

# Mainstreaming the WEFE Nexus into Policy Making

**NEXOGENESIS** is a 4-year European research and innovation project funded by the European Commission under the H2020 programme for the period 2021 to 2025. It gathers 20 partners from Europe and South Africa focusing on facilitating the next generation of effective and intelligent water-related policies using artificial intelligence and machine learning to assess policy impacts on the WEFE nexus to suggest new ways to design better, more coherent policy. The project conducts four European case studies and one in South Africa.

## NEXOGENESIS develops and validates 3 solutions:

- A stakeholders' co-creation approach for WEFE nexus governance developed for and validated by stakeholders who want to mainstream nexus thinking into their policies;
- NEPAT – NEXogenesis Policy Assessment Tool that by using machine learning and artificial intelligence allows the user to explore the impacts of possible (combination of) policy instruments on the WEFE nexus;
- A WEFE Nexus Footprint to visualize and communicate in an easy way the results of the policy impact assessment conducted with NEPAT.

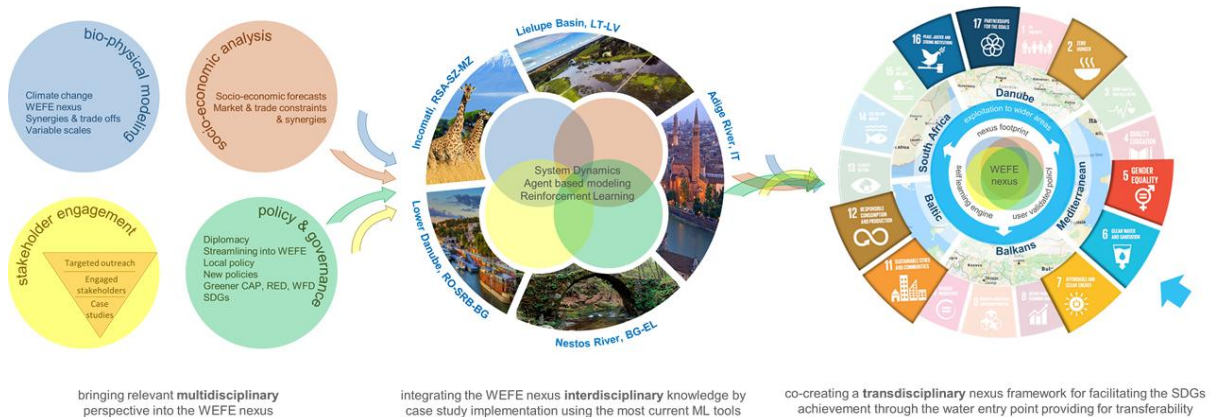


Figure: NEXOGENESIS conceptual framework

## Main Recommendations:

- Support cross-sectoral policy-making by allocating relevant resources (human & financial) with a clear mandate to develop cross-sectoral decision-making structures
- Consider Sustainable Development Goals (SDGs) as platform for streaming nexus thinking into policy-making;
- Support circular processes via existing and new decision-making structures;
- Support WEFE data management capacity and encourage harmonisation, integration and interoperability of data management tools and mechanisms via dedicated resources as part of WEFE nexus decision-making approaches;
- Support public-private partnerships as cross-sectoral instrument fostering a WEFE nexus approach.

## Relevance to EU Policy

**This project demonstrates the interconnections between sectoral policies and consequently legislation, particularly in Europe.** It clearly supports the implementation of the [Green Deal](#) and of the [Digitalisation of Europe](#). It highlights the need to better involve local stakeholders to improve WEFE nexus governance<sup>1</sup> through knowledge co-creation in the different policy areas that the WEFE nexus touches upon, including water, energy, agriculture, climate, biodiversity, disaster risk reduction, and environmental and human health.

**Initial project results lead to the following preliminary recommendations for increased ‘nexus awareness’ and system thinking in the EU decision-making<sup>1</sup> processes and EU policy:**

- Support cross-sectoral policy-making by allocating relevant resources (both human & financial) and providing a clear mandate to develop cross-sectoral decision-making structures;
- Consider Sustainable Development Goals (SDGs) as platform for mainstreaming WEFE nexus thinking into policy-making;
- Support circular processes via existing and new decision-making structures (the one mentioned in the first bullet);
- Support WEFE nexus data collection and management capacity and encourage harmonisation, integration and interoperability of data management tools and mechanisms via dedicated resources;
- Support public-private partnerships as cross-sectoral instrument fostering a WEFE nexus approach.

