NEXOGENESIS
STREAMLINING WATER RELATED POLICIES

Deliverable 1.3

Policies for the Self Learning Nexus Assessment Engine (SLNAE)

Lead: Caro Mooren & Stefania Munaretto (KWR)

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Project Deliverable

Project Number	Project Acronym	Project Title
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Title
Policies for SLNAE

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Abstract

As part of the activities of T1.4, this deliverable (D1.3) presents the policies (i.e. policy instruments) for the Self-learning Nexus Assessment Engine (SLNAE). The policy instruments are presented along with an illustration of the stakeholders co-creation and validation process. In the coming months the case studies will discuss the policy instruments presented in this report with WP3 and WP4 to identify those that are feasible, from a data and modelling perspective, to integrate in the SLNAE and for which targets and indicators will be defined/finalized. This process will result in the final set of policy instruments, goals, objectives and related targets and indicators to be integrated in the SLNAE and whose impact on the Water-Energy-Food-Ecosystems (WEFE) nexus the stakeholders will be able to explore with the SLNAE.

Keywords

Policy instruments, policy packages template, Self-learning Nexus Assessment Engine, stakeholders, co-creation

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Executive summary

As part of the activities of T1.4, this deliverable (D1.3) presents the policies (i.e. policy instruments) validated with the stakeholders (local experts) in each NEXOGENESIS Case Study (CS) and an illustration of the co-creation and validation process. In the coming months the CSs will discuss the policy instruments presented in this report with WP3 and WP4 to identify those that are feasible, from a data and modelling perspective, to integrate in the Self-learning Nexus Assessment Engine (SLNAE) and for which targets and indicators will be defined/finalized. This process will result in the final set of policy instruments and related targets and indicators to be integrated in the SLNAE and whose impact on the WEFE nexus the stakeholders will be able to explore with the SLNAE. The results of the impact assessment of these policies on the WEFE nexus in each CS region will provide the basis for the dialogue among the local stakeholders on what set of policies is desirable and agreeable by all stakeholders to improve WEFE nexus governance in their region.

To help the CS leads identify preliminary policy instruments to discuss with stakeholders, WP 1, in collaboration and after discussions with WP2, WP3 and WP4, designed the so called “policy packages” template and outlined the process to co-create and validate the policies together with the local stakeholders. The identification of the policy instruments builds on insights from the policy coherence analysis and governance assessment in each CS (see details in D1.2) along with bilateral and group discussions with stakeholders at the NEXOGENESIS workshops in the context of task 1.4.

Note to the reader: the consortium decided to rename the SLNAE into Nexus Policy Assessment Tool (NEPAT) in communication with stakeholders to make it more intuitive for them to understand what the tool is about, and to keep using the old name in deliverables to maintain consistency with the Grant Agreement. Accordingly, in this deliverable we will continue to use the original name SLNAE. More detailed explanation about the name change can be found in the M18 project review report.

Contribution to EU policies

This deliverable is a crucial step in the in the overall NEXOGENESIS process as it presents the selected policies who’s impact on the WEFE nexus in the case study regions can be assessed through the SLNAE. The selected policies relate to various EU policies, including the Water Framework Directive, the Common Agricultural Policy and the Renewable Energy policy. The assessment of the impact of the selected policies will ultimately lead to better understanding the interaction between these policies, not only at the local level but also at EU level. It will also provide insights on how local and regional policies contribute to EU policy goals. Moreover, it will give direction on a combination of policies that can lead towards improved WEFE nexus governance both at local/regional and EU level. Finally, all the above insights will be available also for the two transboundary case studies, thus contributing to the EU’s water diplomacy discussion.

Related Deliverables

D1.1 Stakeholders’ co-creation approach for WEFE nexus Governance (M12)
D1.2 Governance and policy assessment in case studies (M25)

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D3.4 Complexity science models implemented for all the Case Studies - Prototypes and explanatory report/manual for each CS (M23)
D3.6 Sensitivity/Uncertainty Analysis Report (M30)
D4.2 Data Lake for data sharing (M32)
D4.3 Simulation policy framework (M34)D4.4 Core module of the self-learning nexus engine (M34)

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Abbreviations

CS	Case Study
D	Deliverable
M	Month
WP	Work Package
WEFE Nexus	Water-Energy-Food-Ecosystem nexus
SLNAE	Self Learning Nexus assessment Engine
NEPAT	Nexus Policy Assessment Tool
PNIESC	National Integrated Plan for Energy and Climate Change 2021-2030
PNS	the Common Agricultural Policy National Strategic Plan 2023-2027

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1. Introduction

WP1 has designed a stakeholders' co-creation approach towards WEFE nexus governance (D1.1 and Figure 1) that aims to support stakeholders in the NEXOGENESIS case study (CS) regions to identify and agree on relevant policies for improved WEFE nexus governance. There are five CSs in the project covering 5 river basins: Nestos-Mesta (Greece-Bulgaria), Lielupe (Lativa-Lithuania), Adige (crossing two autonomous provinces and one region in Italy); Jiu (Romania); and Inkomati-Usuthu (the river basin is transboundary but the project focuses on South Africa).

The stakeholders' co-creation approach aims to support stakeholders to develop a shared understanding of problems for the river basin and accordingly design the building blocks of an agreement for actions to implement in the basin; ideally at least in one of the case studies stakeholders will be able to reach such agreement. NEXOGENESIS defines such a stakeholder agreement as a voluntary, negotiated action plan developed through a stakeholders' co-creation process where relevant stakeholders across the WEFE sectors identify actions for the management of the (transboundary when relevant), cross-sectoral WEFE resources. The stakeholders involved in the process commit and take responsibility, each within their respective frame of roles and competences, for the adoption and implementation of a set of agreed actions for the integrated management of the WEFE resources in the river basin as well as for the monitoring of the implementation. Actions can be of any sort and at any scale, from joint cleaning up of the river, to data sharing or fostering the adoption/change of specific policies.

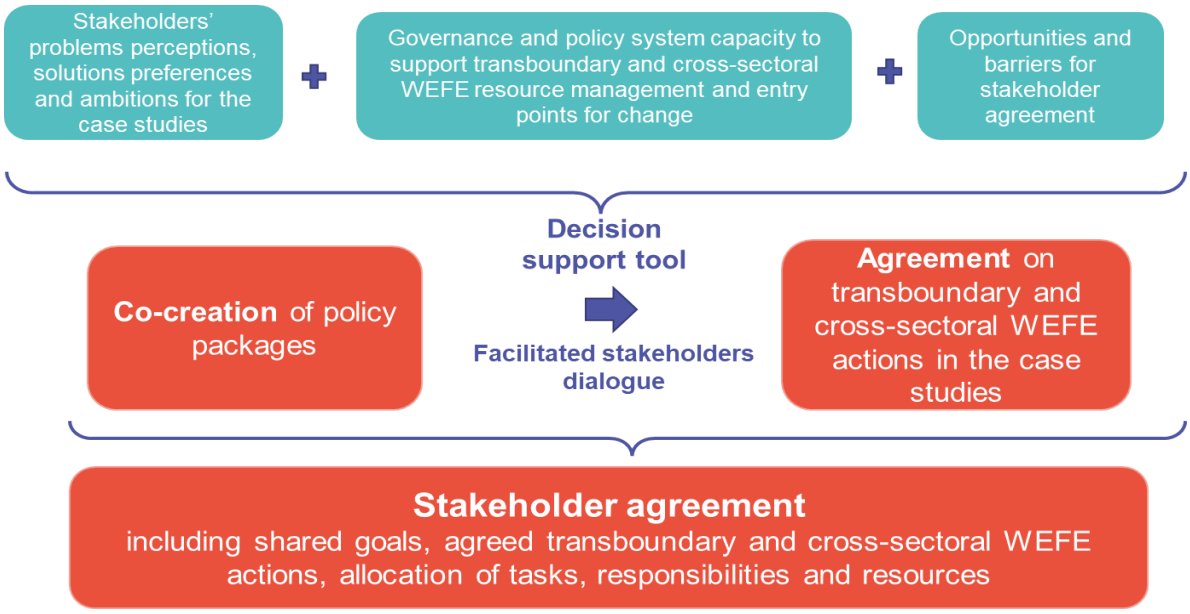

Figure 1 Stakeholders co'-creation approach towards WEFE nexus governance

The selection of the policies (i.e. policy instruments) for the SLNAE for each CSs is a central step in this process. These policies should reflect the needs of the stakeholders. Therefore, the process of co-creation is based on intense exchange with stakeholders via the

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NEXOGENESIS workshops and bilaterally with the CS leads (WP5), as well as on insights gathered during the WEFE nexus governance assessment interviews and the policy coherence assessment reported in D1.2. Furthermore, these policies have to be linked to the CSs conceptual models implemented in the CSs System Dynamic Models (SDMs) by WP3 and later on implemented into the SLNAE by WP4. Therefore, the timely delivery of the policies for the SLNAE is crucial to ensure the success of the whole SLNAE development process. To timely provide the policies for the SLNAE to WP3 and WP4, WP1, in collaboration with WP3 and WP4, designed the so called “policy packages” template, outlined the process to populate it and supported CSs throughout the process of populating the template.

This deliverable presents the template, the stakeholder co-creation process, and the stakeholders (local experts) validated policy instruments. As next step, CS leads will discuss the selected policies with WP3 and WP4 in terms of data availability and modelling feasibility, and for the feasible policies they will identify/finalize targets and indicators.

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2. Methods

The CS leads identified the policy instruments for the SLNAE in close collaboration with WP1. Several steps were taken between January 2022 and July 2023 to this purpose.

