

Abstract

Europe's freshwater ecosystems, from wetlands to rivers, are essential for biodiversity and human well-being. A significant number of these ecosystems are located within forest landscapes, which in turn constitute the largest portion of the EU's land cover and host most of the terrestrial biodiversity. These forests vary in structure across Europe, with Northern Europe having larger, more expansive and often denser stands, while the South has typically sparser and more fragmented forests. What they share, however, is the complex and multifaceted way forest and freshwater ecosystems are interconnected and mutually dependent.

Freshwater ecosystems within forested landscapes provide a multitude of valuable products and services, such as food production, flood control, nutrient and carbon cycling, recreation and water purification. However, these ecosystems are threatened by climate change and human stressors such as land-use change, pollution, river regulation or overexploitation. Furthermore, climate change is an ever-increasing threat. In particular, hydroclimatic extremes like heatwaves, floods, droughts, and heavy rainfall pose a substantial risk, as they can have profound impacts on the services that these ecosystems provide.

Currently, our knowledge of these risks and their geographic extent is limited. This is why the REACTION project has been initiated - to shed light on the risks posed by hydroclimatic extremes and compound events to freshwater ecosystem services in forest landscapes. The project brings together experts in hydrology, ecology, and social sciences to thoroughly study and map these risks in four representative case studies across Europe, while also developing a portfolio of user-endorsed strategies to mitigate these risks and develop effective management and restoration actions that balance human and nature's water needs.

REACTION employs an interdisciplinary integrated risk framework, combined with substantial data harmonization efforts and innovative data-driven modeling techniques to explore existing data resources, co-design relevant indicators and build models that allow us to simulate the complex interlinkages between statistically rare extreme events and freshwater ecosystem functioning and resulting services. This enables us to develop a risk model to provide spatially explicit insights into present-day hydroclimatic risks for ecosystem services provided by freshwater ecosystems in various European forest landscapes, and future risk under a business-as-usual scenario. Considering potential synergies and trade-offs with existing and projected human water uses, we co-develop management and restoration strategies with our stakeholders and test their effectiveness in reducing the vulnerability of freshwater ecosystem services and the risk from hydroclimatic extreme events.

Key outcomes of REACTION encompass:

- the cultivation of new knowledge on the effects of statistically rare and increasingly severe hydroclimatic extremes on ecosystem function and services,
- the synthesis of complex risk information from various sources, combining local watershed data, remote sensing data, climate models, hydrological and hydraulic models to maximize the information content, and
- the co-design of tools designed to share this knowledge/information to enhance stakeholder planning for risk management of freshwater ecosystem services in European forest landscapes.

KEYWORDS



► Project coordinator

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- SWEDEN

► Project partners

- NATURAL RESOURCES INSTITUTE - FINLAND
- CENTRE DE CIÈNCIA I TECNOLOGIA FORESTAL DE CATALUNYA (FOREST SCIENCE & TECHNOLOGY CENTRE OF CATALONIA) - SPAIN
- USTAV HYDROLOGIE SLOVENSKEJ AKADEMIE VIED, VEREJNA VYSKUMNA INSTITUCIAS - SLOVAK REPUBLIC
- INTERNATIONALES INSTITUT FUER ANGEWANDTE SYSTEMANALYSE - AUSTRIA

► Funding organisations

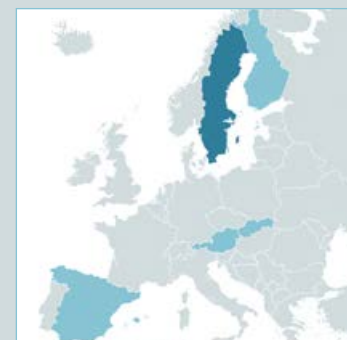
FORMAS (SWEDEN) / AKA (FINLAND) / AEI (SPAIN) / SAS (SLOVAK REPUBLIC) / FWF (AUSTRIA)

► Duration

3 years

► Contact

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