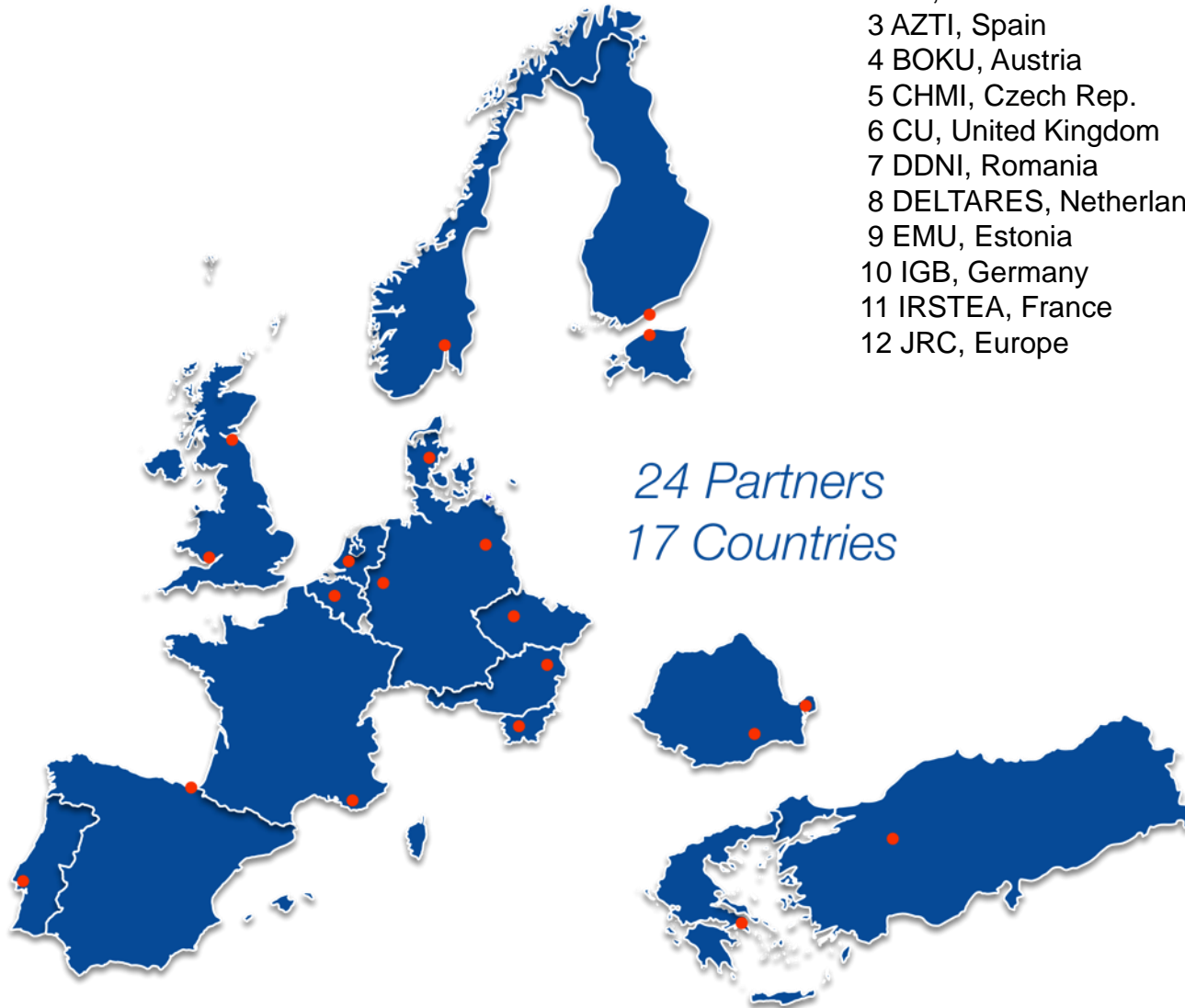
# Introduction to MARS

Katri Rankinen and Sebastian Birk



- Title:  
**Managing Aquatic ecosystems and water Resources under multiple Stress**
- Theme ENV.2013.6.2-1  
Water resources management under complex, multi-stressor conditions
- Collaborative project
- Project duration: February 1<sup>st</sup>, 2014–January 31<sup>st</sup>, 2018
- Funding: 9 Mio. Euro

