Wetlands Solutions *for the Future*

Learning from ALFAwetlands and REWET Projects

17 September 2026

Brussels, Belgium

rewet

Restoration for the future WETLANDS www.alfawetlands.eu

Funded by the European Union

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CINEA. Neither the European Union nor the granting authority can be held responsible for them.

From Pilot Restoration to Basin-Scale Renaturation: Lessons from the Po River Open Lab

Chiara Montecorboli
Po River District Basin Authority
Marco Bartoli
University of Parma

rewet

Restoration for the future WETLANDS
www.altawetlands.eu

Funded by the European Union

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CINEA. Neither the European Union nor the granting authority can be held responsible for them.

Wetlands Solutions for the Future

Restoring wetlands through river basin planning

EU POLICY FRAMEWORK: MULTIPLE OBJECTIVE

Water Framework Directive Directive

Protect and improve water-body body status

+

Floods Directive

Reduce and manage flood risk

+

EU Nature Restoration Regulation

Recover resilient ecosystems

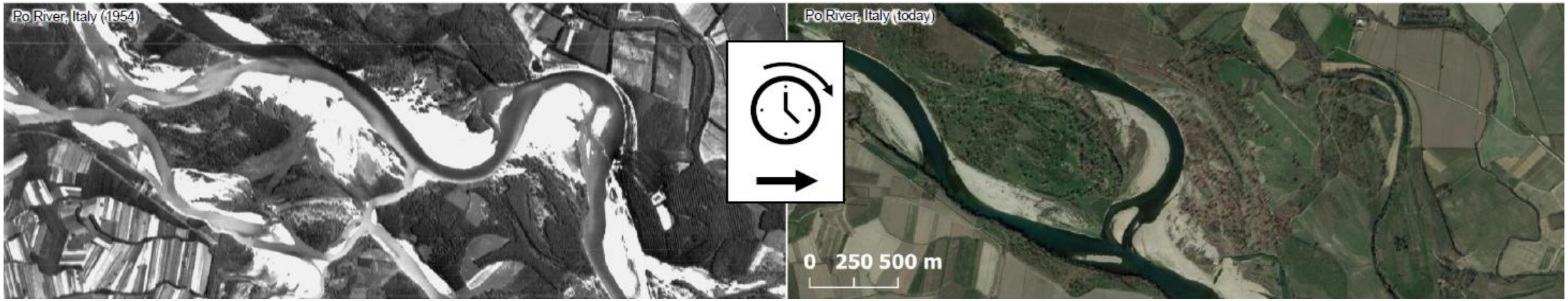
River Basin Planning

WIN–WIN MEASURES

Restore river–floodplain connectivity

One intervention, multiple policy objectives.

The Po River: a planning challenge



Riverbed incision is the result of overlapping human pressures and structural changes across the twentieth century.

Sediment extraction

Intensive gravel and sand extraction altered the river's morphological balance

Defence and navigation structures

Embankments and training works concentrated erosive energy on the riverbed

Isola Serafini dam

Built in 1962, it interrupted downstream sediment transport and transport and accelerated incision incision

The Lanca di Gussola is one example of the broader loss of lateral connectivity resulting from these long-term morphological changes

From Planning to Field Action

Policy instruments become site-specific restoration through a shared sediment-management pathway

RBMP + FRMP

Integrated water and flood risk plans

General Sediment Management Programme

A shared evidence base for action

Priority restoration sites

Focus resources where impact impact matters most

Gussola Open Lab Lab #6

Test, measure and learn

Gussola: Restoring lateral connectivity

BEFORE – Low connectivity (~4,000 m³/s)

October 2022 – April 2023

Lowering the navigation groyne and restoring river connectivity

Increase flood exchange
Re-activate the side channel
Reduce main-channel flow during major floods

AFTER - Restored connectivity (~1,500 m³/s)