First, WP1 developed the policy inventory and conducted, together with the CS leads, the policy coherence assessment (see D1.2) between January 2022 and May 2023. The policy inventory consists of an Excel database in which the CS leads reported all WEFE nexus policies relevant to their case study along with key information such as year of adoption, time horizon of the policy, scale of the policy, goals of the policy and instruments adopted by the policy. The case study leads had to assess the level of coherence of each identified policy with the other nexus sectors (i.e. no coherence, little coherence, high coherence) and explain where the coherence (or lack thereof) was found in the policy document in terms of prescriptions to mitigate negative impacts on other sectors or exploit potential synergies with other sectors (i.e. no prescriptions even if impacts/synergies exists; only mentioning impacts/synergies but no mandatory actions; mandatory actions to mitigate impacts/exploit synergies). This exercise helped the CS leads to have an overview of the relevant existing policies and their level of coherence which is a key characteristic of WEFE nexus governance. Through workshop (WS)1, WS2 and focus groups the policy coherence assessment was validated and stakeholders' initial preferences for policy instruments were gauged. The interviews conducted for the WEFE nexus governance assessment in each CS also provided insight into the preferences of stakeholders for policy instruments.

Second, WP1 designed the so called "policy packages" template in January 2022 (see Figure 2, Figure 3 and Figure 4) to be filled in by the CS leads. The template includes 3 parts:

1) The policy instruments to include in the SLNAE (Figure 1); the selection of the instruments was led by the CSs, supported by WP1, and done in close collaboration with stakeholders;
2) The data needs, model assumptions and variables affected by the policy instruments (Figure 2); this part of the process is done by CS leads with WP3 and WP4 and may lead to changes in the policy instruments to include in the SLNAE, depending on model/data feasibility;
3) The goals, objectives and targets associated with each of the selected and feasible policy instrument (Figure 3); this part of the process is done by CS leads with support of WP1 and WP3 after the final set of feasible policy instruments have been selected.

Step 2 and 3 of the process are beyond the scope of this deliverable and are related to D3.4, D3.6, D4.2, D4.2 and D4.4. The template and methodology were presented to the CSs and WPs during the general assembly in September 2022 in Riga.

Then, WP1 and the CS leads had bilateral meetings between September and November to discuss initial ideas of how to fill in the template. Moreover, there were regular check-in moments on the process of filling in the template during the consortium co-creation meetings.

Finally, between November 2022 and July 2023 the CS leads synthesized the policy discussions they had with their stakeholders and started populating the template. This resulted in a preliminary set of policy instruments which was then discussed with the stakeholders during WS3 for validation between March and July 2023. The selection of policy instruments

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is based on the nexus issues specific to each CS area and reflects stakeholders' needs. As a result, the sectors included by each CS and from which these policy instruments originate may vary across CS extending sometimes beyond the traditional WEFE nexus domains. For example, land use policies were found highly relevant in the Lielupe CS and therefore included in addition to the WEFE. Furthermore, the scale at which these policies operate is reported for the 4 CSs for which it is relevant for the purposes of the project. The Inkomati-Usuthu, while being a transboundary river basin, is analysed from a national perspective (South Africa) and the scale of the identified policies is always national.

In the coming months, the CSs and WP3 will discuss the feasibility of integrating the selected policy instruments into the System Dynamic Models (SDMs) and the SLNAE based on available data. This will lead to the final set of policy instruments for which the CSs will define/finalize targets and indicators. The result of this process and the final set of policy instruments, targets and indicators will be then shared with the stakeholders accompanied with explanation of the rationale that led to it. It is relevant to point out that some CSs, have already started identifying and discussing with stakeholders targets and indicators during the process of selecting policy instruments, ahead of schedule, so as to enhance the feasibility of policy instruments envisaged at this stage.

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Template for policy packages: from policies to models

TO BE DISCUSSED WITH STAKEHOLDERS (CSs WITH SUPPORT WP1, WP3)

	Sector that adopt/implement the policy (WEFE, others)	Existing vs. desired policy	Policy instrument	Scale of implementation (entire rivel basin or sub-basin): only for Lielupe and Nestos; Adige
Example	Agriculture	Existing	Subsidies to farmers for adoption of efficient irrigation technology	Greece part of the basin
				Bulgaria part of the basin
				Entire river basin
	Agriculture	Existing	Subsidies to farmers to switch to low water demand crops	Entire river basin
	Agriculture	Desired	Investments to (repair) renovate water infrastructures	Entire river basin

Figure 2 Policy packages template: policy instruments data

Figure 2 shows the first part of the policy package template, the one that collects the policy instruments data. Here information is reported on the sector that implements the policy, whether it is an existing or desired policy, the policy instrument, and lastly the scale of implementation. The scale is particularly relevant to the transboundary CSs and the Adige case study. These CSs can choose to apply the policy instrument only in one part of the basin (country or administrative region/province in Italy) or in the entire river basin. This choice has implications for the impact of the policy instruments.

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Template for policy packages: from policies to models															
TO BE DEVELOPED BY CSs WITH WP3, WP4, WP2															
Entry sector of the policy in the conceptual model (WEFE, others)	Assumptions to be made to translate policy into models	Modulation of the instrument (range or fixed value)	Specific assumptions on the changes triggered by the policy instrument in the model variables	Input variables used in models to implement policy	Data	link to other sectors	Variables in the models affected by the policy across all nexus sectors	Delay of implementation (start of effects of the policy)	Duration of implement ation	Policy effect is permanent? Yes/no	Policy can be applied more than ones? Yes/no	If applied multiple times, indicate effectiveness reduction	Policy cost (token): low/medium/high	Potential source of funding for the specific policy instrument (from policy documents or there is none; eg EU recovery fund)	Social acceptance of policy instrument (token): low/medium/high

Figure 3 Policy packages template: data requirements, assumptions and variables for the modeling of the policy instruments in the SDM and the SLNAE

Policy goals, objectives and releated targets + indicators for the models							
TO BE DEVELOPED BY CSs WITH SUPPORT WP1 and WP3					TO BE DEVELOPED BY CSs WITH WP3, WP4, WP2; ; each CS has its own set of nexus performance indicators		
Sector	Policy goal (derived from existing policies or more ambitious than existing policies)	Target associated to policy goal (value and timeframe)	Policy objectives that contribute to achieve the goal (as found in existing policies or more ambitious)	Target associated to objective	Indicators (derived from existing policies or defined by CSs and WPs)	Input to the model (WP2 and WP3)	Output of the model (make it as close as possible to the indicator)

Figure 4 Policy packages template: goals, objectives, targets and indicators for each policy instrument

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3. Results

This section presents the stakeholder validated policy instruments for the SLNAE of the five CSs accompanied by a description of how they were selected. Some CSs (Inkomati-Usuthu and Adige) also initiated an internal discussion on the policy goals, targets and indicators associated to those policy instruments and started collecting preliminary feedback from the stakeholders. These preliminary, goals, targets and indicators are not included in this deliverable, which is concerned only with the validated policy instruments, as mentioned in the previous section. The finalization of goals, targets and indicators will take place after the final set of policy instruments for the SLNAE will be selected in dialogue with WP3 and WP4 and will be relevant for the activities that will be reported in D3.4, D3.6, D4.2, D4.3 and D4.4.

3.1 Case study 1 Nestos-Mesta

The design of the Nestos-Mesta case study policy instruments for the SLNAE started with an exploration of existing policies and legislations relevant to the WEFE nexus in both Greece (GR) and Bulgaria (BG). A policy inventory was created that includes the policy goals, instruments, and an assessment of the policy coherence with the respective nexus sectors.

The main pressures and existing problems of the Nestos-Mesta river basin were discussed at the second stakeholder workshop in November 2022, so as to gather input from the stakeholders on relevant policies, which took place separately in the two countries involved in the CS, i.e., one (first) workshop was held in Greece in the Nestos municipality and another (first) one in Bulgaria in Gotse Delchev municipality. The governance assessment that followed (performed in July 2022), provided further input on the existing pressures and problems in the Nestos-Mesta river basin and the existing governance and policy structure.

The policies presented by the research team during Workshop 3 were developed based on suggestions discussed with stakeholders during the 2nd Workshop and subsequently validated by them during the 3rd Workshop. These policies are detailed in Table 2. Specifically, during the 2nd Workshop, stakeholders proposed solutions, which the research team refined to create an initial draft list of policies. This draft was then transferred to the Excel file provided by WP1 and presented to stakeholders at Workshop 3 for validation. Notably, there were no changes to the policy list between the 2nd and 3rd Workshops. Problems, needs, and preferences were systematically linked to the policies during this process.

Workshop 3 details

Table 1 illustrates the stakeholder composition for Workshop 3. It is important to note that some stakeholders identify themselves as representatives of multiple WEFE nexus sectors, which explains why the total count of sector representatives exceeds the number of participants. For instance, the mayor, as a local decision-maker responsible for managing and implementing policies and practices related to water, energy, food/agriculture, and ecosystems, represents all WEFE nexus sectors. Similarly, representatives from academic

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and research institutions often span multiple sectors, with a common example being water sector representatives who also represent the ecosystems sector..

Table 1 Stakeholder composition for Workshop 3 Mesta-Nestos CS

Participants: total number	Sectors represented			
	Water	Energy	Food	Ecosystems
37	33	17	27	31

Not all invited stakeholders, such as Public Power Corporation SA (DEI), the dam operator and representative of the energy sector, were able to attend the workshop. However, the NEPAT does include policies aimed at the effective and sustainable management of water in dams. For example:

- Changing/modernizing irrigation systems, from furrow to drip irrigation, in both Greek and Bulgarian sub-basins in order to minimize water losses
- Replacement of open irrigation canals transferring water from the river to the crops by closed pipelines supporting water conservation and reduction of losses
- Cultivation of less-water demanding crops
- Extensive use of water saving infrastructures by the sector of livestock.

The research team of the Nestos/Mesta CS utilized information and data from the literature, relevant projects, past experiences, and statistical databases to integrate these policies into the NEPAT tool. However, the participation of the dam operator in the workshop would have allowed for a more in-depth exploration of critical issues related to dam operations and the balance of competing water demands, including electricity production, irrigation, and ecological flow. Additionally, their involvement could have provided a platform to address existing conflicts with farmers and initiate a negotiation process to foster better stakeholder alignment and collaboration.