# MARS consortium



- 1 UDE, Germany
- 2 AU, Denmark
- 3 AZTI, Spain
- 4 BOKU, Austria
- 5 CHMI, Czech Rep.
- 6 CU, United Kingdom
- 7 DDNI, Romania
- 8 DELTARES, Netherlands
- 9 EMU, Estonia
- 10 IGB, Germany
- 11 IRSTEA, France
- 12 JRC, Europe
- 13 METU, Turkey
- 14 NERC, United Kingdom
- 15 NIVA, Norway
- 16 NTUA, Greece
- 17 SYKE, Finland
- 18 UL, Slovenia
- 19 ULT, Portugal
- 20 APA, Portugal\*
- 21 BMLFUW, Austria\*
- 22 EA, United Kingdom\*
- 23 ICPDR, international\*
- 24 NARW, Romania\*

\*Applied partners



# MARS website

The screenshot shows a web browser window displaying the homepage of the MARS project. The browser's address bar shows the URL "mars-project.eu" and the page title "Home - MARS - Managing Aquatic ecosystems and water resources under multiple stress". The website header includes the MARS PROJECT logo and a navigation menu with links for HOME, ABOUT, BACKGROUND, METHODS, RESULTS, GLOSSARY, CONTACT, and BLOG. The main content area features a large photograph of a river with fallen logs and green algae. A semi-transparent text box over the image reads "Near natural floodplains and river self-purification. MARS project". Below the image, the text "Welcome to MARS" is visible, followed by the beginning of a sentence: "We investigate how multiple stressors". A black box with white text at the bottom of the screenshot contains the URL "http://www.mars-project.eu".

<http://www.mars-project.eu>

# The challenges

---

- General confusion about ecological assessment
  - variable in space and time
  - linkage to stressors often obscure
  - difficult to disseminate
- Ecosystem services as an alternative, but ...
  - not part of the Water Framework Directive
  - is there a relation to ecological status?
  - how to measure?
- Restoration is not really advancing
  - restoration principles are simple, but widely ignored
  - variability of biological assessment used as readily available excuse to do nothing