FSC Fondo per lo Sviluppo e la Coesione

MINISTERO DELL'AMBIENTE E DELLA SICUREZZA ENERGETICA

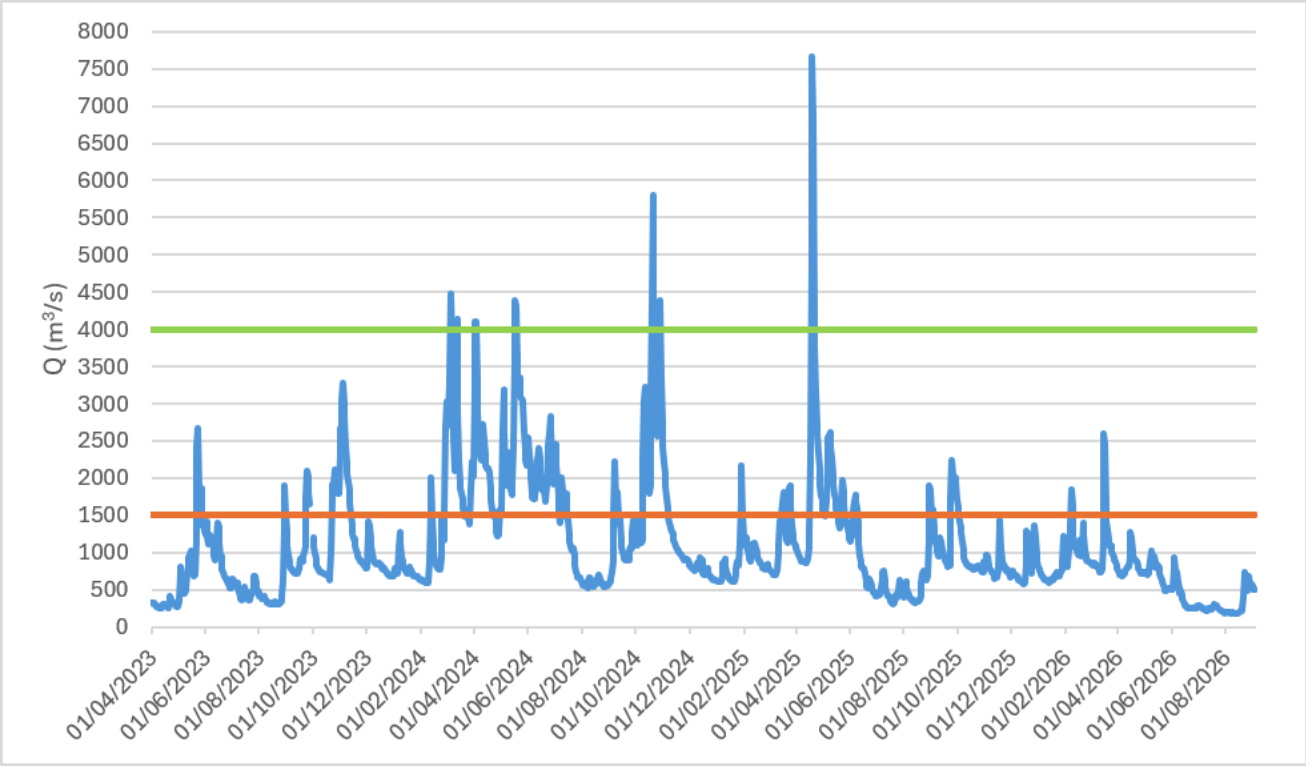
ADBPO Autorità di bacino distrettuale del fiume Po

AIPo Agenzia Interregionale per il fiume Po

REWET Open Lab 6 provided the opportunity for coordinated pre- and post-intervention monitoring

From restoration action to measurable hydraulic change

Lowering the groyne reduced the overtopping threshold from ~4,000 to ~1,500 m³/s



14 times > ~4,000 m³/s

264 times > ~1,500 m³/s

Discharge hydrograph of the Po River at Cremona, the reference gauging station for Gussola. Data updated as of 3 September 2026

The intervention substantially increased the frequency of potential river–oxbow connection.

From restoration action to evidence

1

Physical Intervention

Implementation of restoration measures on site.

2

Pre & Post Monitoring

Comparative analysis of baseline vs. post-intervention conditions.