*“We need a new European Water Resilience Strategy to ensure sources are properly managed, scarcity is addressed, and that we enhance the competitive innovative edge of our water industry and take a circular economy approach. As part of this, we will lead efforts to help mitigate and prevent acute water stress across the world”<sup>1</sup>.*

**In the context of water governance and the EU’s Political [Guidelines 2024-2029](#), stakeholder co-creation of WEFE nexus governance could improve coherence of EU legislation, and, consequently, also at national level. This approach will be beneficial for<sup>1</sup> :**

- The development of the European Water Resilience Strategy particularly relating to the inclusive governance aspect;
- Providing good practices on the implementation of the SDGs agenda;
- Accelerating the achievement of the [Water Framework Directive](#) objectives;
- The implementation of the new [water reuse](#) architecture, particularly with the recast of the new urban wastewater treatment directive;
- The implementation of the [greener Common Agriculture Policy](#) and its future recast.

## **BENEFITS OF THE SOLUTIONS: A TOOL FOR POLICY MAKERS TO SUPPORT INTEGRATED RESOURCE MANAGEMENT**

NEXOGENESIS develops tools aimed at **facilitating cross-sectoral policy-makers dialogue for integrated WEFE resource planning, management and security**. The tools benefits include:

- **NEPAT tool :**
  - **allow optimisation of natural resource management**, contributing to the creation of water-smart societies in a more resilient world<sup>1</sup>.
  - **increase acceptance across all sectors** through multi-sectoral and multi-stakeholder dialogues and better identification of policy packages.

- **WEFE Nexus Footprint visualization tool<sup>1</sup>:**
  - provides an easy-to-understand overview of the impacts of individual policies or combinations of policies on the WEFE nexus;
  - allows user to get an integrated perspective on the cross-effect of multiple policies;
  - facilitates cross-sectoral decision-making by showing how WEFE indicators affect and are affected by the implementation of different policy instruments.
- **Stakeholders' co-creation approach:**
  - Raise stakeholders' awareness and understanding of WEFE nexus biophysical, socio-economic, governance and policy interdependences, challenges, trade-offs and potential synergies
  - Facilitate identification of multi-level governance barriers, levers and opportunities to overcome incoherence and leverage opportunities;
  - Create opportunities for improved cooperation between European, national, regional and local authorities, thus supporting the recommendation of the Committee of Regions.<sup>1</sup>
  - Facilitate potential widespread replication in different contexts and scales via a step-by-step guidebook delivered at the end of the project;

### AN INTERNATIONAL DIMENSION TO SUPPORT SHARED PROSPERITY

The case studies contribute to the [UN Water Action Agenda](#) putting in practice integrated and collaborative approaches, including those supporting transboundary and international cooperation. The Inkomati-Usuthu Case Study shows how water-smart international partnerships<sup>1</sup> drive effective resource management and EU-Africa cooperation toward achieving SDGs and the 2030 vision. A 1% increment in a country's Human Development Index is associated with a 1.3%-3.2% increment in water and sanitation access<sup>1</sup>.

1. Amorocho-Daza H., van der Zaag P., Sušnik J. 2023. Access to Water-Related Services Strongly Modulates Human Development. *Earth's Future*. 11: e2022EF003364. DOI: 10.1029/2022EF003364
2. Sušnik J, Masia S, Teutschbein C. Water as a key enabler of nexus systems (water–energy–food). *Cambridge Prisms: Water*. 2023;1:e1. doi:10.1017/wat.2023.1
3. The mapping of the relevant legislation depends at the local levels and cannot be developed extensively here. The project has identified several policy areas that are impacted by the project. All of them referring to several European, national, and local legislation.
4. European Union, Europe's Choice: Political Guidelines for the next European Commission, July 2024. [https://commission.europa.eu/document/download/e6cd4328-673c-4e7a-8683-f63ffb2cf648\\_en?filename=Political%20Guidelines%202024-2029\\_EN.pdf](https://commission.europa.eu/document/download/e6cd4328-673c-4e7a-8683-f63ffb2cf648_en?filename=Political%20Guidelines%202024-2029_EN.pdf)
5. Ioannou AE and Laspidou CS (2022) Resilience Analysis Framework for a Water–Energy–Food Nexus System Under Climate Change. *Front. Environ. Sci.* 10:820125. doi: 10.3389/fenvs.2022.820125
6. Simpson GB, Jewitt GPW, Becker W, Badenhorst J, Masia S, Neves AR, Rovira P and Pascual V (2022) The Water-Energy-Food Nexus Index: A Tool to Support Integrated Resource Planning, Management and Security. *Front. Water* 4:825854. doi: 10.3389/frwa.2022.825854

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### The NEXOGENESIS consortium



## ANNEX TO THE POLICY BRIEF

NEXOGENESIS entails five case studies - four in European River basins and one in Southern Africa – to demonstrate and validate the NEXOGENESIS framework, including the application of the NEPAT.

