

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

## **THE CHALLENGES**

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 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



## 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



## 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

## THE NEXOGENESIS SOLUTIONS







## **User-validated policy packages**

A conceptual and analytical co-creation framework towards nexus governance.

### **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.

## **PROJECT COORDINATION**



**BUDGET: 5M€** 

### Dr. Janez Sušnik

Land and Water Management Department at the IHE Delft Institute for Water Education, Netherlands j.susnik@un-ihe.org



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