The policies presented to stakeholders during Workshop 3 were developed based on discussions and suggestions from stakeholders during the 2nd Workshop. These discussions were informed by the local pressures and needs identified during the 1st Workshop. In the initial workshop, stakeholders provided insights into these challenges, which were then integrated with the primary WEFE nexus interlinkages outlined in the conceptual model. This groundwork enabled a preliminary discussion of potential solutions and interventions during the 2nd Workshop. The research team then refined these solutions into policy proposals, which were presented to stakeholders during the 3rd Workshop for validation. The final set of stakeholders' validated policies represent a key outcome of the co-creation process, as they integrated: (i) stakeholders' views and perspectives, (ii) targeted interventions to address current challenges and alleviate existing pressures, and (iii) priorities aligned with the national policy framework.

Workshop 3 was conducted as an open plenary discussion, a widely appreciated and highly effective communication format for the Mesta-Nestos CS, according to the experience of the case study leads. This approach has been used across all in person workshops —Workshop 1, Workshop 2, and Workshop 3— fostering open dialogue and active participation.

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Table 2 Policies instruments to be validated in Mesta-Nestos CS

Reported Problem/Pressure	Policy instrument
Need to modernize irrigation systems and minimize water losses – Current irrigation network is obsolete	Change of irrigation systems/practices (furrow, sprinkler, drip) - Investments
Need to protect water quality in the river – Preservation of the aquatic ecosystem	Monitoring/measuring the quantity of pesticides/toxic substances discharged in the river
Need to mitigate climate change impacts and reduce flood risk	Flood-preventing infrastructures; Proactive assessment of flood risk
Need for water saving / water conservation	Waste-water treatment plants / technologies
Sometimes excessive volumes of water are coming in Greece from upstream	Monitoring volumes of water coming from the Bulgarian side
Need to protect forest land and wetlands	Reforestation; register of wetlands
Need to protect the aquatic ecosystem and balance conflicting water needs	Securing the minimum % of ecological flow
Need to explicitly define the characterization of each protected area and the activities allowed to take place within their boundaries	Characterization of areas as: strict nature reserves, nature reserves (protected areas), natural parks (national/regional), protected habitats (special preservation zones, areas of special protection, habitats of wildlife or combination of all the above), protected landscapes
Need to manage land use conflicts and protect terrestrial ecosystems for intensive agricultural practices	Protection of biodiversity from intensive agriculture / expansion of agricultural land
Need to protect local biodiversity	Inventory of biodiversity threats/pressures
Need to assess ecosystem services as they play a critical role to the future development of the area	Definition of specific indicators assessing ecosystem services
Need to strengthen trade of agricultural products and the cultivation of crops with export capabilities	Cultivation of dynamic crops aromatic and pharmaceutical herbs, whortleberry, pomegranate, sea buckthorn, tobacco, legumes, honey, wine
Need to strengthen trade of agricultural products and the cultivation of crops with export capabilities	Livestock products, greenhouse crops, arboriculture, vegetables, agro-forestry. Local pillars: honey, grapes, winery
Need to manage land use conflicts	Protection of pastures
Need to further develop the sector of aquaculture	Increase aquaculture production
Need to exploit RES for energy production	Energy production from geothermal, P/Vs, wind turbines
Need to exploit RES for energy production	Energy production from biomass, agricultural waste combustion (GR), composting (BG) and energy crops
Continue to exploit water potential for hydro-electric power production	Electricity production from water available in dams

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Table 3 Stakeholders validated policy instruments for the Nesto/Mesta case study

Sector that adopts/ implements the policy	Existing vs. desired policy	Policy instrument	Policy document in Greece	Policy document in Bulgaria	Scale of implementation
Water	Desired	Change of irrigation systems/practices (furrow, sprinkler, drip) - Investments	-		Entire basin
Water	Existing	Monitoring/measuring the quantity of pesticides/toxic substances discharged in the river	1. Law 3199/2003 on the protection and management of water resources - Reconciliation with the WFD 2000/60/EC 2. Legislative Decree 51/2007 on the determination of measures and procedures for the integrated protection and management of water resources in compliance with the WFD 2000/60/EC 3. Decision 39626/2208/E130 (2009): Measures for the protection of groundwater from pollution and deterioration in compliance with the European Directive 2006/118/EC	1.Water law 27.07.1999, last change 13.10.2023 2. Ordinance № 1 of 11.04.2011 for water monitoring 3. Ordinance № H-4 of 14.09.2012 on characterization of surface waters, last change 4.08. 4. Ordinance № 2 of 13.09.2007 on the protection of waters from nitrate pollution from agricultural sources, last change 9.12.2011 5. River Basin Management Plan Western White Sea Region (2016-2021), in an update for 2022-2027	Entire basin
Water	Existing	Flood-preventing infrastructures; Proactive assessment of flood risk	Common Ministerial Decision 31822/1542/E103 (2010): Assessment and management of flood risk in compliance with the provisions of the European Directive 2007/60/EC	1. Flood Risk Management Plan (FRM) 2016 – 2021 in the Western White Sea Management Area, in an update for 2022-2027 2.River Basin Management Plan Western White Sea Region (2016-2021), in an update for 2022-2027	Entire basin

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				3. Ordinance on the conditions and procedures for carrying out an environmental impact assessment	
Water	Existing	Waste-water treatment plants / technologies		1.Water law 27.07.1999, last change 13.10.2023 – Закон за водите 2. Ordinance №2 of 06/08/2011 on issuing permits for the discharge of wastewater into water bodies and determining the individual emission limits of point sources of pollution 3. Ordinance on the conditions and procedures for carrying out an environmental impact assessment	Mostly BG sub-basin
Water	Desired	Monitoring volumes of water coming from the Bulgarian side	-		GR sub-basin
Ecosyst ems	Existing	Reforestation ; register of wetlands	1. Law 3937/2011: Preservation of Biodiversity 2. Decision 40332/2014: National Strategy for biodiversity between 2014-2029 and 5-years action plan		GR sub-basin
Ecosyst ems	Existing	Securing the minimum % of ecological flow	Decision 40332/2014: National Strategy for biodiversity between 2014-2029 and 5-years action plan	1. River Basin Management Plan Western White Sea Region (2016-2021), in an update for 2022 2.Strategic plan for biological diversity until 2030. and a 5-year National Plan for the conservation and sustainable use of biological diversity and genetic resources	Entire basin
Ecosyst ems	Existing	Characterization of areas as: strict nature reserves, nature reserves (protected areas), natural parks (national/regional), protected habitats	Law 3937/2011: Preservation of Biodiversity	1.Law on biological diversity of 9.08.2002, last change 20.10.2023 2.Strategic plan for biological diversity until 2030. and a 5-year National Plan for the conservation and sustainable use of biological diversity and genetic resources	Entire basin

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		(special preservation zones, areas of special protection, habitats of wildlife or combination of all the above), protected landscapes			
Ecosystems	Existing	Protection of biodiversity from intensive agriculture / expansion of agricultural land	Decision 40332/2014: National Strategy for biodiversity between 2014-2029 and 5-years action plan	1.Strategic plan for biological diversity until 2030. and a 5-year National Plan for the conservation and sustainable use of biological diversity and genetic resources 2. Law on biological diversity of 9.08.2002, last change 20.10.2023	Entire basin
Ecosystems	Existing	Inventory of biodiversity threats/pressures	Decision 40332/2014: National Strategy for biodiversity between 2014-2029 and 5-years action plan	1.Strategic plan for biological diversity until 2030. and a 5-year National Plan for the conservation and sustainable use of biological diversity and genetic resources	Entire basin
Ecosystems	Existing	Definition of specific indicators assessing ecosystem services	Decision 40332/2014: National Strategy for biodiversity between 2014-2029 and 5-years action plan	1.Strategic plan for biological diversity until 2030. and a 5-year National Plan for the conservation and sustainable use of biological diversity and genetic resources	Entire basin
Food	Desired	Cultivation of dynamic crops aromatic and pharmaceutical herbs, whortleberry, pomegranate, sea buckthorn, tobacco, legumes, honey, wine	-		GR sub-basin
Food	Desired	Livestock products, greenhouse crops, arboriculture, vegetables, agro-forestry. Local pillars:	-		GR sub-basin

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		honey, grapes, winery			
Food	Desired	Protection of pastures	-		GR sub-basin
Food	Existing	Increase aquaculture production	Law 4282/2014: Development of the aquaculture sector		GR sub-basin
Energy	Existing	Energy production from geothermal, P/Vs, wind turbines	1. Law 4414/2016: Support electricity production from RES and high performance electricity and heat production from cogeneration - Legal and operational separation of natural gas supply and distribution 2. Law 3468/2006: Electricity production from RES and cogeneration of high performance electricity and heat 3. Decision (49828-2008): Special legislative framework of spatial planning and sustainable development for the renewable energy sector and the respective strategic environmental impact assessment	1. Renewable Energy Law 03.05.2011, last change 13.10.2023 2. Water law 27.07.1999, last change 13.10.2023 3. Ordinance № 1 on exploration, use and protection of groundwater, issued by the Minister of Environment and Water, the Minister of Regional Development and Public Works, the Minister of Health and the Ministry of Economy and Energy 4. Ordinance on the conditions and procedures for carrying out an environmental impact assessment	Entire basin
Energy	Existing	Energy production from biomass, agricultural waste combustion (GR), composting (BG) and energy crops	1. Decision 4/31-12-2019: Ratification of the National Energy Plan for Energy and Climate 2. Law 3468/2006: Electricity production from RES and cogeneration of high performance electricity and heat 3. Decision (49828-2008): Special legislative framework of spatial planning and sustainable development for the renewable energy sector and the respective strategic environmental impact assessment	1. National long-term program to promote the use of biomass for the period 2008-2020 2. National strategic plan for a step-by-step reduction of the amount of biodegradable waste destined for landfill (2010-2020) 3. Ordinance on the conditions and procedures for carrying out an environmental impact assessment	Entire basin

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Energy	Existing	Electricity production from water available in dams	1. Law 4414/2016: Support electricity production from RES and high-performance electricity and heat production from cogeneration - Legal and operational separation of natural gas supply and distribution 2. Law 3468/2006: Electricity production from RES and cogeneration of high performance electricity and heat 3. Decision (49828-2008): Special legislative framework of spatial planning and sustainable development for the renewable energy sector and the respective strategic environmental impact assessment	1. Renewable Energy Law 03.05.2011, last change 13.10.2023 2. Regulation on the use of surface water, dated 23.03.2021 3. Ordinance on the conditions and procedures for carrying out an environmental impact assessment, last change 05.08.2022	Entire basin

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3.2 Case study Lielupe

The Lielupe policy instruments for the NEPAT were designed through an iterative co-creation process with stakeholders from Latvia (LV) and Lithuania (LT) in several workshops. As in the other case studies, the process started with the policy inventory.

