

THE NEXOGENESIS SOLUTIONS

The NEXOGENESIS self-learning nexus assessment engine (SLNAE)

An intelligent analysis engine for operational, tactical, and strategic resources planning and an aid for harmonious policy-making to streamline water-related policies into the WEFE nexus. It is supported by biophysical and socio-economic models and will be validated by stakeholders in five river basin case studies.

A WEFE Nexus Footprint: a composite indicator

The WEFE Nexus Footprint will be a visual, integrated representation of critical indicators related to each case study within the NEXOGENESIS project.

User-validated policy packages

Designing a conceptual and analytical co-creation framework towards nexus governance.

ABOUT NEXOGENESIS

START DATE	01 September 2021
DURATION	48 months
BUDGET	5M€
AIM	To help improve policies related to the water, energy, food and ecosystems



PROJECT COORDINATION

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NEXOGENESIS

STREAMLINING WATER RELATED POLICIES

Facilitating the next generation of effective and intelligent water-related policies utilising artificial intelligence and reinforcement learning to assess the water-energy-food-ecosystem (WEFE) nexus



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101003881.

THE CHALLENGE

Shifts in the WEFE nexus are driven by changes in biophysical (climate, precipitation, land cover) and human (economic development, agriculture, urban growth) conditions.

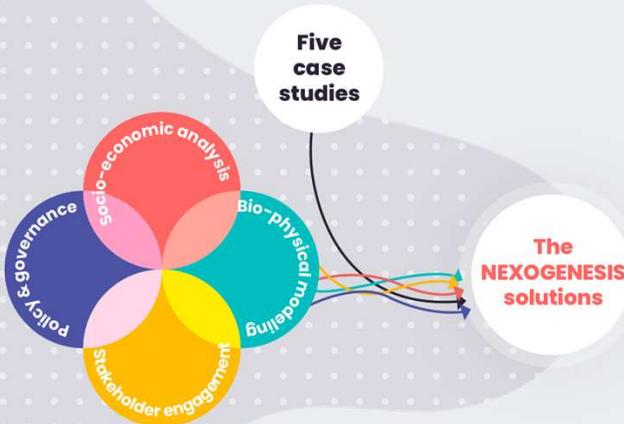
Continuing current consumption rates imply deepening resource and ecological deficit – when resources are extracted at a faster rate than they are replaced.

To effectively manage resources and avoid conflicts between users, many relevant policies must be intelligently designed to address nexus interconnectedness at multiple spatial scales.

THE PROJECT OBJECTIVES

- Identify and **model WEFE nexus interlinkages**
- **Reduce uncertainties** of how new policies and stakeholder behavior affect the nexus through the integration **Self-Learning Nexus Assessment Engine (SLNAE)**
- Develop and apply a new **WEFE Nexus Footprint**
- **Demonstrate and validate the NEXOGENESIS framework** including the application of the SLNAE in five case studies
- Support **out-scaling** of the NEXOGENESIS framework to other basins and wider spatial areas.

THE PROJECT CONCEPT



THE CASE STUDIES AND EXPECTED RESULTS



Lielupe River Basin

Latvia and Lithuania

- Stakeholder collaboration in Lithuania has paved the way for common actions in this transboundary context
- NEXOGENESIS tools are accepted and applied for better planning approaches
- Novel policy suggestions are developed considering interlinkages and footprint by water, energy, food, ecosystems, and climate components



Adige River Basin

Italy: Provinces of Bolzano-Bozen, Trento, Verona, Padova, Rovigo and Venezia

- Refine water availability assessments, accounting for the effects of climate change on snow and glaciers as well as scenarios of crosssectoral water use
- Strengthen trust and collaboration among stakeholders to jointly address challenges following a river catchment perspective
- Foster local WEFE policies to improve water allocation and management under different conditions of water use and availability



Inkomati-Usuthu

South Africa

- Trade-offs and synergies between water, energy, food and ecosystems will be identified, assessed and incorporated into policies and development plans
- Need for integrated water resource management will become central to policy development and implementation
- Practical, progressive, and sustainable projects that enhance integrated and transboundary resource management will be identified



Lower Danube Basin

Romania

- Stakeholder engagement in co-creation and validation of a policy approach tailored to local challenges
- Use of the SLNAE for improved policymaking at basin-level creating solid and trustworthy reference for the national level and in the region (in dialogue with other case studies in the project and sister projects under H2020-LC-CLA-2020)
- Support replication for sustainable water resources management in Romania and dissemination of results to Serbia and Bulgaria for maximizing project impact within the Lower Danube region



Nestos River Basin

Bulgaria and Greece

- Balanced, sustainable, equitable development of water resources, energy, land use, biodiversity, agriculture and livestock.
- Water saving in agriculture and reduced water losses – Cultivation of climate-resilient crops – Monitoring emissions from agricultural and livestock sectors.
- Policy recommendations and perspectives supporting WEFE nexus governance in transboundary river basins.