NEXOGENESIS
STREAMLINING WATER RELATED POLICIES

Policy Brief #2
May 2025

Contribution to the Water Resilience Strategy

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.

Our recommendations are extracted from the project activities, including workshops, interviews, analysis of policy documents, expert knowledge and reflections and focus group discussions - co-implemented with local stakeholders of the case studies. This "co-creation process" intends identifying coherency issues in case-study specific WEFE nexus policies. This policy brief identifies challenges and recommendations from the preliminary conclusions of the testing phase of the artificial intelligence decision-support tool (known as NEPAT). NEPAT facilitates the identification of the effects of policy options on the bio-physical and socio-economic WEFE interlinkages thus allowing for evidence-based stakeholder conversations around WEFE goal conflicts[1].

[1] Cf. Policy Brief 1 to get further details on the benefits of the Nexus Policy Assessment Tool (NEPAT) tool.

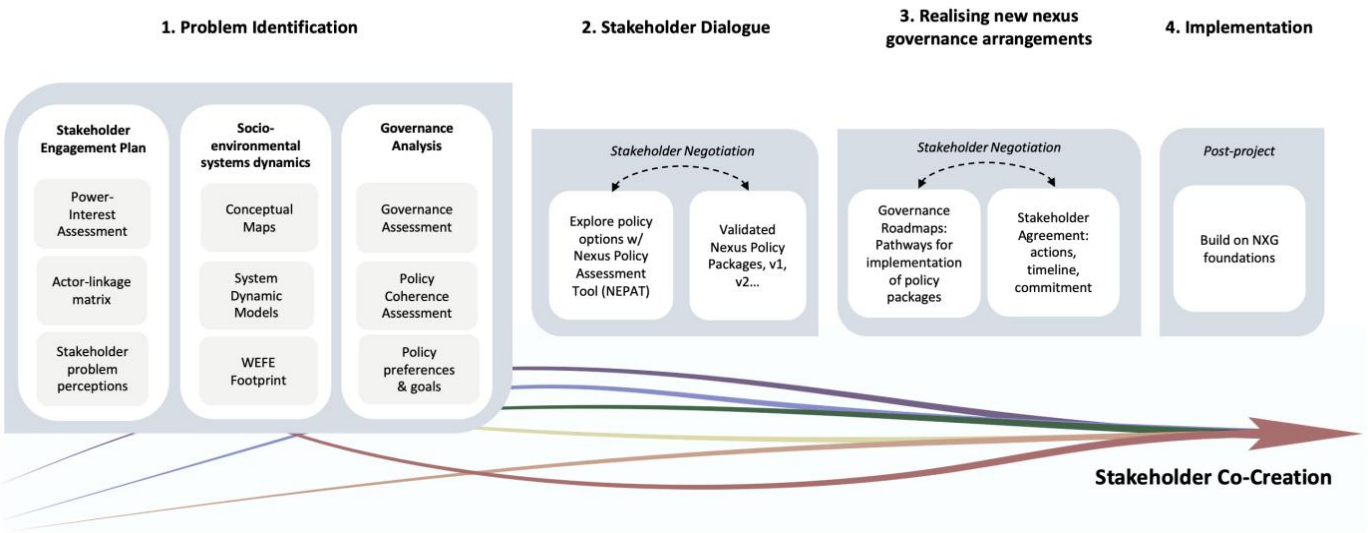

Figure: NEXOGENESIS Approach

Main Recommendations:

- Encourage nexus thinking in the development of EU policy
- Harmonised local transboundary and cross-national cooperation
- Secure financial support for an EU water-smart transition
- Improve data collection through systemic standardisation and interoperability

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A call for Nexus Thinking in the EU Water Resilience Strategy

In the context of the new Water Resilience Strategy, the NEXOGENESIS project provides recommendations due to its WEFE nexus approach. The WEFE nexus approach provides a systemic and holistic method to develop and implement coherent policies for natural resource management, by reducing trade-offs and exploiting synergies across respective WEFE policies. This approach aligns with the Water Resilience Strategy announced in the EU political guidelines for the New EU Commission 2024-2029.