# Selected key questions

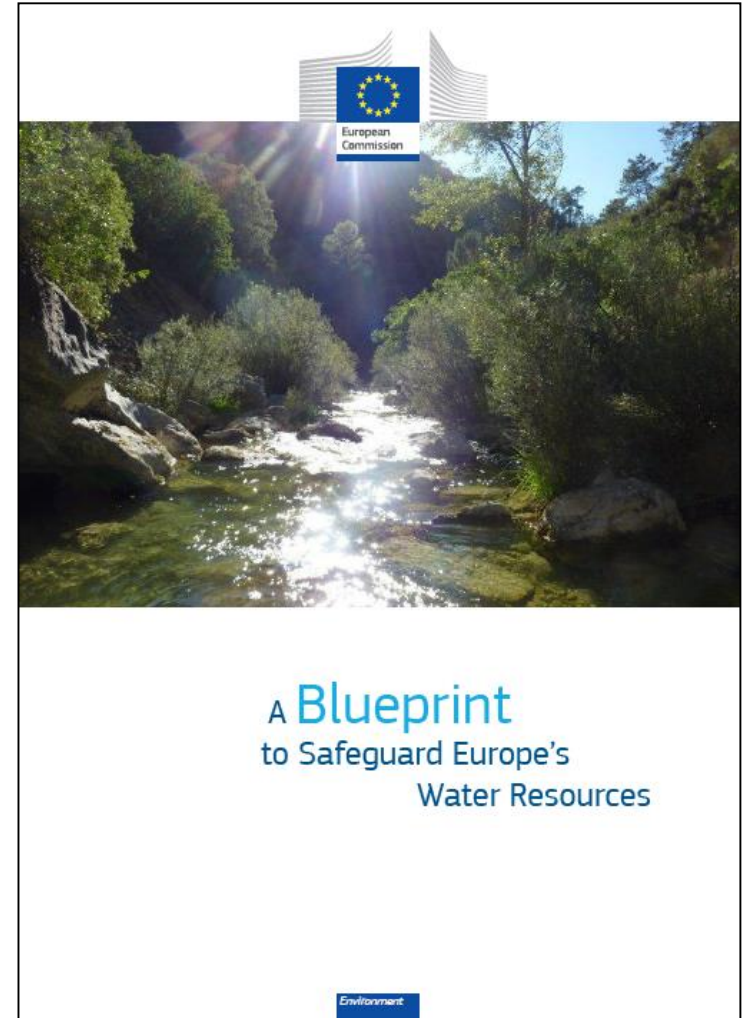
---

- What is the relation of ecological status and ecosystem services?
- How do stressors interact in affecting status and services?
- Despite the multitude of stressors, is there a common ground for restoration activities?
- How should the implementation of the Water Framework Directive and related legislation be developed?

