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Conference Abstract

AnaEE ERIC: From European Coordination to Regional Impact. Simulating Future Ecosystems for Climate Solutions

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Abstract

Understanding how ecosystems respond to climate change, land-use pressure and management decisions requires more than observing change over time. It also requires controlled experimentation to identify underlying mechanisms and modelling to explore alternative future scenarios. European environmental research infrastructures can address these complementary needs by strengthening collaboration between long-term research and monitoring networks and experimental, analytical and modelling facilities. AnaEE ERIC (Analysis and Experimentation on Ecosystems) offers an opportunity to build these connections and translate European-scale coordination into regional scientific and societal benefits.

This contribution explores how AnaEE ERIC's distributed experimental platforms, analytical services and ecosystem modelling capacities can complement long-term observation infrastructures such as eLTER. While long-term monitoring documents ecosystem dynamics across temporal and spatial scales, experimentation enables researchers to investigate causal mechanisms, test ecosystem responses to environmental pressures and identify potential thresholds. Modelling can then integrate observational and experimental evidence to assess future ecosystem trajectories under alternative climate and management scenarios. Together, these complementary

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approaches provide the foundations for an integrated observe–experiment–simulate framework.

We examine practical opportunities for collaboration between research infrastructures, including the harmonisation of methods and metadata, improved data interoperability and application of FAIR principles, coordinated access to research facilities, joint training and the development of integrated user services. Linking long-term observations with experimental results and process-based models can strengthen model calibration and validation, improve the interpretation of observed ecosystem changes and support the assessment of climate risks, nature-based solutions, sustainable land management and ecosystem restoration. Achieving this integration requires attention to differences in infrastructure mandates, data standards, access procedures and governance, while preserving the distinct roles and added value of each network.

Particular attention is given to Central, Eastern and South-Eastern Europe, where strengthening connections between national research capacities and European infrastructures can support regional responses to climate and environmental challenges. The experience of LTER-Bulgaria within the eLTER community illustrates the value of embedding national research sites in a wider European framework. Building on this observational foundation, collaboration with AnaEE ERIC could facilitate access to experimental and modelling capabilities, promote cross-border research and strengthen the evidence available to regional researchers and decision-makers.

The contribution concludes by identifying practical pathways towards stronger collaboration between observational and experimental infrastructures, including shared interoperability activities, complementary use of sites and datasets, coordinated transnational access, joint capacity-building and engagement with policy stakeholders. By connecting long-term observation, experimentation and simulation, European research infrastructures can develop a more integrated scientific basis for anticipating ecosystem change and supporting regional climate adaptation and nature-based solutions.

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infrastructures across Europe. Their commitment, expertise and collaboration are essential to strengthening national capacities, facilitating transnational access to experimental and analytical facilities, and fostering cooperation between European research infrastructures. Their collective efforts support the integration of experimentation, observation and modelling to advance ecosystem science and develop knowledge-based solutions to climate and environmental challenges.

Conflicts of interest

The authors have declared that no competing interests exist.