### CASE STUDY 1 Nestos River Basin

The Nestos Case Study comprises the Nestos River basin that crosses the Bulgarian-Greek border, forming a significant ecosystem, considered a first-priority site under EU Nature 2000. Energy production and irrigation water supply are ensured by two dams, affecting water availability along the Nestos River. The Nestos River basin is primarily characterized by agriculture and livestock, which contribute significantly to the basin's complex water management challenges arising from competing water demands. NEXOGENESIS investigates strategic policy plans on water management of transboundary river flows to identify sustainable water management solutions and to implement small scale interventions and policy practices towards the protection of aquatic and terrestrial ecosystems. It also focuses on sustainable policy interventions addressing the effective management of the energy and food/agricultural sectors. Collaboration among stakeholders at national and at transboundary level enhances and reinforces the identification of economic benefits from the nexus sectoral policies to the local communities and the two countries (water-diplomacy issues).

### CASE STUDY 2 Lielupe River Basin

The Lielupe river is shared between Latvia and Lithuania, covering about 12% and 11% of the two countries population, respectively. Agriculture is the predominant economic activity, but the basin also includes large areas of forests (about 30%) and some urban areas, as well as nature protected areas and parks. Agriculture has intensified over the past decades, combined with use of fertilisers, with negative effects on biodiversity and natural grassland habitats, as well as water and water ecosystems quality. Additional pressures are originating from tourism and recreational activities, and cross-border water diplomacy issues are also identifiable in the Lielupe basin. In the context of NEXOGENESIS the case study investigates the WEFÉ nexus bio-physical interlinkages in the river basin and by means of system dynamics modelling it explores the impacts of various policies in the WEFÉ nexus. The whole approach is based on the engagement of Lithuanian and Latvian stakeholders that together, based on the impact assessment of policy options, explore the possibility of transboundary collaboration activities, which eventually can take the form of a stakeholder agreement.

### CASE STUDY 3 Jiu River Basin, Lower Danube

The Jiu River Basin case study aims to assess the intersectoral interdependencies within a complex natural and socio-economic environment and explores the potential of applying a WEFÉ nexus approach for sustainable local development. The basin is characterised by arable land (48%), forest (30%) and pastures (9%). The basin's population relies heavily on water-intensive sectors, including energy production and agriculture. The Lower Danube wetland



ecosystem, to which the Jiu River basin belongs, has already lost nearly 80% of its surface area in the last century due to anthropogenic interventions (e.g. dams) along the Danube, which stimulated erosion and negatively affected the riverbed, while floods and drought events continue to impact the region. NEXOGENESIS actively involves stakeholders from all four sectors and transversal policy platforms (such as SDGs and Circular Economy) also using the opportunity of the implementation of the Just Transition Mechanism in the Jiu basin region, to increase awareness on the value of the WEFE nexus approach. A set of policies relevant for the local context were identified and prioritized together with the stakeholders and included in the NEPAT tool facilitating the development of alternative scenarios to support the improvement of the policymaking processes. The specific challenges in the river basin context (such as water scarcity, wetland restoration, transition to climate neutral economy, etc.) contribute to the development of the cross-sectoral policy-making framework proposed by NEXOGENESIS while the continued stakeholders' engagement process aims at increasing the project impact.

## CASE STUDY 4 Adige River Basin

The Adige River basin, spanning across the Italian Alps into the Adriatic Sea, encompasses different economic and legislative autonomy levels, resulting in a complex water governance and management system. The upstream part of the basin produces energy while the downstream is characterised by intensive agriculture, tourism activities and ecosystems services. This case study first aims to identify existing policy conflicts surrounding water allocation and management among different sectors within a specific territorial context. Second, the case study aims to foster trust and collaboration among stakeholders to collaboratively address water management challenges. This includes identifying mutually beneficial solutions, such as enhancing water availability forecasting and assessing the evolving water demands of different sectors under changing socioeconomic conditions. Third, the case study aims to assess the impact of novel, more sustainable practices in agriculture, under the objectives of greening the Common Agriculture Policy, to enhance sustainable and efficient water use, reduce pressure on water resources, and facilitate ecosystem services provision. Finally, stakeholder awareness on water resources is fostered by inclusive participatory processes.

## CASE STUDY 5 Inkomati-Usuthu

The Inkomati-Usuthu case study comprises the Inkomati-Usuthu Water Management Area (IUWMA), in South Africa and Eswatini, extending to the border with Mozambique. The dominant economic activities in this river basin are mining activities and agriculture. The basin is vital to South Africa's development, in particular relating to energy security (coal-fired power stations), food security (almost half of the country's high potential agricultural land) and water security (numerous competing water users). NEXOGENESIS assesses the coherence of WEFE Nexus (and sector-specific) policies relevant to the IUWMA. The focus is on assessing the integration of water policy integration with those of forestry, mining, conservation, tourism, irrigation, livelihoods, including transboundary considerations. Such analysis allows to identify ways to mainstream water-related policy into the WEFE nexus for the IUWMA.