



Abstract

Climate change is changing weather patterns in Europe, making extreme events such as heatwaves, meteorological droughts and extreme rainfall events more likely. Consequently, hydrological regimes of rivers and wetlands are becoming more erratic and extreme. It affects their ecological functioning and biodiversity, as species are not adapted to these new conditions. We are also increasingly relying on surface and groundwater resources, especially during drought episodes, when there is already a natural water stress for aquatic ecosystems.

To compromise between higher water demand and the ecological boundaries of sustainability, we either have to reduce water demand or increase water availability. There is still a substantial gain to be realised in increasing water availability. By implementing “Nature based Solutions” (NBS) that restore the catchment’s water retention function, we can make better use of periods with precipitation surplus to overcome subsequent periods of droughts.

Our innovative approach involves the development of an integrated indicator framework aimed at comprehensively studying hydrological dynamics across diverse river systems in Belgium, Poland, Portugal and Spain. At the heart of our methodology lies the innovative water battery concept, which analogizes river hydrology to the recharge cycle of a battery. This conceptual framework serves as a guiding principle for investigating how NBS can play a crucial role in replenishing groundwater and bolstering ecosystem resilience, particularly during periods of drought.

A distinctive feature of the project is its emphasis on stakeholder engagement right from the project’s outset, ensuring that local communities, water managers, conservation organizations, and other stakeholders are actively involved in the research process. Through this collaborative approach, we aim to develop robust metrics for assessing the outcomes of NBS implementation and facilitate their integration into broader restoration initiatives.

The project’s methodology encompasses a multifaceted approach, starting with geomorphological and geospatial analyses to identify suitable locations for implementing NBS. By examining land use patterns and urban planning, we can assess the current status of rivers and their potential for improvement through NBS interventions. Subsequently, the effectiveness of NBS in delivering ecosystem services such as water purification, carbon storage, nutrient cycling, and biodiversity support will be evaluated.

To gauge the efficacy of NBS and their impact on ecosystem dynamics, a suite of indicators will be developed. These indicators will assess various aspects of the water battery, including its size, recharge potential, leakage, utilization, and overall effects on ecosystem services. Through the application of the Driver-Pressure-State-Impact Response (DPSIR) Framework, we will analyze the implications of our findings for current policies and management practices.

By bridging scales and integrating human dimensions into our research framework, RECHARGE offers a holistic and forward-thinking approach to riparian ecosystem management. The insights gained from this project will not only advance our understanding of ecosystem functioning but also inform policy decisions and adaptation strategies in the face of climate change. Ultimately, RECHARGE aims to contribute to the restoration and sustainability of riparian ecosystems, ensuring water security and ecosystem health.



► Project coordinator

Jan STAES - UNIVERSITEIT ANTWERPEN - BELGIUM

► Project partners

- POZNAN UNIVERSITY OF LIFE SCIENCES - POLAND
- FCIÊNCIAS.ID - ASSOCIAÇÃO PARA A INVESTIGAÇÃO E DESENVOLVIMENTO DE CIÊNCIAS - PORTUGAL
- UNIVERSITY OF THE BASQUE COUNTRY - SPAIN

► Funding organisations

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► Contact

Jan STAES

jan.staes@uantwerpen.be



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