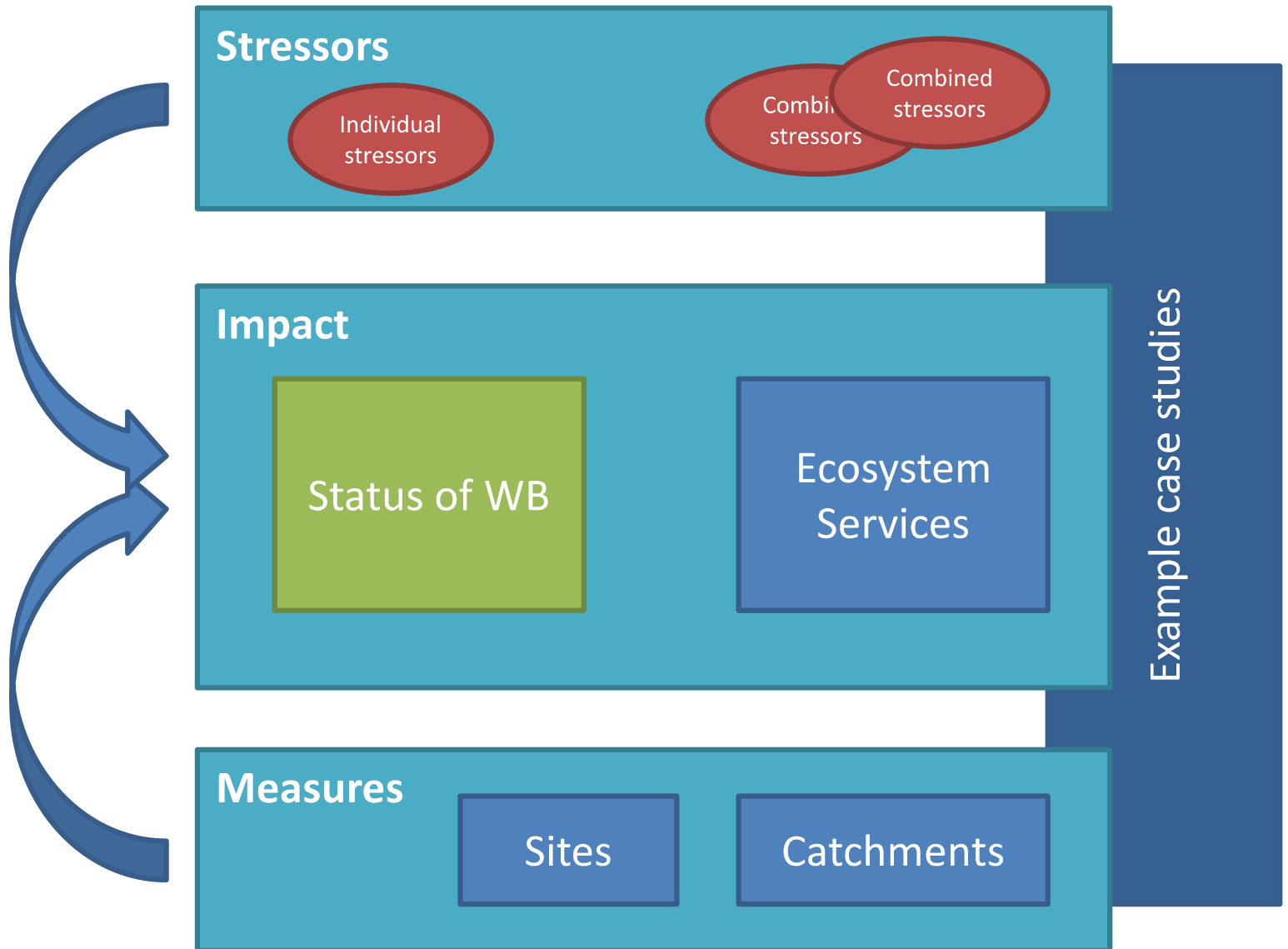


# Main stressor-groups addressed

- Water scarcity
- Flooding
- Flow alteration
- Extreme climatic events
- Morphological alteration
- Water quality



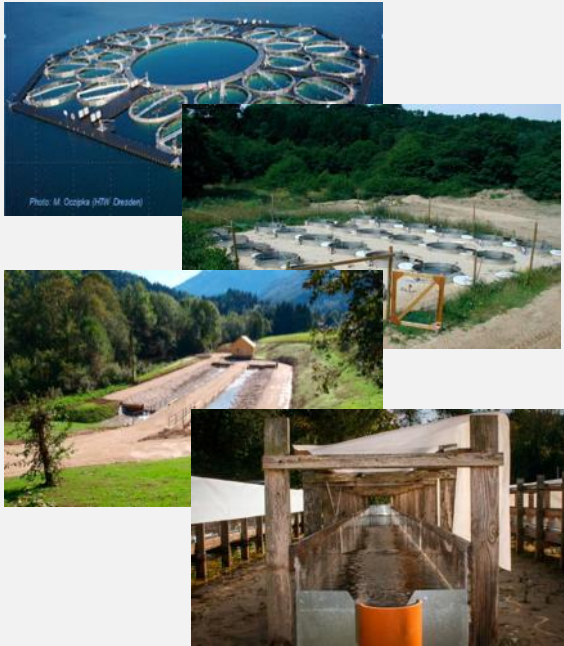
# Information system & Diagnostic tool





# Spatial project organisation

Water body scale:  
7 flume and mesocosm  
experiments



Combined effects of DOC, flow,  
water abstraction, temperature,  
precipitation, nutrients,  
fine sediments,  
habitat morphology