During the first stakeholder workshop in February 2022 (online) the stakeholders discussed key policies and their impact on the WEFE nexus, climate, and land use sectors in the Lielupe river basin. Stakeholders from both LV and LT attended the workshop. The stakeholders were split into four smaller groups where each participant was asked to reflect on a preliminary list of policy instruments prepared by the CS leads.

During the second stakeholder workshop held in Riga in November 2022, Latvian stakeholders identified the policy instruments that they considered the most effective to improve integrated resource management and reach the policy goals relevant for the Lielupe river basin. Based on the outputs of these discussions, the CS leads drafted the concept set of policy instruments. The set of proposed policy instruments covers all WEFE nexus sectors. Specifically:

- **Water** policy instruments include measures to decrease Nitrogen and Phosphorous and to reduce water pollution from urban areas such as requirements for buffer strips along water bodies, subsidies for application of precise fertilization technology, subsidies for improved operation of WWTP - tertiary water treatment in larger agglomerations, and subsidies for the construction of nature-based solutions e.g., constructed wetlands for smaller agglomerations.
- **Energy** policy instruments relate to increasing differentiation of energy sources in the energy mix and to reduce greenhouse gas emissions from (heat) energy consumption. The policy instruments include support schemes for installation of solar (PV) technologies in small-scale applications and for wind energy production at large commercial applications; introduction of regulatory policy instrument - revenue for municipalities from energy production from renewable energy sources could promote interest of local authorities to allocate areas for renewable energy production; and financial support to increase energy performance of buildings and to introduce energy efficient technologies for industry shall promote reduction of energy consumption in the territory.
- **Food** policy instruments aim to improve soil fertility and agricultural yield by increasing the share of organic farming and include measures such as: regulatory instruments prescribing requirements for application of fertilizers, crop rotation, alternated agricultural practices (e.g., minimal tillage); financial instruments including subsidies for organically grown products to compensate for reduced production compared to conventional farming, and support for dairy cattle farming; sewage sludge to increase fertilization of soils with organic matter.
- **Ecosystem** policy instruments include measures to ensure sufficient ecological flow in rivers and increasing land areas in optimum moisture conditions such as: subsidies for removal of obstacles/wastes in water bodies, cleaning of riverbeds, the development of constructed wetlands and improving the drainage system performance.

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Workshop 3 details

The draft set of policy instruments was discussed with Lithuanian and Latvian stakeholders during the third stakeholder workshop in June 2023 in Vilnius (see Table 4 for an overview of the participants). Building on outcomes from earlier stakeholder workshops, the CS leads compiled a proposed set of policy instruments across the WEFE sectors prior to the event (Figure 5). The primary goal of the workshop was to identify and prioritize key policy instruments within these sectors. Using insights from prior discussions, the research team prepared a draft set of policy instruments for the Lielupe CS, which were subsequently validated by stakeholders during the workshop.

Table 4 Overview stakeholder composition for WS3 Lielupe CS. Some stakeholders identify with multiple sectors

Participants: total number	Sectors represented			
	Water	Energy	Food	Ecosystems
8	4	4	1	5

A two-step approach was employed for validation and prioritization. First, stakeholders engaged in small group discussions using a World Café format. This interactive method allowed participants to review and deepen their understanding of the proposed instruments. In the second step, participants took part in a voting session, using coloured sticky dots to mark their priority instruments, ensuring that stakeholder input guided the final selection process. During the workshop, stakeholders not only validated the relevance and applicability of the proposed policy instruments for the Lielupe river basin but also suggested additional instruments. These new suggestions were analysed in terms of their potential impacts, effects, and trade-offs, enriching the overall policy framework.

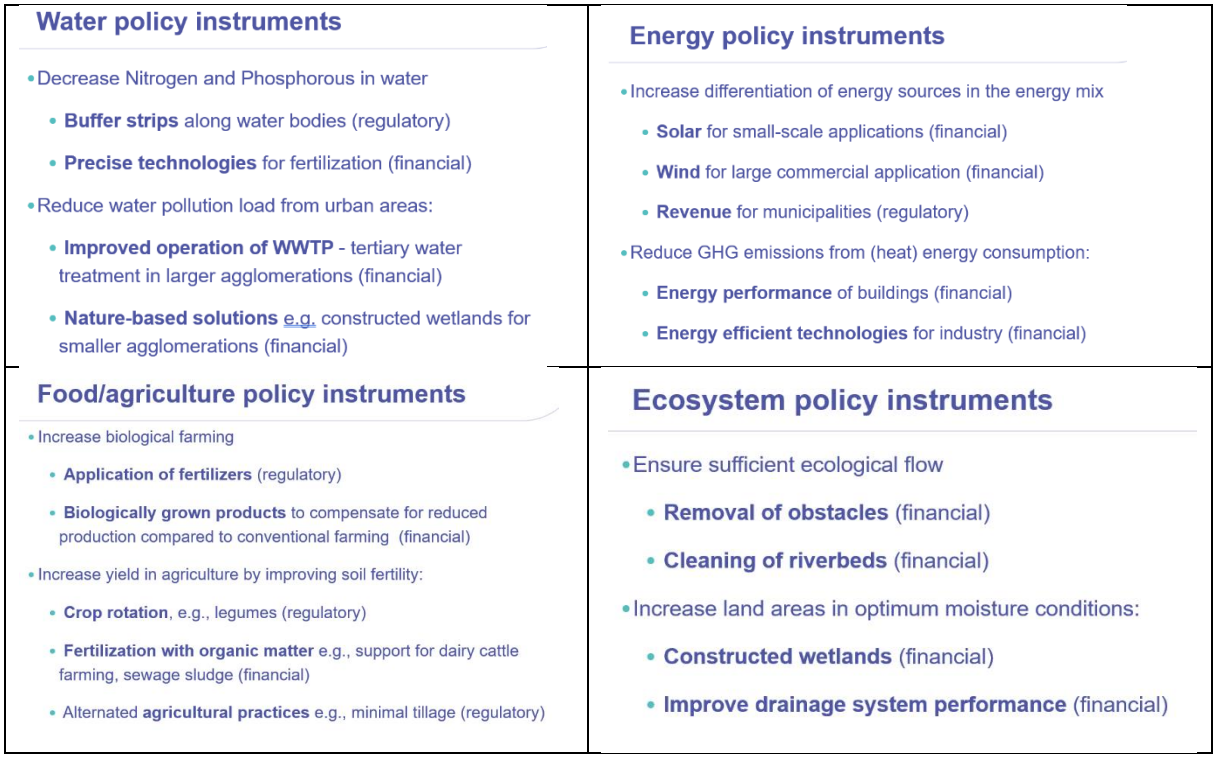

Figure 5 Draft set of policy instruments for the Lielupe CS presented to stakeholders.

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An additional stakeholder workshop was held in Riga on 6-7 February 2024. An overview of the participants representation is in Table 5. The aim of this workshop was to review the baseline results of the System Dynamics Modelling (SDM) and gather suggestions from participants on how to best incorporate policy instruments into the SDM and SLNAE.

Table 5 Overview stakeholder composition for the additional workshop Lielupe CS. Some stakeholders identify with multiple sectors

Participants: total number	**Sectors represented**			
	Water	**Energy**	**Food**	**Ecosystems**
14	9	3	6	8

The workshop employed a plenary discussion format, allowing participants to reflect on the results and provide input. This collaborative approach enabled stakeholders to suggest specific details that should be integrated into both tools, ensuring that the models accurately reflect the relevant policy instruments. The results of the workshops led to the stakeholders validated policy instruments presented in Table 6.

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Table 6 Stakeholders validated policy instruments for the Lielupe case study

Sector that adopts/ implements the policy	Existing vs. desired policy	Policy instrument	Policy document	Scale of implementation
Food	Existing	Regulatory requirements for buffer strips along water bodies	(LV) Protection Zone Law, Adoption: 05.02.1997., https://likumi.lv/ta/en/en/id/42348-protection-zone-law (LT) Special Land use regulations (2019), I SKYRIUS BENDROSIOS NUOSTATOS, https://e-seimas.lrs.lt/portal/legalAct/lt/TAD/46c841f290cf11e98a8298567570d639/asr	LV and LT part of the basin
Food	Existing	Subsidies for application of precise technologies for fertilization	LV) Cabinet of Ministers Regulation No. 198, Adopted 18 April 2023, Procedures for Granting Direct Payments to Farmers, https://likumi.lv/ta/en/en/id/341260-procedures-for-granting-direct-payments-to-farmers (LT) LAW ON AGRICULTURAL AND RURAL DEVELOPMENT (2002), https://e-seimas.lrs.lt/rs/legalact/TAD/TAIS.220310/	LV and LT part of the basin
Land-use	Existing	Subsidies for improved operation of WWTP - tertiary water treatment in larger agglomerations	(LV) Cabinet of Ministers Regulation No. 285, adopted 07.05.2024. "Eiropas Savienības kohēzijas politikas programmas 2021.–2027. gadam 2.2.1. specifiskā atbalsta mērķa "Veicināt ilgtspējīgu ūdenssaimniecību" 2.2.1.1. pasākuma "Notekūdeņu un to dūņu apsaimniekošanas sistēmas attīstība piesārņojuma samazināšanai" pirmās projektu iesniegumu atlases kārtas īstenošanas noteikumi", https://likumi.lv/ta/id/351828-eiropas-savienibas-kohezijas-politikas-programmas-2021-2027-gadam-2-2-1-specifiska-atbalsta-merka-veicinat-ilgtspejigu (LT) LIETUVOS RESPUBLIKOS APLINKOS MINISTRAS ĮSAKYMAS DĖL LIETUVOS RESPUBLIKOS APLINKOS MINISTRO 2022 M. LIEPOS 15 D. ĮSAKYMO nR. d1-231 „dĖL 2022–2030 METŲ PLĖTROS PROGRAMOS VALDYTOJOS LIETUVOS RESPUBLIKOS APLINKOS MINISTERIJOS APLINKOS APSAUGOS IR KLIMATO KAITOS VALDYMO PLĖTROS PROGRAMOS PAŽANGOS PRIEMONĖS NR. 02-01-06-07-01 „GERINTI VANDENS TELKINIŲ BŪKLĘ“ ĮGYVENDINIMO“ PAKEITIMO, https://e-seimas.lrs.lt/portal/legalAct/lt/TAD/1d400f70cf6811ee9269b566387cfecb	LV and LT part of the basin
Land-use	Desired	Subsidies for introduction of nature-based solutions e.g. constructed wetlands	(LV) Cabinet of Ministers Regulation Nr. 150, Adopted 01.03.2022, « Emisijas kvotu izsolīšanas instrumenta finansēto projektu atklāta konkursa "Siltumnīcefekta gāzu emisiju samazināšana mājsaimniecībās – atbalsts	LV and LT part of the basin