3

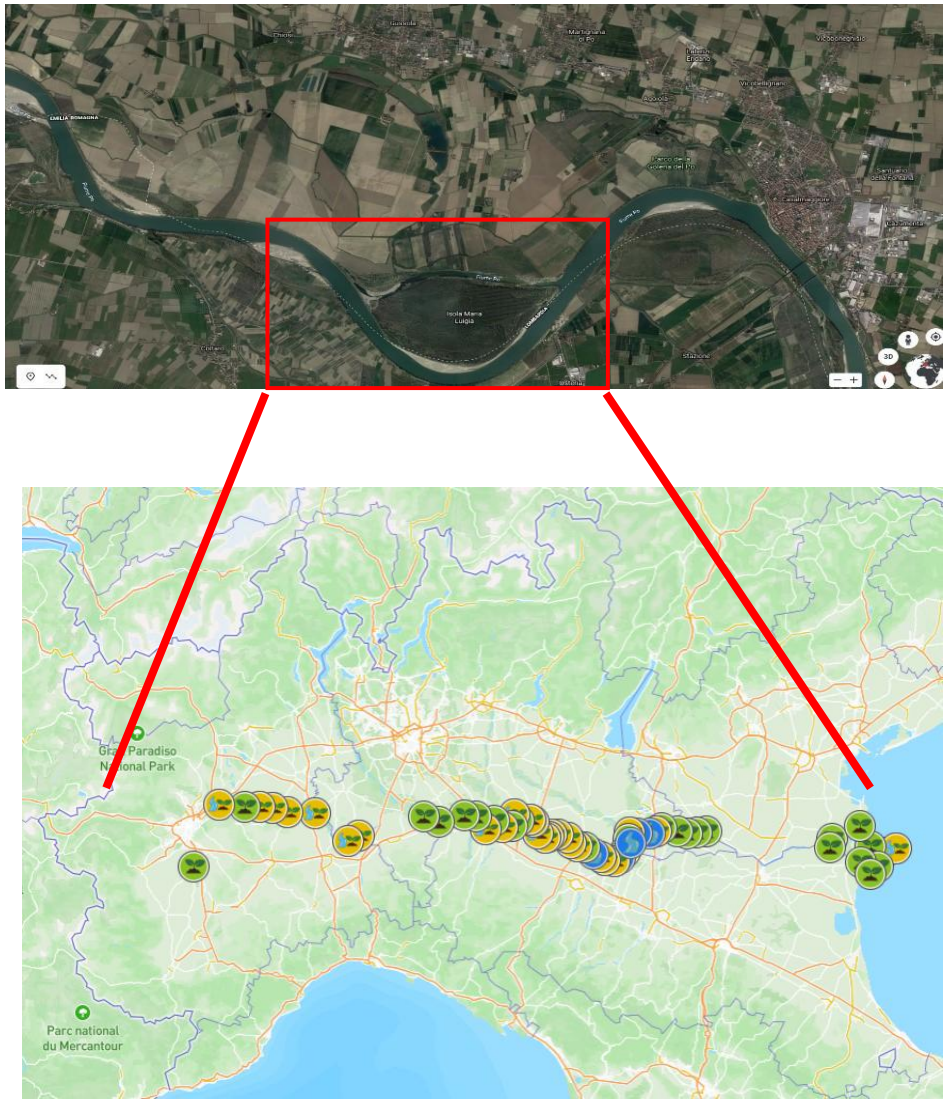
Multidimensional Assessment

- Hydromorphology
- Ecology
- GHG Emissions
- Biodiversity
- Social Dimension

4

Future Evidence

Generating robust data to guide future restoration strategies.



The **experience of the pilot case of Gussola** provided the methodological basis for scaling up

Wetlands Solutions for the Future

From pilot experience to basin-scale action

Scientific Committee

Supports the Po River Basin Authority within the Po Restoration Project.

Monitoring Guidelines Guidelines

Define common criteria and methods for interventions along along the Po.

What is measured?

Ecosystem functionality and biodiversity biodiversity outcomes.

ASSESSMENT CYCLE

Monitoring needs to be embedded in restoration programmes—not added after implementation.

01 Ante operam — Before works

02 In progress — During works

03 Post operam — After works

Wetlands Solutions for the Future

From pilot experience to basin-scale action

The Gussola experience provides relevant technical and monitoring knowledge for wider restoration efforts along the Po River.

A National Recovery and Resilience Plan programme is now extending restoration across the Po River.

€357 million

Programme investment

56 sites

Planned intervention sites along the Po River

27,984 ha

Area covered by the programme

2 million

Plantings (1,400 plants/ha)

What Does This Mean for River Basin Policy?

Basin-scale restoration is an operating model—not a collection of isolated projects.

01

Restore processes, not only habitats

Riverine wetland restoration should restore hydrological and morphological connectivity.

02

Integrate restoration into basin planning

Restoration measures should contribute simultaneously to water, biodiversity, flood-risk and climate objectives. objectives.

03

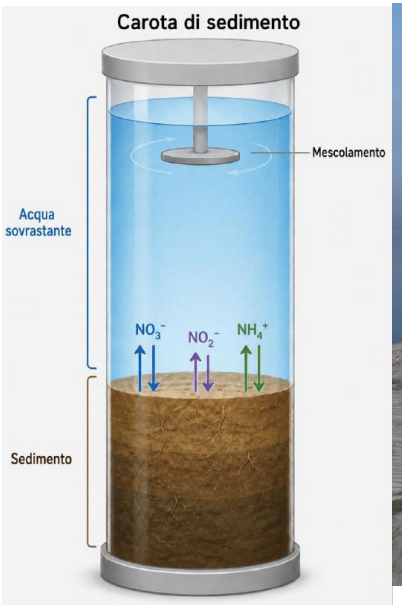
Turn pilots into transferable knowledge

Embed monitoring and evaluation so local lessons can guide wider action.