River basin scale:  
16 case study basins



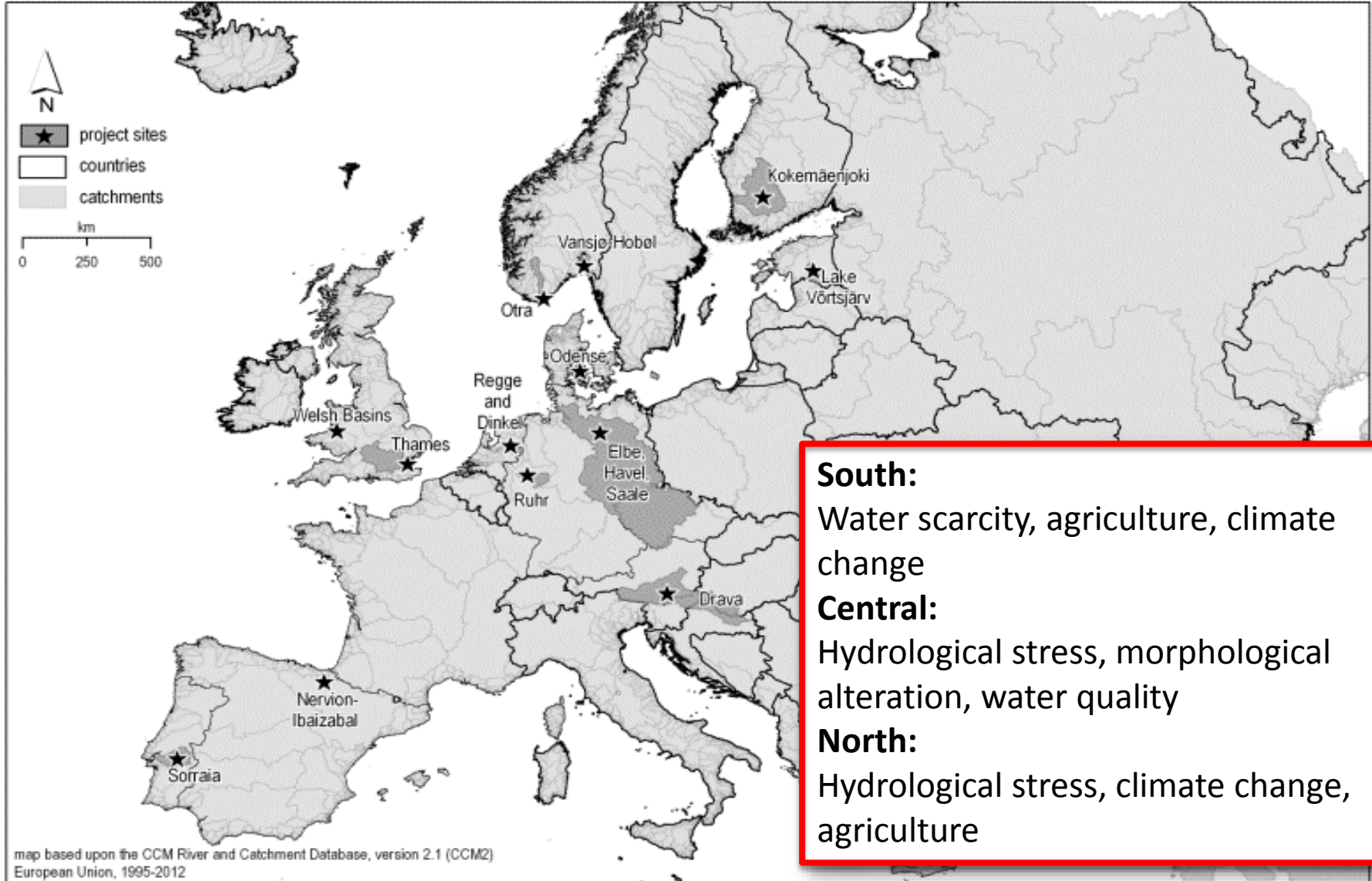
Statistical analysis of  
combined effects of  
water abstraction, flow regulation,  
morphological alteration,  
water quality, warming,  
land use

Continental scale:  
Europe-wide data analysis  
of large lakes and rivers and  
of fish across rivers,  
lakes and and estuaries



Statistical analysis of  
relationships between drivers,  
pressures, biological impacts,  
ecosystem processes  
and ecosystem services