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		for smaller agglomerations	atjaunojamo energoresursu izmantošanai" nolikums" https://likumi.lv/ta/id/330568	
Energy	Existing	Subsidies for installation of Solar (PV) for small-scale applications	(LV) Cabinet of Ministers Regulation Nr. 150, Adopted 01.03.2022, « Emisijas kvotu izsolīšanas instrumenta finansēto projektu atklāta konkursa "Siltumnīcefekta gāzu emisiju samazināšana mājsaimniecībās – atbalsts atjaunojamo energoresursu izmantošanai" nolikums" https://likumi.lv/ta/id/330568	LV and LT part of the basin
Energy	Existing	Subsidies for wind park erection for large commercial application	Flagship EU funding programme «Connecting Europe Facility (CEF) » - supporting the development of high performing, sustainable and efficiently interconnected trans-European networks in the sectors of transport, energy and telecommunications, https://cinea.ec.europa.eu/programmes/connecting-europe-facility/about-connecting-europe-facility_en	LV and LT part of the basin
Energy	Desired	Revenue for municipalities from energy production from RE technologies in their respective administrative territories		LV and LT part of the basin
Energy	Desired	Subsidies for production of biomethane (2nd generation biofuel)		LV and LT part of the basin
Energy	Existing	Subsidies for increasing energy performance of buildings	(LV) Cabinet of Ministers Regulation Nr. 460, adopted on 14.07.2022. «Eiropas Savienības Atveseļošanas un noturības mehānisma plāna 1.2. reformu un investīciju virziena "Energoefektivitātes uzlabošana" 1.2.1.1.i. investīcijas "Daudzdzīvokļu māju energoefektivitātes uzlabošana un pāreja uz atjaunojamo energoresursu tehnoloģiju izmantošanu" īstenošanas noteikumi", https://likumi.lv/ta/id/334084-eiropas-savienibas-atveselosanas-un-noturibas-mehanisma-plana-1-2-reformu-un-investiciju-virziena-energoefektivitates-uzlabosana (LT) Ministerial Order (2022) DĖL DAUGIABUČIAMS NAMAMS ATNAUJINTI (MODERNIZUOTI) VALSTYBĖS PARAMOS TEIKIMO IR KVIETIMO TEIKTI PARAIŠKAS SĄLYGŲ APRAŠO PATVIRTINIMO, https://e-seimas.lrs.lt/portal/legalAct/lt/TAD/fd035a9271b811ed8a47de53ff967b64/khKAOfzjaO?jfwid=14jc7oaiz2	LV and LT part of the basin

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Energy	Existing	Subsidies for introduction of energy efficient technologies for industry (boiler houses)	(LV) Cabinet of Ministers Regulation Nr. 594, adopted on 20.09.2022., «Eiropas Savienības Atveseļošanas un noturības mehānisma plāna 1.2. reformu un investīciju virziena "Energoefektivitātes uzlabošana" 1.2.1.2.i. investīcijas "Energoefektivitātes paaugstināšana uzņēmējdarbībā (ietverot pāreju uz atjaunojamo energoresursu tehnoloģiju izmantošanu siltumapgādē un pētniecības un attīstības aktivitātes (t. sk. bioekonomikā))" 1.2.1.2.i.1. pasākuma "Energoefektivitātes paaugstināšana uzņēmējdarbībā (ietverot pāreju uz atjaunojamo energoresursu tehnoloģiju izmantošanu siltumapgādē)" īstenošanas noteikumi" , https://likumi.lv/ta/id/336032-eiropas-savienibas-atveselosanas-un-noturibas-mehanisma-plana-1-2-reformu-un-investiciju-virziena-energoefektivitates-uzlabosana	LV and LT part of the basin
Food	Existing	Requirements for application of fertilizers	(LV) Cabinet of Ministers Regulation Nr.834, adopted on 23.12.2014, "Prasības ūdens, augsnes un gaisa aizsardzībai no lauksaimnieciskās darbības izraisīta piesārņojuma", https://likumi.lv/ta/id/271376-prasibas-udens-augsnes-un-gaisa-aizsardzibai-no-lauksaimnieciskas-darbibas-izraisita-piesarnojuma (LT) Ministerial decree, ĮSAKYMAS dĖL ŽEMĖS ŪKIO VEIKLOS valdymo reikalavimų IR TRĄŠŲ BEI AUGALŲ APSAUGOS PRODUKTŲ NAUDOJIMO REIKALAVIMŲ APRAŠO patvirtinimo ir valdymo kontrolės institucijų paskyrimo, https://www.e-tar.lt/portal/lt/legalAct/TAR.93E1CEF88CA1/asr	LV and LT part of the basin
Food	Desired	Subsidies for biologically grown products to compensate for reduced production compared to conventional farming		LV and LT part of the basin
Food	Existing	Requirements for crop rotation, e.g., legumes	(LV) Cabinet of Ministers Regulation No. 198, Adopted 18 April 2023, Procedures for Granting Direct Payments to Farmers, https://likumi.lv/ta/en/en/id/341260-procedures-for-granting-direct-payments-to-farmers (LT) LAW ON AGRICULTURAL AND RURAL DEVELOPMENT (2002), https://e-seimas.lrs.lt/rs/legalact/TAD/TAIS.220310/	LV and LT part of the basin
Food	Desired	Subsidies for fertilization with organic matter e.g., support for dairy cattle		LV and LT part of the basin

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		farming, sewage sludge		
Food	Existing	Requirements for alternated agricultural practices e.g., minimal tillage	LV) Cabinet of Ministers Regulation No. 198, Adopted 18 April 2023, Procedures for Granting Direct Payments to Farmers, https://likumi.lv/ta/en/en/id/341260-procedures-for-granting-direct-payments-to-farmers (LT) LAW ON AGRICULTURAL AND RURAL DEVELOPMENT (2002), https://e-seimas.lrs.lt/rs/legalact/TAD/TAIS.220310/	LV and LT part of the basin
Water	Desired	Subsidies for removal of obstacles in water courses		LV and LT part of the basin
Water/ Ecosystem	Existing	Subsidies for cleaning of river beds	(LV) Funding for cleaning of rivers has been obtained through implementation of EU projects e.g., ENGRAWE, Latvian Environmental Protection Fund, Fish fund, municipal budget, etc.	LV and LT part of the basin
Food	Desired	Subsidies for erection of constructed wetlands		LV and LT part of the basin
Food	Existing	Subsidies for improving drainage system performance	LV) Cabinet of Ministers Regulation 776, adopred on 30.11.2021 “Valsts un Eiropas Savienības atbalsta piešķiršanas kārtība atklātu projektu konkursa veidā pasākumā "Ieguldījumi materiālajos aktīvos" 2014.–2020. gada plānošanas perioda pārejas laikā 2021. un 2022. gadā”, https://likumi.lv/ta/id/328179-valsts-un-eiropas-savienibas-atbalsta-pieskirsanas-kartiba-atklatu-projektu-konkursa-veida-pasakuma-ieguldijumi-materialajos	LV and LT part of the basin
Food	Desired	Subsidies for increasing organic carbon content in soil		LV and LT part of the basin

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3.3 Case study Jiu

The design of the Jiu policy instrument for the SLNAE started with a preliminary inventory of the main policy documents for each WEFE sector based on desk research conducted by the CS lead. The policy documents were selected based on the following reasoning:

- The selection of policy documents for the water sector was guided by the documents transposing the Water Framework and Flood Risk Directives into Romanian legislation. Accordingly, the main policy documents considered for the analysis were the Jiu River Basin and Jiu Flood Risk Management Plans.
- The energy sector is covered in the policy inventory by the National Integrated Plan for Energy and Climate Change 2021-2030 (NECP) that, although currently under revision, provides a good background to foster WEFE nexus governance.
- For the food sector, the Common Agricultural Policy National Strategic Plan 2023-2027 (NSP) is considered the leading policy document, setting the national targets for competitive, resilient agriculture as well as the sustainable development of rural areas. The document also considers climate action, the protection of natural resources, circular economy, and the preservation/improvement of biodiversity.
- Additionally, the Integrated Strategy for the Jiu Valley developed within the European Just Transition Mechanism was included in the policy inventory because the North part of the Jiu river basin is one of the European territories under transition to climate neutrality based on economic diversification and reconversion that will impact the WEFE nexus.
- Finally, the National Strategy for Sustainable Development 2030 was included in the policy inventory as it is considered an umbrella policy document setting the national targets for sustainable development goals and framing actions for reaching them.

The above approach on the inventory of relevant public policies packages was preliminary presented to stakeholders in the first NEXOGENESIS workshop, completed and refined during the governance assessment interviews and extensively discussed in the second stakeholder workshop in October 2022. In parallel, the CS lead preliminary identified policy instruments potentially relevant to include in the SLNAE tool derived from the selected policy documents.