A biogeochemical/biodiversity perspective

What REWET allowed us to do, together with the National Recovery and Resilience Plan

Move from a laboratory scale to an *in situ* scale, and analyse the effects of groyne lowering and hydraulic connection between the largest Italian river and an oxbow lake



The Gussola oxbow lake

Before

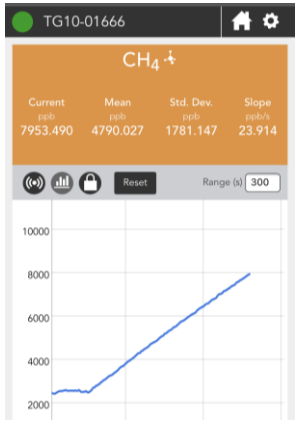
During

After

What did me measure?

-Sedimentary transport and biogeochemical features, water chemistry, GHG (CO_2, CH_4 and N_2O) saturation and fluxes and biodiversity of the oxbow lake during periods of hydraulic isolation and connection

-GHG fluxes along gradients of organic matter and water saturation in sediments and soils



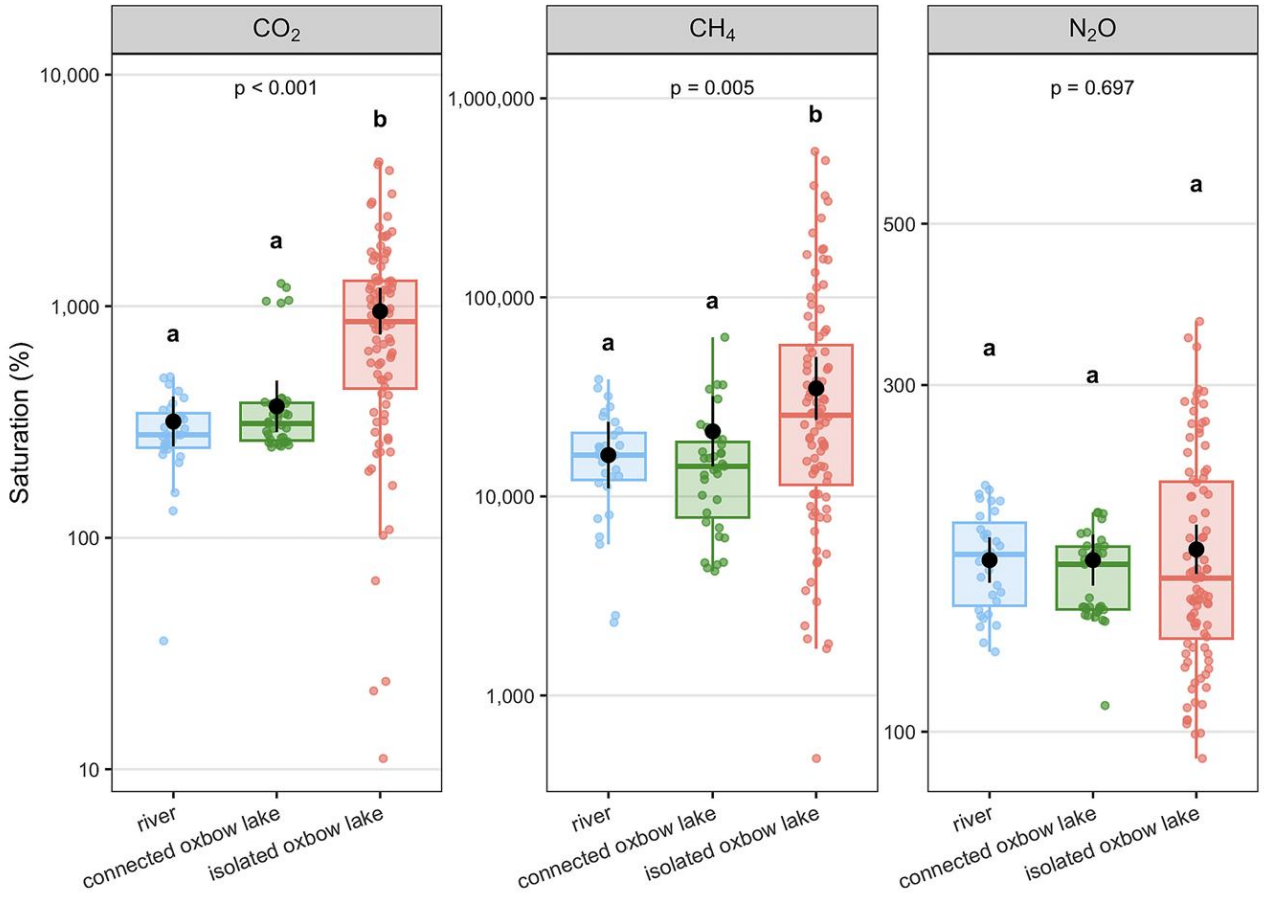
What did we find?