# 16 Case study basins

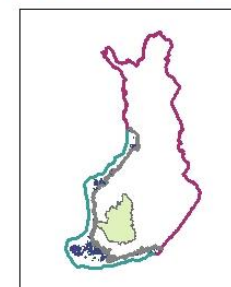
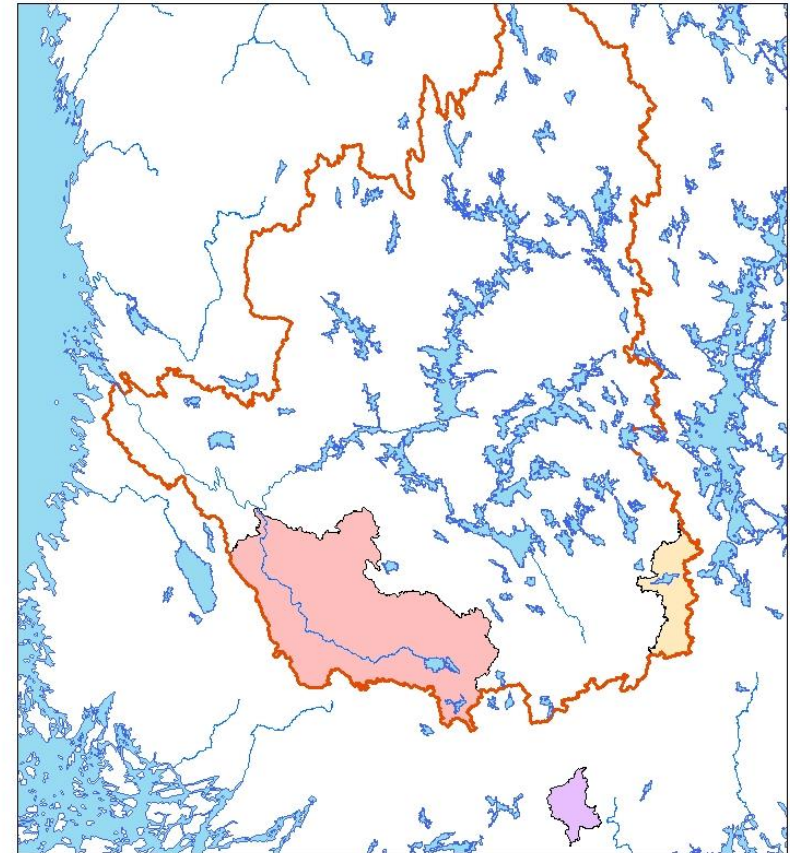


**South:**  
Water scarcity, agriculture, climate change

**Central:**  
Hydrological stress, morphological alteration, water quality

**North:**  
Hydrological stress, climate change, agriculture

- Three smaller representative catchments with good data of hydrology, water quality and ecology
- Study catchments in previous studies
- Teuronjoki (270 km<sup>2</sup>)
- Loimijoki (3100 km<sup>2</sup>)
- Lepsämäjoki (230 km<sup>2</sup>)





# Teuronjoki catchment

- Ecological status of the lake good, and of the river moderate
- Pressures from agriculture and forestry -> **brownification + ecosystem services**
- Well monitored lake and sub catchments discharging to the lake -> **catchment – lake** relationship
- INCA-Sed and -N setup, MyLake setup, Uncertainty analysis of N









# Lepsämäenjoki catchment

- Ecological status of the river is poor
- Pressures from agriculture -> **eutrophication + ecol. indicators**
- INCA-N and INCA-Sed setups
- Study area of several previous projects



# Scenarios and storylines

---

A large, light blue arrow pointing to the right, containing three dark blue rounded rectangular boxes. The boxes are arranged horizontally and contain the text "Climate change", "Landuse change etc.", and "3 storylines" respectively.

Climate  
change

Landuse  
change etc.

3 storylines



- **Storyline1 – Techno world**
  - Economy: the main objective is an economic growth
  - Environment: high awareness on society but poor regulation of environmental protection by the governments
- **Storyline2 – Consensus world**
  - Economy: the main objective is to stimulate economic growth on the one hand and to promote sustainable and efficient use of resources on the other hand.
  - Environment: awareness and eye for preservation, but mostly due to the existing and extended strong regulations.
- **Storyline3 – Fragmented world**
  - Economy: there is a high difference between the developments of the different countries
  - Environment: no attention is paid to the preservation of the ecosystems

# What will be our products? Advice

---

- ...to 3<sup>rd</sup> River Basin Management Plan
- ...to national implementation
- ...to Common Implementation Strategy (CIS)
- ...to the revision of the Water Framework Directive

Thank you!