Workshop 3 details

The validation and prioritization of policies took place during the third Jiu CS workshop, held in May 2023. The workshop was attended by 25 participants, including 23 stakeholders and 2 representatives from the Rexus and GoNexus sister projects. All WEFE sectors were represented (Table 7), with a slightly higher number of participants from the water sector at both national and basin levels. Additionally, stakeholders who besides representing the nexus sector also specialize in climate change adaptation and sustainable development participated.

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Table 7 Overview stakeholder composition for WS3 Jiu CS

Participants: total number	Sectors represented				
	Water	Energy	Food	Ecosystems	Sister projects
25	8	5	5	5	2

The policy inventory compiled by the CS lead, consisting of 18 policy instruments and related goals and targets, was presented to the participants (Table 8). Considering the current status of nexus-based dialogue in Romania, the inventory focused on existing targets at national level with planned implementation instruments expected to have regional and river basin scale impact. This strategy aimed to build stakeholder trust on the nexus approach and foster a shared understanding of the real-world implications of WEFE nexus-based decisions. The nexus dialogue already initiated during the previous workshops and further Nexogenesis activities in the case study, provided a stimulating platform for active discussions and knowledge sharing. Stakeholders actively engaged in discussions, validating proposed options and suggesting additional relevant instruments. Specifically, stakeholders recommended including among the selected policies also the circular economy action plan under elaboration by the national government. The plan implements the National Strategy for Circular Economy adopted in late 2022. The plan was discussed during public consultations organized by the Romanian Government's Department for Sustainable Development in May 2023 as a step towards finalization. Such recommendations provided a valuable opportunity for the Nexogenesis project to contribute to the development of the Romanian circular economy action plan and demonstrate the benefits of a nexus-based approach.

Stakeholders were asked to rank the policy options based on their perceived impact on socio-economic development and climate resilience within the Jiu River basin. Ten high-impact instruments were selected. The project team explained that these instruments would be integrated into the SLNAE, with the possibility of adjusting their parameters (e.g., ranges or fixed values) as needed. Because some of the selected policy documents are currently under review/update (e.g. NECP) and several of the financing instruments are not yet finalized (e.g. CAP- NSP) and are expected to be finalized in Romania towards the end of 2023, the validated set of policy instruments, related goals and targets will be finalized in the coming months. These adjustments are not expected to delay the development of the Jiu SDM and of the SLNAE as WP3 and WP4 activities are distributed over year 3 of the project starting with the front runners CSs. This gives the followers CSs such as Jiu more time to finalize their policy instruments. If, however, a delay in governmental policy processes occurs, the final instruments, goals and targets will be defined with the stakeholders based on the current political discussions. The validated selection of policy instruments by the stakeholders is presented in Table 9.

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Table 8 List of policies presented to stakeholders for the Jiu CS

Sector that adopts/ implements the policy	Existing vs. desired policy	Policy instrument
Water	Jiu River Basin Management Plan; Existing	Investment in water saving measures in agriculture and domestic uses (e.g., water meters)
Water	Jiu River Basin Management Plan; Existing	Investments in new water outlets
Water	Jiu River Basin Management Plan; Existing	Investments to extend the water supply networks
Water	Jiu River Basin Management Plan; Existing	Investments in ecosystem restauration to achieve good ecological status
Water	Jiu River Basin Management Plan; Existing	Investments in the protection of wetlands and of peat bogs
Water	Jiu River Basin Management Plan; Existing	Investments in removing obstacles in the water courses and restoration of riparian habitats
Energy	National Integrated Plan for Energy and Climate Change 2021-2030 PNIESC; Existing (in updating process)	Investments for extension of renewable energy infrastructure
Energy	National Integrated Plan for Energy and Climate Change 2021-2030 PNIESC; Existing (in updating process)	Investments in co-generation units
Energy	National Integrated Plan for Energy and Climate Change 2021-2030 PNIESC; Existing (in updating process)	Improvement of wastewater treatment capacity
Food	National Strategic Plan 2023-2027 (CAP); Existing	Investment for extension of irrigated area
Food	National Strategic Plan 2023-2027 (CAP); Existing	Subsidies and grants for natural protection curtains
Food	National Strategic Plan 2023-2027 (CAP); Existing	Subsidies and grants for buffer zones on agricultural land in the proximity of the water protection areas where the use of fertilizers and chemical products is forbidden
Sustainable Development	National Strategy for Sustainable development 2030; Existing	Investments in water reuse infrastructure
Sustainable Development	National Strategy for Sustainable development 2030; Existing	Investments in water distribution system
Sustainable Development	National Strategy for Sustainable development 2030; Existing	Investments in climate change adaptation and disaster risk prevention, resilience considering eco-system-based approaches
Sustainable Development	National Strategy for Sustainable development 2030; Existing	Investments in the protection and preservation of nature, biodiversity, and green infrastructure, including in urban areas, and reducing all forms of pollution
Sustainable Development	National Strategy for Sustainable development 2030; Existing	Investments in green-blue infrastructure to increase urban resilience to climate change, restoration of biodiversity, reduction of the carbon footprint, adequate management of water and soil, improved air quality
Transition towards a	Just Transition Mechanism, Jiu Valley Strategy; Existing	Investments in the development of small capacities for production, transport, and

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climate-neutral economy		storage of RES energy for own consumption

Table 9 Stakeholder validated policies for the Jiu CS

Sector that adopts/ implements the policy	Existing vs. desired policy	Policy instrument	Scale of implementation
Water	Existing	Investments in water supply and waste water management networks	National Jiu River basin
Water	Existing	Investments in rehabilitation/modernization of public utilities infrastructure including intelligent metering systems for public utilities services	National Jiu River Basin
Water	Existing	Achieving good ecological status	Jiu River basin
Energy	Existing	Investments for extension of renewable energy infrastructure	National Jiu River Basin
Energy	Existing	Investments in co-generation units based on natural gas for replacement of current lignite capacities	National Jiu River Basin
Food	Existing	Investment for extension of irrigated area	National Jiu River basin
Food	Existing	Subsidies for setup buffer areas along water courses	National Jiu River basin
Ecosystems	Existing	Investment in removing obstacles in the water courses and restoration of riparian habitats	National Jiu River basin
Ecosystems	Existing	Investment in forestation and afforestation	National Jiu River basin
Ecosystems	Existing	Protection of wetlands and of peat bogs	National Jiu River basin

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3.4 Case Study Adige

The design of the Adige policy instruments for the SLNAE started with the CS leads identifying the WEFE nexus performance goals per WEFE sector to be included in the policy packages template. The results of the governance and policy coherence assessment, the policy inventory, the conceptual model, and local news items helped identifying these goals. Linking the WEFE nexus performance goals to the drought of the past few years increased interest of stakeholders to participate in the development of the policy instruments via bilateral meetings and at the NEXOGENESIS workshops.

Subsequently, the policy inventory was used to select the policy objectives and targets associated with the nexus performance goals. Such overview of preliminary sectoral policy goals and instruments was presented during the second stakeholder workshop, held in October 2022. In this setting, the stakeholders were asked to express their preferences and to include any missing goal and instrument. This helped to better define and pinpoint all the potential relevant features to be included in the SLNAE, leading to a preliminary draft of goals and instruments. The Adige river basin is managed by three different administrative entities in Italy, each with different policies and objectives (province of Bolzano, province of Trento, and Veneto region). Therefore, the policy objectives were identified per each administrative region. Some policy objectives were defined only for one part of the basin, but considered relevant for either the entire basin or multiple parts of it. These objectives were added after discussions amongst the CS leads and their colleagues and experts on the Adige river basin. As next step, the CS leads developed numerical targets for the policy objectives. Because the policies included in the policy inventory often did not provide numerical targets, the CS leads prepared policy instruments that were used to consult the key stakeholders to design targets. This occurred either via email or through bilateral discussions.

The final draft of policy goals and instruments resulting from the above-mentioned activities is presented in Table 10. These were presented and validated during the third stakeholders' workshop in early July 2023, resulting in a final list of policy instruments presented in Table 11.

Workshop 3 details

Twenty-seven stakeholders attended Workshop 3, covering all the WEFE sectors (see Table 10**Error! Reference source not found.**). Five stakeholders represented the Autonomous Province of Bolzano while ten the Autonomous Province of Trento; ten stakeholders represented the downstream part of the basin, i.e. the Veneto Region. Some experts represented multiple sectors. The Ecosystem and Energy sectors were slightly less represented.

Table 10 Stakeholder composition for the WS3 of the Adige CS

Participants: total number	Sectors represented			
	Water	Energy	Food	Ecosystems
33	13	5	9	6

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During the workshop, the previously identified policy goals, targets and instruments were presented by the CS lead to the stakeholders in a plenary (see Table 11). The stakeholders were then divided in breakout groups, each balanced across WEFE sectors and administrative areas. At least one moderator from the Nexogenisis project was present in each breakout group. In particular, the participants were asked to vote instruments that could be used to achieve the objectives and targets for each WEFE sector. For each instrument, when available, quantitative targets (either previously provided by stakeholder themselves or found in policy documents) were presented. Stakeholder were also asked to provide clarifications regarding such targets. For the water sector six instruments were previously identified, for food four instruments and for energy and ecosystems only one each, so the discussion focussed more on proposing additional instruments. Each group addressed all the WEFE sectors. For each sector a slide was presented to guide the discussion and to write notes as well as the stakeholder preferences. The results were then reported back to the plenary (including the votes) and discussed jointly. Overall, stakeholder preferences varied from upstream to downstream as well as across different sectors. Since one of SLNAE goals is to foster discussions over policy implementation, most of the proposed instruments were applied to the three sub-areas of the basin, when relevant, although the interest or preference might have been expressed by representatives of one specific area. Therefore, although some stakeholders might be less in favour of implementing specific instruments, having them included in the SLNAE could still be useful to provide an evidence-base, data-driven basis for discussion.

The stakeholder validation process resulted in the validated policy instruments presented in Table 12. The validated policy instruments will be discussed with WP3 and WP4 for modelling feasibility and the goals and targets will be finalized in the coming months once the instruments will be consolidated.