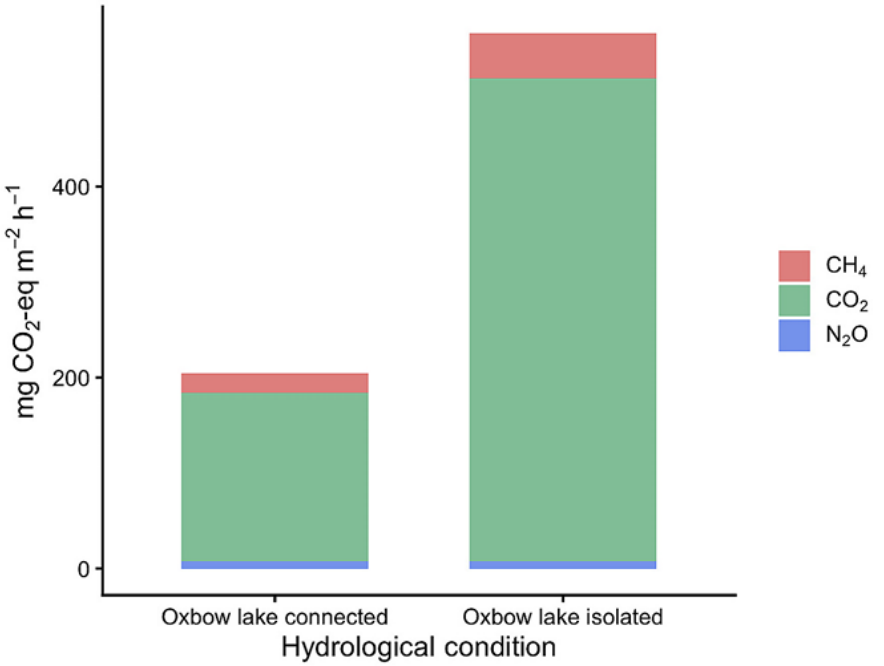
Ecological Engineering
Date: December 2026
Show more

Research article • Open access Under a Creative Commons license ↗ Get rights and content ↗

Lowering a navigation groyne increases the frequency of flooding and reduces greenhouse gas evasion from an oxbow lake

