

# Addressing Water-Energy-Food-Ecosystem Nexus in Transboundary Basins

## The WEFE Nexus: A delicate balance

In landscapes where rivers and water bodies stretch across provincial, regional and national borders, a delicate balance is required to sustain communities, economies, and ecosystems. Water is not just a resource; it is a lifeline intricately connected to human well-being, energy production, food security, and environmental health. This interdependence defines the Water-Energy-Food-Ecosystem (WEFE) nexus.

Managing this balance in transboundary basins presents a series of complex challenges. When multiple governance entities such as countries share a water source, competition, political hurdles, and environmental concerns become ever more pronounced.

Upstream and downstream regions struggle to agree on water allocation for different user needs. People need drinking water, farmers require irrigation, industries desire water for production, and hydropower plants demand consistent flows. Climate change exacerbates tensions, as extreme droughts and floods become more likely further stressing already fragile agreements. Meanwhile, overuse challenges the maintenance of ecological flows and lax pollution control can raise havoc to ecosystem quality. These imbalances undermine the provision of ecosystem services that are the foundation of water security. Policies for water, food, energy and ecosystem security are not always aligned to yield synergistic effects. The lack of harmonised governance systems and structures further complicates alignment. While challenges remain in aligning and openly sharing information on water availability, quality, and future risks, there is generally sufficient credible data to support informed decision-making and meaningful action.



## Transboundary challenges and solutions

Managing transboundary waters is like orchestrating a symphony where every instrument must play in harmony. In many cases, discord arises because regions, or particular user groups prioritise their own water needs over collective well-being. The lack of shared governance frameworks and power imbalances leads to unequal access to resources, often leaving downstream areas at a disadvantage. National interests and political agendas complicate collaboration, sometimes resulting in unilateral actions that disrupt regional stability. In other cases, legal inconsistencies, outdated treaties, and the incongruences of the evidence base, including data and models, are barriers to coordinating joint actions. Meanwhile, local communities—those most affected by water decisions—are frequently left out of discussions.

Addressing these challenges requires bold, cooperative solutions. Harmonised and aligned policies across borders based on the relatively comparable water quality and use indicators and thresholds can create unified approaches to water governance, ensuring that all countries work towards shared goals. Establishing joint water management bodies with real decision-making power and including a wide range of user groups on an equal footing allows for transparent and equitable resource distribution, potentially preventing conflicts before they arise. Transparency is crucial, which is why data sharing and monitoring mechanisms must be strengthened and aligned. Basins can benefit immensely from having and using the same real-time, reliable information about water flow, quality, and usage.

Nature itself offers solutions. Investing in nature-based approaches to resource management, such as reforestation, grassland conservation and wetland restoration, basins can enhance ecosystem and social resilience to climate change. No management system is perfect, and disputes are bound to arise. Bolstering conflict resolution mechanisms helps disagreements be resolved through diplomacy rather than escalating into prolonged tensions.



## The NEXOGENESIS Project: Enhancing water diplomacy

Recognising these challenges, the NEXOGENESIS project aims to bridge gaps through cooperation. Its goal is to enhance water diplomacy by promoting an integrated management approach that considers the interconnected nature of water, energy, food, and ecosystems. The project is not just about policies; it is about people—bringing together governments, researchers, local communities, civil society organisations, and businesses to co-create solutions through a co-creation approach.

Its novel contribution is the development of a decision support tool, the Nexus Policy Assessment Tool (NEPAT). It is an artificial intelligence system that integrates unified and user-validated advanced modelling techniques, to help basin stakeholders explore how changes in one sector affect other sectors. By understanding the trade-offs, stakeholders also realise the advantages of cooperation over unilateral action. The project also convenes stakeholder dialogues, allowing the voices of affected parties to be heard.

NEXOGENESIS works through knowledge co-creation. By equipping basin stakeholders, including water managers and policymakers, with the necessary knowledge and skills to understand the current and future water, energy, food and ecosystems security issues, the project creates a common evidence-base for a shared vision and management strategy. The use of the same evidence-base and tools creates a common vision for streamlining the implementation of policies for future improved management, hence strengthening cooperation across borders. Training sessions, policy recommendations, and collaborative research efforts help co-create a sound foundation for water diplomacy, allowing for transformative change towards stakeholder river-basin wide agreements.

More information about our solutions and local activities can be found at: <https://nexogenesis.eu/>. You can also experience the Nexus Policy Assessment Tool here (use “Guest Login”) <https://nepat-dev.nexogenesis.eu/>



## Sustainable water governance: from conflict to collaboration

The sustainable management of transboundary waters is not just an environmental issue—it is a matter of security, development, and human well-being. The interconnected nature of water, energy, food, and ecosystems means that a problem in one sector inevitably ripples into another. NEXOGENESIS provides tools for addressing these challenges, fostering cross-border cooperation with a long-term vision in mind.



By integrating science, policy, society and diplomacy in a co-creative way, transboundary water conflicts can be transformed into opportunities for collaboration. With the right governance structures, technological innovations, and inclusive dialogues, provinces, regions and nations can move beyond competition and work together to safeguard quality, quantity of and access to the shared water resources for the multiple users of future generations.

More about the project: <https://nexogenesis.eu/>

And stay tuned to learn more about the results on our social media accounts:



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### The NEXOGENESIS consortium