Table 11 Policies presented to the stakeholders at WS3 in the Adige CS

Sector that adopts/ implements the policy	Existing vs. desired policy	Policy instrument	Scale of implementation
Food	Existing	Subsidies to farmers for the adoption of more water-efficient irrigation technologies	South Tyrol part of the river basin
			Trentino part of the river basin
			Veneto part of the river basin
Food	Existing	Incentives for saving water (requires introducing flow meters + Integrated information system)	South Tyrol part of the river basin
Food	Existing		Trentino part of the river basin
Food	Desired		Veneto part of the river basin
Food	Desired	Incentives to farmers for crop conversion	South Tyrol part of the river basin
Food	Desired		Trentino part of the river basin
Food	Existing		Veneto part of the river basin
Food	Existing	Incentives to farmers for using organic fertilizers	South Tyrol part of the river basin
Food	Existing		Trentino part of the river basin
Food	Existing		Veneto part of the river basin
Energy	Existing	Incentives for PV installation	South Tyrol part of the river basin
Energy	Existing		Trentino part of the river basin
Energy	Desired		Veneto part of the river basin
Ecosystems	Desired	Regulations on landscape diversity	South Tyrol part of the river basin

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Ecosystems	Desired		Trentino part of the river basin
Ecosystems	Desired		Veneto part of the river basin
Water	Existing	Adjusting water withdrawal regulation for agriculture (requires: introducing flow meters + Integrated information system)	South Tyrol part of the river basin
Water	Existing		Trentino part of the river basin
Water	Existing		Veneto part of the river basin
Water	Desired	Regulations on construction of new hydropower plants / basins	South Tyrol part of the river basin
Water	Existing		Trentino part of the river basin
Water	Desired		Veneto part of the river basin
Water	Existing	Public investment to construct new multi-functional water reservoirs	South Tyrol part of the river basin
Water	Existing		Trentino part of the river basin
Water	Existing		Veneto part of the river basin
Water	Desired	Integrated information system on salt wedge intrusion	Veneto part of the river basin
Water	Existing	Regulation on status of the minimum ecological flow	South Tyrol part of the river basin
Water	Existing		Trentino part of the river basin
Water	Existing		Veneto part of the river basin
Water	Existing	Regulation on nitrogen and phosphorus for urban water treatment	South Tyrol part of the river basin
Water	Desired		Trentino part of the river basin
Water	Desired		Veneto part of the river basin

Table 12 Policies validated with stakeholders at WS3 Adige CS

Sector that adopts/ implements the policy	Existing vs. desired policy	Policy instrument	Policy document	Scale of implementation
Food	Existing	Subsidies to farmers for the adoption of more water-efficient irrigation technologies	General Plan for the Use of Public Waters (mentioned as PGUAP or GPUPW)	South Tyrol part of the river basin
			PGUAP, Rural Development Plan 2014-2022	Trentino part of the river basin
			Rural Development Plan 2014-2022	Veneto part of the river basin
Food	Existing	Incentives for saving water (requires introducing flow meters + Integrated information system)	PGUAP	South Tyrol part of the river basin
Food	Existing		PGUAP	Trentino part of the river basin
Food	Desired		-	Veneto part of the river basin
Food	Desired	Incentives to farmers for crop conversion	-	South Tyrol part of the river basin
Food	Desired		-	Trentino part of the river basin
Food	Existing		Rural Development Plan 2014-2022	Veneto part of the river basin
Energy	Existing	Incentives for PV installation	Climate Plan - South Tyrol 2040 Provincial Environmental Energy Plan 2021-2030 (mentioned as PEAP)	South Tyrol part of the river basin
Energy	Existing			Trentino part of the river basin
Energy	Desired		-	Veneto part of the river basin
Ecosystems	Desired	Regulations on landscape diversity	-	South Tyrol part of the river basin
Ecosystems	Desired		-	Trentino part of the river basin

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Ecosystems	Desired		-	Veneto part of the river basin
Water	Existing	Adjusting water withdrawal regulation for agriculture (requires: introducing flow meters + Integrated information system)	PGUAP	South Tyrol part of the river basin
Water	Existing		PGUAP	Trentino part of the river basin
Water	Existing		Water Protection Plan	Veneto part of the river basin
Water	Desired	Regulations on construction of new hydropower plants / basins	-	South Tyrol part of the river basin
Water	Existing		Provincial Environmental Energy Plan 2021-2030 (mentioned as PEAP)	Trentino part of the river basin
Water	Desired		-	Veneto part of the river basin
Water	Existing	Public investment to construct new multi-functional water reservoirs	Climate Plan - South Tyrol 2040	South Tyrol part of the river basin
Water	Existing		PEAP	Trentino part of the river basin
Water	Existing		Water Protection Plan	Veneto part of the river basin
Water	Desired	Integrated information system on salt wedge intrusion	-	Veneto part of the river basin
Water	Existing	Regulation on status of the minimum ecological flow	PGUAP	South Tyrol part of the river basin
Water	Existing		PGUAP	Trentino part of the river basin
Water	Existing		Water Protection Plan	Veneto part of the river basin

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3.5 Case study Inkomati-Usuthu

The first step in designing the Inkomati-Usuthu policy instruments for the SLNAE was to create an inventory of relevant policies to the WEFE nexus. These policies were reported in the policy inventory and presented to the stakeholders during the first stakeholder workshop in March 2022. During this workshop, the stakeholders provided feedback on the inventory and suggested additional policies. The CS leads used the updated inventory of relevant policies to narrow down the selection of policy instruments based on whether these policies contained specific quantitative targets, as this would make it easier to integrate them into the SLNAE.

The results of this exercise were presented to the stakeholders during the second stakeholder workshop in October 2022, during which stakeholders were asked to provide feedback on the targets identified for these policies. Moreover, the stakeholders were asked to suggest additional targets not included in existing policies. Based on the stakeholder's feedback from workshop 2, the CS leads refined the list of policies, respective instruments and quantitative targets. The CS leads selected the applicable indicators to ensure alignment between the policies, targets and indicators.

Finally, at the third stakeholder workshop, the stakeholders were informed about he identified policy instruments, and they discussed them and selected the ones they preferred for inclusion in the SLNAE. The goals and targets will be finalized in the coming months. The process resulted in the policy instruments presented in Table 13.

Workshop 3 details

The third stakeholder workshop was held virtually on 5 June 2023. During this workshop the stakeholders:

- were provided a recap of the identified policy instruments outlined in Table 13
- discussed the significance of each policy instrument; and
- selected the preferred policy instruments that would form a set of validated policy instruments to be included in the SLNAE.

Table 13 Policy instruments presented at WS3 to the stakeholders Inkomati-Usuthu CS.

Policy instrument	Sector
Increased tariffs on water services, cross-subsidised with property taxes to fill the operational and maintenance gap (all sectors)	Water
Audits/inspections of non-compliant abstractors (against water use licence issued)	
Routine monitoring of water quality (national, regional and citizen level) to assist in the identification of 'hot spots'	
Assignment of protected area status to surface water Strategic Water Source Areas (SWSAs)	
Investment in reparation of water distribution and treatment infrastructure and in maintenance and monitoring of these systems to prevent leakage.	
Monitoring of water usage to ensure effective water-supply planning, development and operation	
Investments in water reuse infrastructure (e.g. industry, mining, agriculture)	
Facilitate Renewable Independent Power Producer Programme (REIPPP) that encourages renewable energy development	Energy
Investments for cross-border energy transmission infrastructure to support regional electricity connection	

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Policy instrument	Sector
Disincentives (industry/mining/agriculture), such as preferential electricity pricing agreements and carbon pricing/budget, as well as stepped tariffs (domestic) to reduce energy usage	
Sectoral Emission Targets (SETs), which are quantitative greenhouse gas emission targets allocated to an emitting sector or sub-sector, over a defined time period	
Subsidies for small scale community renewable energy production	
Investments to increase energy efficiency (e.g. industry, mining, agriculture)	
Investment in energy grid expansion to integrate renewables	
Subsidise the most expensive input material for production systems that contribute most to food security	Food
Lower input costs where necessary by potentially reducing tariffs based on agreed terms between sector and relevant service providers	
Investments to set up inclusive local food value chains - production of valued agricultural products and nutritious crops	
Subsidies for adoption of more efficient irrigation techniques	
Subsidies for use of eco-friendly fertilisers	
Lower maximum water extraction permits for irrigation purposes	
Budget allocations and grants (public sector funding mechanisms) for protected area institutions to expand on protected areas	Ecosystem
Incentives (fiscal, technical advice and support, management assistance and support) for landowners and communities to enter in contractual agreements to restrict land uses.	
Develop and strengthen economic incentives to encourage appropriate investment by the private sector in biodiversity management and conservation, such as tax incentives, conservation agriculture incentives to farmers and others	
Identification of priority areas for ecological infrastructure and national biodiversity priority areas (including freshwater ecosystem priority areas)	
Investments in nature-based solutions for restoration and co-benefits	

A summary of the stakeholders (in terms of the organisation and sector represented) that attended the third stakeholder workshop is provided in Table 14. A key sector that was underrepresented at the workshop was the energy sector. There were no representatives from the Department of Mineral Resources and Energy, however, the energy sector was represented by South Africa's state-owned power producer, Eskom. Furthermore, the underrepresentation of the energy sector was mitigated by other stakeholders who were tasked to apply a nexus lens when selecting preferred policy instruments, as per the defined goals of the workshop.