Sara Benelli ✉, Bianca Maria Lecchini ✉, Marco Bartoli ✉ Show more



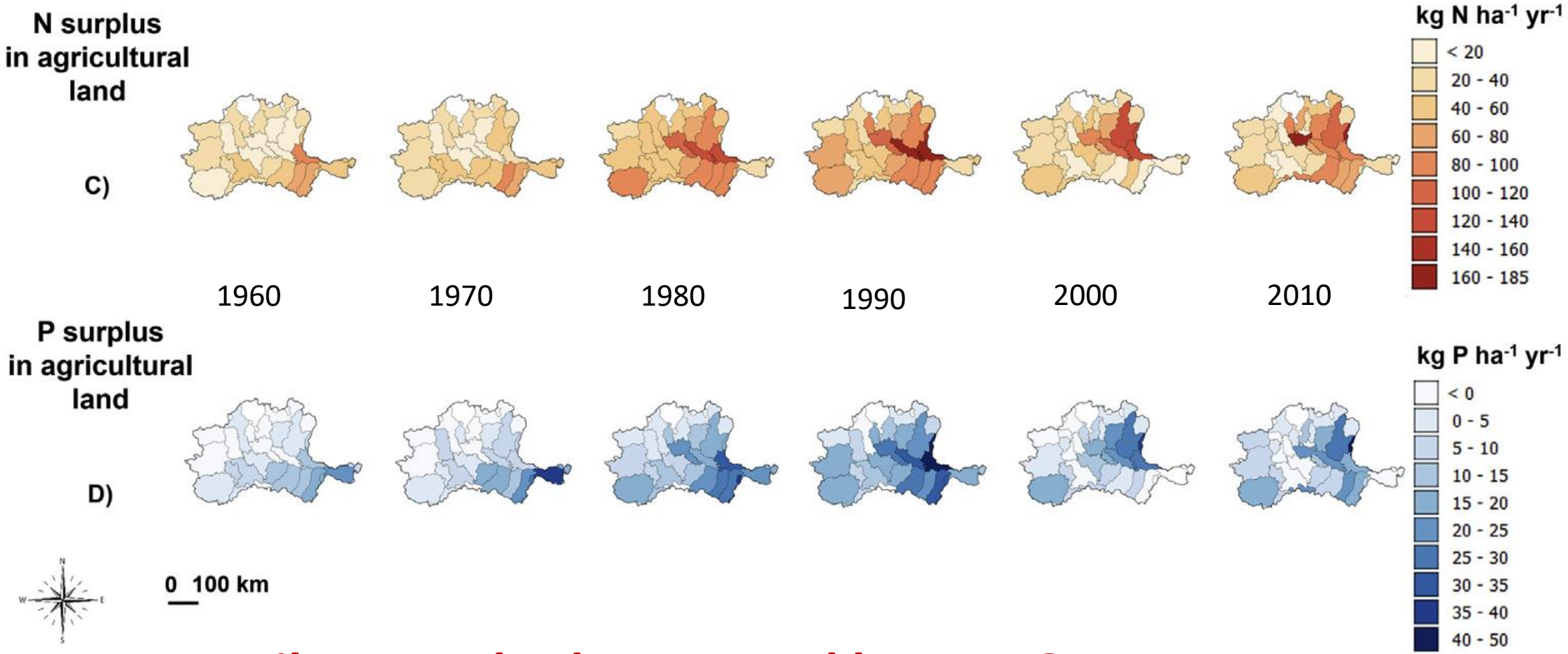


What did we find more?

- We also found signs of improvement in water chemistry in terms of oxygen, chlorophyll, and nutrients, as well as in biodiversity, in terms of aquatic insects, fish, and more.

-Despite these positive signs, the river and the oxbow lake remain in a precarious ecological condition, as these interventions may have been implemented too far downstream from the source of the problems, or because the reversal of eutrophication processes and biodiversity recovery are not immediate

What are the reasons of the low ecological quality?

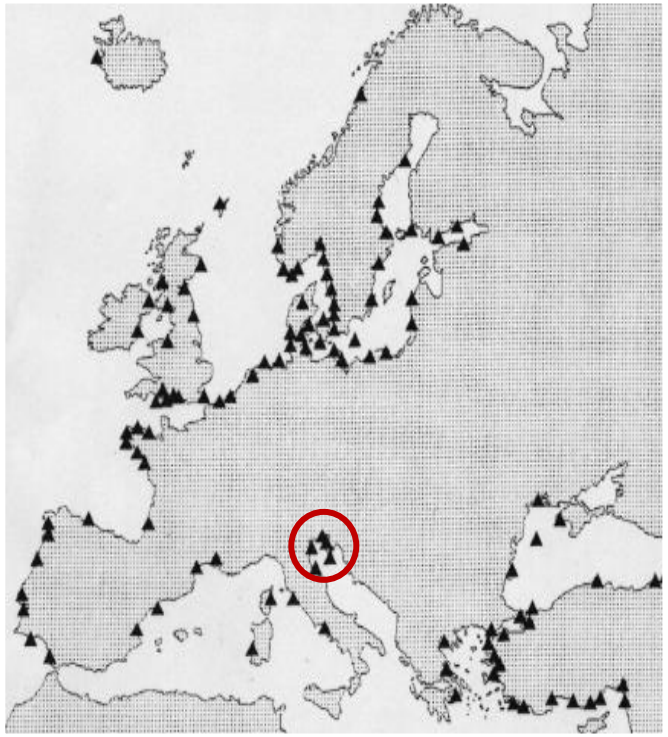


Soil system budgets reveal large N & P excess

What are the reasons of the low ecological quality?