The Water Resilience Strategy aims to strengthen Europe's water security by ensuring that "*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*." This strategy will particularly look at[2]:

- The interconnection between EU policies, including a *source-to-sea* approach.
- Enhancing the competitive, innovative edge of the water industry and taking a circular economy approach, including tackling pollution at the source.
- Facilitating digitalisation of water management, cycles and utilities.
- International and multi-level cooperations and partnerships to achieve the 2030 Agenda for sustainable Development.

NEXOGENESIS strongly supports the nexus approach that the European Commission **intends to consider by looking at the interconnections between the different EU policies in the Water Resilience Strategy which will emphasise the** focus on the water node of the nexus which is critical as water is a central enabler of nexus systems[3]. This approach must be included in the River Basin Management Plans[4], including ex-ante and ex-post **evaluation of EU policies.**

In addition, a stronger implementation of the subsidiary principle could benefit river basin management, identifying the most impactful added-value of the European Union for such strategy and policy-making process. The NEPAT tool can help identify the most impactful actions based on local context. For instance:

- The Common Agricultural Policy in its objective to address environmental challenges is encouraged to adopt the WEFE Nexus Index in order to quantitively evaluate trade-offs with respect to the other nodes of the nexus, mainly water quantity and quality, ecosystem services and biodiversity, and green energy production to support achieving sustainable development[5]. Radical land use changes in upstream countries (away from agriculture and towards landscape protection and restoration) have significant benefits for the biodiversity but also for water quality and quantity in both up- and downstream countries.

[2]Ursula von der Leyen, Candidate for the European Commission President, Europe's choice: Political guidelines for the next European Commission 2024–2029, 18 July 2024; European Commission, Commissioner for Environment, Water Resilience and a Competitive Circular Economy: Mission letter, 17 September 2024
[3]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
[4] Refer to the River Basin Management Plan requested by the Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy, art. 13.
[5]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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Finding a triple win for food protection, biodiversity protection as well as renewable energy production on limited amounts of land should be the aim rather than competing land uses.

- Mountainous regions are encouraged to adopt agroforestry practices and expand tree cover on agricultural land as this can have multiple benefits on other nexus aspects such as soil water retention, carbon emissions reduction, and sustained agricultural production[6].

General Recommendations

The case studies identified common water-smart measures using a WEFE nexus approach to ensure water resilience, sustainability and security.

Harmonise local transboundary and cross-national nexus cooperation

The case studies underscore the need to reinforce cooperative governance in river basin management, especially in transboundary settings. Enhanced management across borders and national boundaries is essential, with improvements needed in the following areas:

- **Clarifying and aligning the legal frameworks**: Standardization of quantitative and qualitative resource management laws across participating regions will enhance cohesive governance.

- **Strengthening effective stakeholder participation:** exploration of mandating stakeholders and systemic participation in river basin management processes, including through WEFE-related forums of policymakers to negotiate acceptable trade-offs and synergies (c.f. Article 14, Water Framework Directive).

- **Strengthening implementation of the principle of subsidiarity**: Enabling greater local stakeholder involvement by reducing overly restrictive governance limits via decentralisation. For examples, the NEPAT tool could be considered as an add-on in the Regional Adaptation Support Tool process in the Guidance 24[7].

- **Standardizing data collection and monitoring**: Harmonizing data processes will facilitate coherent, interoperable data sharing (e.g., standardized methodology for evaluation of quality classes for water bodies). NEPAT has been demonstrated as a transboundary tool to spark deliberation and consensus.

- **Increasing non-financial recognition for local stakeholders**: Providing incentives for local actors (e.g., natural resource managers such as farmers) to contribute to local planning processes can foster a more collaborative approach.

[6]Zomer RJ, Yang J, Spano D, Trabucco A. 2023. Irrecoverable carbon in mountains and the global mitigation potential of agroforestry and increased tree cover in mountain agricultural systems. Circular Agricultural Systems 3:11 https://doi.org/10.48130/CAS-2023-0011
[7]European Commission: Directorate-General for Environment, *River basin management in a changing climate – Common implementation strategy for the Water Framework Directive and the Floods Directive*, Publications Office of the European Union, 2024, https://data.europa.eu/doi/10.2779/126657

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Beyond the implementation of the Water Framework Directive, these recommendations shall be considered in activities related to the different programmes of the European Neighbourhood Policy and Enlargement Negotiations, to build more trust among partners, support more effective upstream-downstream pollution control, and alleviate administrative burdens within the implementation of the EU water acquis.