Table 14 Stakeholder composition for WS 3 of the Inkomati-Usuthu CS

Stakeholder organisation	Stakeholder sector
Department of Agriculture, Land Reform and Rural Development	Food
Mpumalanga Department of Agriculture, Rural Development, Land and Environmental Affairs	Food/Ecosystem
Department of Water and Sanitation	Water
Glencore Mining	Energy
Mpact	Food
Mpumalanga Tourism and Parks Agency	Ecosystem
MBB Engineers	Water
Department of Forestry, Fisheries and the Environment	Ecosystem

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Stakeholder organisation	Stakeholder sector
Eskom	Energy
South African National Parks	Ecosystem
Association for Water and Rural Development	Water
Endangered Wildlife Trust	Ecosystem
White River Irrigation Board	Water
RCL Foods/Inkomati Irrigation Board	Food/Water
South African National Biodiversity Institute	Ecosystem
Komati Basin Water Authority	Water
Inkomati-Usuthu Water Management Agency	Water
Agricultural Research Council	Food
Mpumalanga Agriculture	Food
University of KwaZulu Natal	Water/Energy/Food/Ecosystem
National Planning Commission	Water/Energy/Food/Ecosystem

During the third stakeholder workshop:

- The final WEFE Nexus Policy Inventory was discussed and used to identify a set of policy instruments with the stakeholders. Validation of the policy instruments took place through online break-out rooms:
    - Stakeholders were split into groups of 4-5 people;
    - The case study lead facilitated the break-out rooms with assistance from consortium members from WP1 and WP5;
    - The facilitators guided stakeholders in discussing the policy instruments included in the WEFE Nexus Policy Inventory on a sector-by-sector basis.
    - Stakeholders defined each policy instrument's relevance, trade-offs to other WEFE Nexus sectors and importance; and
    - Based on the discussions, the stakeholders identified 2-3 policies per sector that should be included in the final set of validated policies.
- Following the break-out rooms, facilitators provided feedback in a plenary session on the outcomes of each break-out room.

The results of the third stakeholder workshop were used to define the stakeholder-validated policy instruments selected for implementation in the SLNAE. These policy instruments are presented in Table 15. The targets and relevant indicators associated with the stakeholder-validated policy instruments will be finalised in the coming months.

Table 15 Stakeholders validated policy instruments for the Inkomati-Usuthu CS

Sector that adopts/ implements the policy	Existing vs. desired policy	Policy instrument	Policy document
Food	Existing	Investments to set up inclusive local food value-chains	National Food and Nutrition Security Plan for South Africa (2018 - 2023)

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Ecosystem	Existing	Budget allocations and grants (public sector funding mechanisms) for protected area institutions to expand on protected areas	National Protected Area Expansion Strategy (2018 update - 20 years end 2022)
Ecosystem	Existing	Develop and strengthen economic incentives to encourage appropriate investment by the private sector in biodiversity management and conservation, such as tax incentives, conservation agriculture incentives to farmers and others	National Biodiversity Strategy and Action Plan (2015 - 2025)
		Identification of priority areas for ecological infrastructure and national biodiversity priority areas (including freshwater ecosystem priority areas)	
Water	Existing	Investment in reparation of water distribution and treatment infrastructure and in maintenance and monitoring of these systems to prevent leakage	National Development Plan (2013-2030)
		Monitoring of water usage to ensure effective water-supply planning, development and operation	
Energy	Existing	REIPPP (power purchase program) that encourages renewable energy development	Integrated Resource Plan (2010 - 2030)
Energy	Existing	Sectoral Emission Targets or SETs, which are quantitative greenhouse gas emission targets allocated to an emitting sector or sub-sector, over a defined time period	South Africa's Low Emission Development Strategy 2050 (combines many different policies) (2018-2050)
Water	Desired	Assignment of protected area status to surface water SWSAs	-
Food	Existing	Subsidize the most expensive input material for production systems that contribute most to food security	The Agriculture Integrated Growth and Development Plan (2012
Food	Desired	Subsidies/incentives for adoption of more efficient irrigation techniques	-

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4. Conclusion

As part of the activities of T1.4, this deliverable (D1.3) presented per each NEXOGENESIS CS, Nestos-Mesta, Lielupe, Jiu, Adige, and Inkomati-Usuthu, the stakeholder validated policies (i.e. policy instruments) for the SLNAE along with an illustration of the stakeholder co-creation and validation process. The policy packages template designed by WP1, in collaboration with WP3 and WP4, for the purpose of collecting the policy instruments and all necessary information for integrating them into the SDMs and SLNAE proved to be a helpful tool for integrating CSs analysis of policies, stakeholder policy preferences and WP3 and WP4 technical requirements for integrating the stakeholder validated policies in the SDMs and the SLNAE.

Next steps and further work

In the coming months the CSs will discuss the policy instruments presented in this report with WP3 and WP4 to identify those that are feasible, from a data and modelling perspective, to be integrated in the SLNAE and for which targets and indicators will be defined/ finalized. This process will result in the final set of policy instruments and related targets and indicators to be integrated in the SLNAE and whose impact on the WEFE nexus stakeholders will be able to explore through the SLNAE tool. These activities will be reported in D3.4, D3.6, D4.2, D4.3 and D4.4.

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References

Hüesker, F. Sievers, E., Mooren, C.E., Munaretto, S, Canovas, I., La Jeunesse, I., Cirelli, C., Mounir, K., Madigal, J., Scheier, S. Müller, A. &T. Avallan (2022). *Stakeholders' co-creation approach for WEFE nexus Governance,* UFZ, Leipzig,Germany

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Dear Project Officer and Reviewers,

We would like to express our gratitude for the constructive feedback on Deliverable 1.3. We were pleased to note that the reviewer agreed the deliverable meets the requirements outlined in the Description of Action. However, the reviewer requested additional information regarding the process of designing the policy package and suggested specific points for improvement. These suggestions are detailed in the table below. The left column lists the reviewer's feedback, while the right column provides the authors' responses. In the revised version of the deliverable changes are shown with green text.

Following these revisions, we believe the deliverable now fully meets the standards for acceptance.

Sincerely,

Caro Mooren & Stefania Munaretto

Comment reviewers	Authors response
#1 Complete the information and analysis on the participation of the SHs in the WSs: This should include the number of SHs that participated, an evaluation of their representativeness, and an assessment of whether there were any missing SHs that could have provided valuable input. This information is essential for substantiating the credibility of the WS outputs	In each case study chapter we added the list of participants and the WEFE nexus sector that they represent and a brief reflection on which stakeholders were missing.
#2 Information should be provided regarding the evolution of the process, with a particular focus on emphasising the significance and value of the co-creation process. This should include details on how the preliminary list of policy instruments developed by the research team was subsequently updated by SHs following each workshop.	In each case study chapter we provided more detailed information on the co-creation process by: - Providing a list of the original policies brought to the WS3 to discuss with the stakeholders; - How the policies were selected; - Description of the validation process.
#3 It would be beneficial to establish a unified set of requirements applicable to all sectors and next, to identify the sector that has adopted or implemented the policy, as well as the individual or entity responsible for managing this sector in each country. For example, the Nestos pilot does not include the "land management and agriculture" sectors, yet the food sector is present. It should be aligned with the D3.1, where	Thank you for pointing out the discrepancy in terminology between the deliverables. We double checked the terminology used in D1.3 and made sure to align our terminology in all case studies. Concerning the issue of some case studies having land management policies or sustainable development policies in their validated policy instruments, these policies were selected based on the nexus issues present in the river basins and relevance to the stakeholders. We understand how this might be confusing and therefore added an sentence explaining this in the method section see. *"The selection of policy instruments is based on the nexus issues specific to each CS area and reflects stakeholders' needs. As a result, the*

the interlinkage of ecosystems with all nexus elements is not referred to as "agriculture," but only as "food."	*sectors included by each CS and from which these policy instruments originate may vary across CS extending sometimes beyond the traditional WEFE nexus domains. For example, land use policies were found highly relevant in the Lielupe CS and therefore included in addition to the WEFE."*
#4 In the case of existing instruments, it is also necessary to provide a detailed description of the instrument in question, along with a link or reference to it, if available. In order to facilitate the analysis of the Inkomati-Usuthu pilot, it is essential to incorporate a scale. It is essential to elucidate why, in the context of the Jiu case study, agriculture (including adaptation to climate change) is referenced, despite this approach being absent from the considerations of other pilots/sectors.	For the existing policy instruments, we added the name of the policy document that we found them in the table. We provided a separate table with a link to the policy documents. Concerning the comment of scale, we added the scale of the policies for the 4 case studies for which it was relevant for the purposes of the project. The Inkomati-Usuthu, while being a transboundary river basin, is analyzed from a national perspective (South Africa), and therefore the scale of the policies is always national. To clarify this, we added a sentence in the methods chapter: *"The selection of policy instruments is based on the nexus issues specific to each CS area and reflects stakeholders' needs. As a result, the sectors included by each CS and from which these policy instruments originate may vary across CS extending sometimes beyond the traditional WEFE nexus domains. For example, land use policies were found highly relevant in the Lielupe CS and therefore included in addition to the WEFE. Furthermore, the scale at which these policies operate is reported for the 4 CSs for which it is relevant for the purposes of the project. The Inkomati-Usuthu, while being a transboundary river basin, is analysed from a national perspective (South Africa) and the scale of the identified policies is always national."* For the Jiu case study we removed "*including adaptation to climate change"* as it is not relevant for this deliverable. However, as explained above, highlighting climate change in the Jiu policy mix is the direct result of stakeholder expressed needs. It is not relevant to specify it in the policy instruments as climate change is taken into consideration in the climate scenarios developed by WP2 that underpin the entire SLNAE analysis. We removed "*including adaptation to climate change*" from the Jiu case study, as it was not directly relevant to this specific deliverable. The climate scenarios developed by WP2, which account for climate change impacts, provide the necessary context for the SLNAE analysis thus integrating this specific stakeholder feedback.
#5 It would be beneficial to include an annex with supplementary information about each workshop, such as additional images, details about the	We added additional information on the workshops in the main text such as descriptions of the participatory process, methods used etc.

participatory tools used, and other relevant data.	
#6 please, indicate all changes in a clear manner, preferably by using a different colour for the text. It will help to reassess your work accordingly.	All changes are indicated with green text.
#7 It is recommended that the policy instruments identified in the case study and used in the model later on be verified by local experts.	The policies and policy instruments mentioned in this deliverable are already validated by local stakeholders who have expertise in the WEFE nexus domains. We agree that we could have communicated this more clearly. Therefore we added this in both the introduction and executive summary. See "*As part of the activities of T1.4, this deliverable (D1.3) presents the policies (i.e. policy instruments) validated with the stakeholders (local experts) in each NEXOGENESIS Case Study (CS) and an illustration of the co-creation and validation process*." and *"This deliverable presents the template, the stakeholder co-creation process, and the stakeholders (local experts) validated policy instruments."*