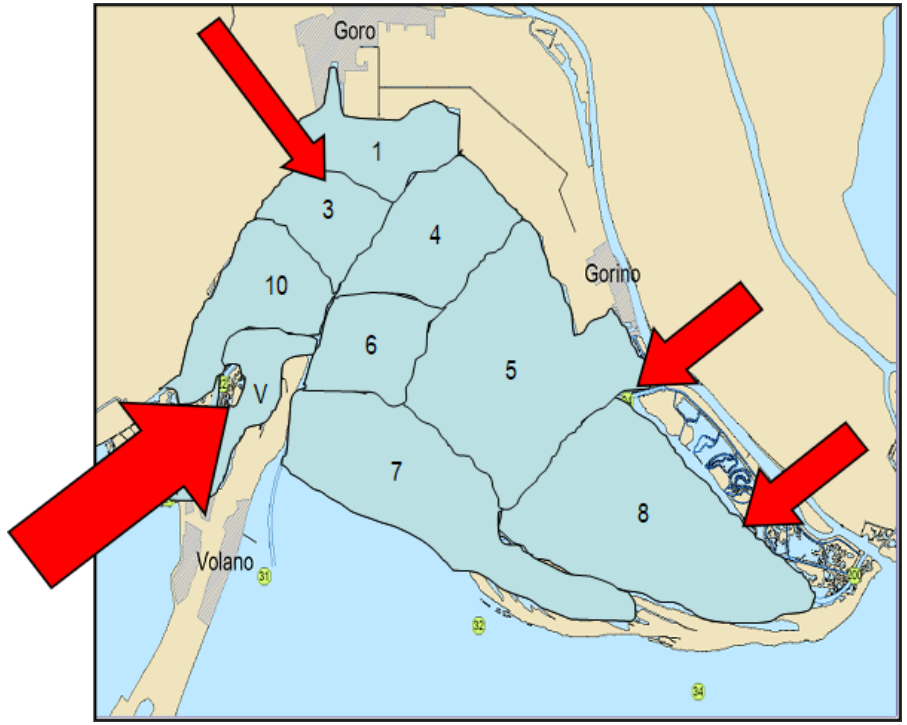
Oversimplification of agricultural landscape & Climate change