Secure financial support for an EU water-smart transition

Water infrastructure and policy have faced persistent underfunding by authorities. €255 billion is required by 2030 to ensure compliance with EU water directives and to increase the efficiency of water infrastructure systems across the continent (Water Europe, 2024) with direct impact on WEFE nexus resource management. Aligning with the EU Blue Deal and the recent statement from Commissioner Roswall on the environment, circular economy, and water resilience, there is a clear need to secure financial backing in this area, to advance Europe's water-smart transition, for instance through the Blue Funds in the Multiannual Financial Framework of the EU. Key areas of focus for such support should include:

- **Encouraging the funding of nature-based solutions when relevant and appropriate to contribute to the upgrade of existing infrastructure.**
- **Encouraging local public-private partnerships**, with enhanced involvement and capacity-building of Local and Regional Authorities, in developing sustainable business models to fund and implement projects.
- **Increasing the visibility of water-related funding opportunities** across member countries so that non-governmental actors can leverage these for local projects (e.g. pilots in NBS).

Improve data collection through systemic standardisation and interoperability at basin level

Europe currently faces a structural gap in data collection and lacks a systemic standardization process to ensure at least basic interoperability of quantitative and qualitative data across river basins. This hampers authorities and stakeholders (especially in transboundary watersheds) in problem-solving. To address these needs, it would be beneficial to:

- **Establish guidelines for evaluating and reporting quantitative and qualitative data** to harmonise practices across regions and within transboundary river basins. For instance:
  - *The WEFE Nexus Index could be used to quantitively evaluate trade-offs to support achieving sustainable development[8].*
  - *The identification of water parameters both for quantitative and qualitative aspects adapted to the local case is key to successfully manage WEFE nexus policies[9]. This can*

[8]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
[9]NEXOGENESIS, Deliverable 3.1, *Conceptual models completed for all the case studies*, May 2023

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include simple water balance exercises based on individual needs (plots, neighbourhoods, sectors such as tourists, sub-catchment, etc.) and the basic water quality parameters used for SDG 6[10]. The Water Exploitation Index plus (WEI+) could be prioritised as a measurement of water stress in the WEFE models used to analyse the impact of policy measures[11].

- The **version 3 of the Global Aridity Index and Potential Evapotranspiration Database** could be considered as a key parameter particularly for policies dealing with the water-soils nexus[12]

- **Enhance data collection using a source-to-sea approach** to better account for biophysical and policy-related upstream-downstream interconnections by collecting a set of data representative of the complexity of the WEFE nexus in the considered river basin and its main challenges identified by the relevant authorities and stakeholders.

- **Facilitate open data and disclosure in a citizen-friendly manner** to increase transparency, avoid investment duplication, and support the development of accurate forecasting models, such as the NEPAT, and evidence-based policies resulting from its artificial intelligence powered decision support system.

These recommendations help **improve data consolidation** at both the river basin and European levels and enable a more accurate comparative analysis of **WEFE biophysical and policy interlinkages and interactions** at the local, national and European levels. By reducing the need to agree on the 'right' data and respective model outputs, conflicts, arguments and misunderstandings can be reduced and avoided ultimately helping alleviate stakeholder fatigue and limitations in engagement. A consolidated and agreed upon evidence-base is key for a **trusting stakeholder engagement process** which in turn is paramount for the adoption of an **open WEFE nexus approach towards integrated policy making**.

[10]UN Water, Indicator 6.3.2 "Proportion of bodies of water with good ambient water quality"; https://www.unwater.org/our-work/integrated-monitoring-initiative-sdg-6/indicator-632-proportion-bodies-water-good-ambient; accessed Feb. 2025
[11] 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
[12] Zomer, R.J., Xu, J. & Trabucco, A. Version 3 of the Global Aridity Index and Potential Evapotranspiration Database. *Sci Data* **9**, 409 (2022). https://doi.org/10.1038/s41597-022-01493-1 ; Zomer RJ, Xu J, Spano D and Trabucco A. CMIP6-based global estimates of future aridity index and potential evapotranspiration for 2021-2060 [version 1; peer review: 3 approved with reservations]. Open Res Europe 2024, **4**:157 (https://doi.org/10.12688/openreseurope.18110.1)

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