The first transition: from estuarine to inland biogeochemistry



Valiela, 1995

Green tides



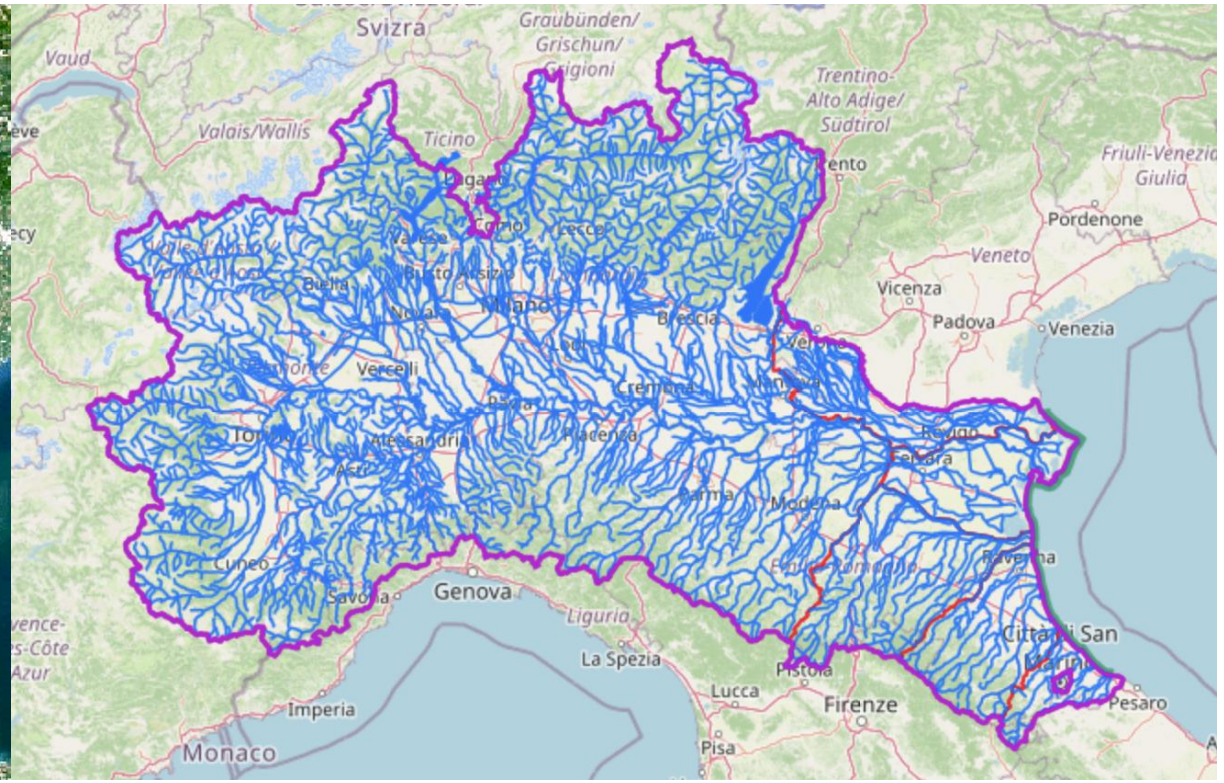
N input: 2000 tons yr^{-1}

Denitrification and
Algal uptake: 300 tons yr^{-1}

The second transition: from large rivers to small canals

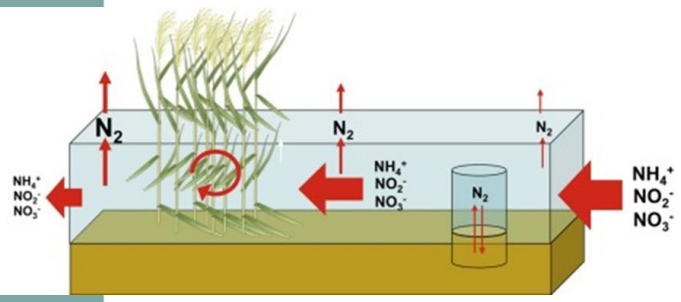
650 Km

A few interfaces

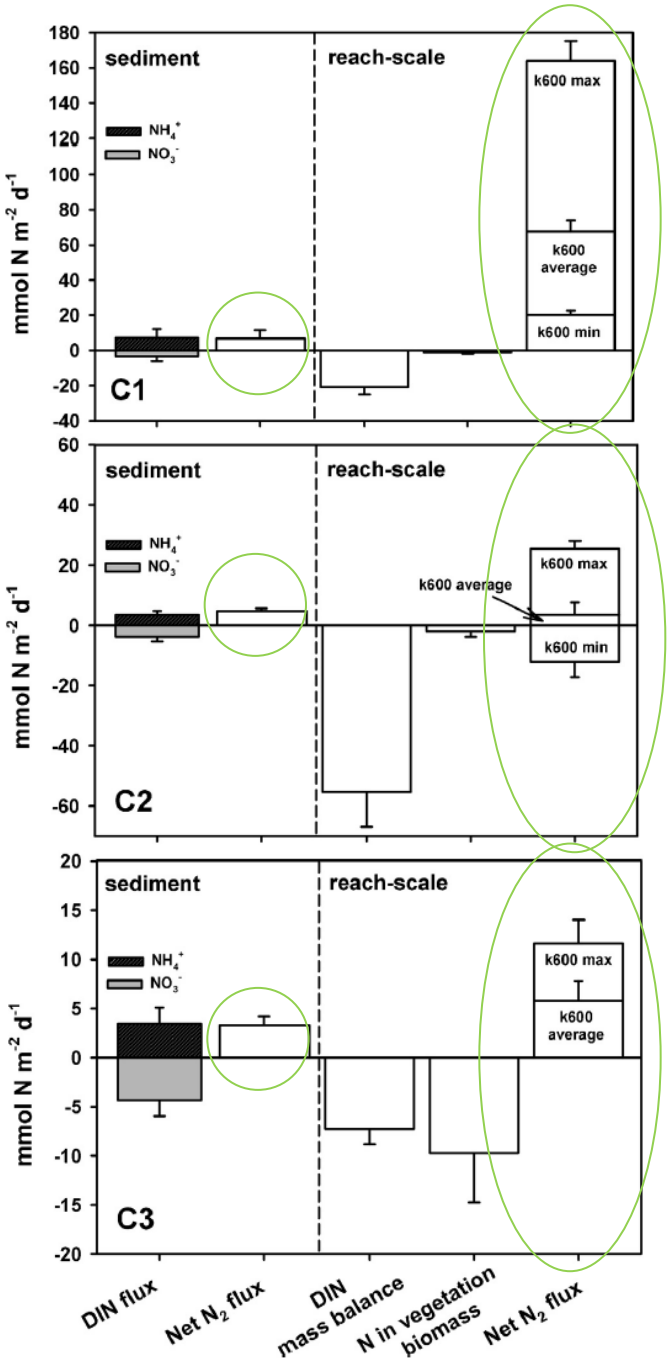


>50000 Km

A large number of interfaces



Vegetated, small canals have an impressive potential for nutrient reduction and biodiversity increase



P. australis

T. latifolia

G. maxima

They need to be managed in a different way, to produce basin-scale positive effects, with little investments

Conclusions

-The Gussola restoration action and REWET were a unique experience, which will be replicated along the Po River.
-However, the Po basin contains >50,000 km of canals with a high potential for “low-cost” and effective restoration actions. These interventions are based on the management of macrophytes and could generate cascading effects on several pollutants, biodiversity, native species, and greenhouse gas emissions.
-*We need to act further upstream and less downstream if we want to see a significant change in the Po River basin and in other hypereutrophic, oversimplified and poorly biodiverse European basins*.

THANK YOU

Contacts:

Chiara Montecorboli
chiara.montecorboli@adbpo.it

Marco Bartoli
marco.bartoli@unipr.it

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CINEA. Neither the European Union nor the granting authority can be held responsible for them.