The RETOUCH NEXUS project promotes a cross-sectoral Water–Energy–Food–Ecosystems (WEFE) Nexus approach to support a resilient EU water economy. It ensures that water governance considers ecological, social, and economic dimensions, fostering coherence and effectiveness across sectors and governance levels.

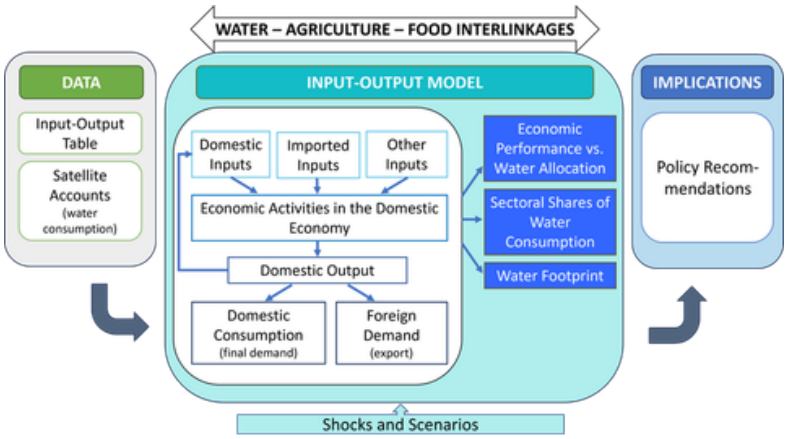
RETOUCH NEXUS
2023 2026

Policy brief | Upscaling of water governance Instruments | Economy-wide water footprint analysis

This policy brief examines methodological approaches to scaling economic instruments and models for water governance.
Case studies are illustrative, and broader application is possible through context-specific analysis.

Introduction: water consumption can be concentrated in a small number of sectors that contribute a relatively modest share of total economic output and employment. However, water is embedded in complex supply chains, so that constraints on one sector (e.g., agricultural water restrictions) propagate indirectly through the food industry, manufacturing, and services via intermediate inputs. Traditional water policy, which focuses on direct water users, often overlooks these indirect, economy-wide effects.

Modelling Approach: environmentally extended input–output (EEIO) analysis can reveal the full picture of water dependencies across an economy, trace virtual water flows through supply chains, and inform targeted, sector-sensitive policy interventions that improve water efficiency without causing disproportionate economic disruption. The approach is particularly relevant for designing policies that integrate water, food, and trade considerations within the WEFE nexus.



Analytical Framework of Environmentally Extended Input-Output Model.

RETOUCH NEXUS CASE STUDIES - LESSONS LEARNED

Scenario 4 – economy-wide water constraint.

% change rel. to baseline	Total economy	Agriculture	Food industry	Manufacturing	Services
Output	-0.02%	-0.07%	-0.62%	0.00%	0.00%
Value added	-0.02%	-0.09%	-1.28%	0.00%	0.00%
Employment	-0.04%	-0.09%	-1.03%	0.00%	-0.03%
Water consumption	-5.00%	-0.08%	-30.24%	-0.04%	-0.65%

RETOUCH NEXUS CASE STUDY

In Slovakia, agricultural output generated ~$2.1 billion in added value (~2% of total) while accounting for roughly 123 million m³ of blue water consumption (~ 29% of sectoral total). Similarly, the food industry generated about $1.2 billion in added value and consumed 69 million m³ of blue water.

Applying an EEIO framework representing the economy with 39 subsectors, plus a blue water consumption satellite account, four scenarios were tested: 1) changes in food demand composition, 2) improved agricultural water efficiency, 3) water-use restrictions in agriculture, 4) economy-wide water constraints. Results show:

- Plant-based foods are less water-intensive during processing, but increase water consumption during production.
- Efficiency improvements yield cost-effective reductions without compromising output.
- Agricultural water restrictions produce concentrated impacts on food processing supply chains.
- Economy-wide water rationing disproportionately affects water-intensive food sectors.

Indicators (data requirements and resulting insights)

- Sectoral water footprints (direct and supply-chain embedded virtual water).
- Water intensity ratios (m³/$ output) by sector.
- Economic output and employment impacts of water policy scenarios.
- Cross-sectoral multiplier effects of water constraints.

Governance mechanisms

- Inter-ministerial multi-stakeholder platforms for dialogue across water, agriculture, environment, and land-use sectors.
- Aligning spatial development and sustainable water-resource management.
- Adaptive management through regular policy reviews with monitoring and stakeholder input.
- Unified, interoperable water data platform for evidence-based decision-making.

Implications for WEFE Nexus framework

- Economy-wide water footprint analysis reveals hidden dependencies and supply-chain vulnerabilities.
- Dietary shifts must be paired with efficiency measures to avoid unintended water-use increases.
- Sector-sensitive water allocation strategies are essential to avoid disproportionate disruptions.
- Water governance reform in Slovakia requires integrated spatial planning and WEFE-aligned incentives.

Potential Economic Instruments

- Subsidies for water retention and regenerative agriculture.
- Tiered tariffs reflecting scarcity conditions.
- Cooperative leasing of water abstraction infrastructure by farmers.
- Carbon–water banks and public–private partnerships for infrastructure and ecosystem restoration.
- Water footprint metrics integrated into food and agricultural policy.

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SCALING OUT

TO INCREASE IMPACT BY REPLICATING A MODEL IN SIMILAR CONTEXTS, PROVIDING FLEXIBILITY, RESILIENCE, AND COST-EFFECTIVE GROWTH, OFTEN FOCUSING ON SHARED FEATURES.

MODELLING STRATEGY

EEIO modelling with water satellite accounts

The EEIO framework is inherently replicable: any country with national input–output tables and water-use statistics can apply the same methodology. Eurostat and international project initiatives provide harmonised data for all EU member states.

Example: Apply the same EEIO framework to other Central and Eastern European economies with similar agricultural water intensity (Czech Republic, Hungary, Poland, Romania) to enable cross-country comparison and EU-level policy recommendations.

Scaling out general framework.

Assumptions & potential Risks:

- Requires national IO tables with sufficient sectoral disaggregation.
- Water-use satellite data may be incomplete or use different definitions across countries.

Mitigation measures:

- Standardise definitions (blue water, virtual water).
- Use harmonised input–output tables (e.g., from Eurostat).
- Develop automated preprocessing tools for all EU member states.

SCALING UP

TO INCREASE THE COVERAGE, SIZE, CAPACITY, SCOPE, OR OUTPUT OF A MODEL TO A WIDER CONTEXT, ESSENTIALLY MAKING IT BIGGER AND MORE EFFECTIVE. IT'S ABOUT GROWING SUBSTANTIALLY, NOT JUST LINEARLY, TO PROVIDE MORE COMPREHENSIVE INSIGHTS.

Scaling up general framework.

ECONOMIC INSTRUMENT

Comprehensive sector-sensitive national water policy framework

Scaling up involves increasing sectoral detail (60+ sector disaggregation), adding multi-regional IO analysis to capture trade flows and transboundary virtual water, and integrating dynamic IO modelling to capture temporal evolution of economic structure and water consumption.

Example: Linking Slovakia's EEIO with neighbouring country models (Czech Republic, Hungary, Austria) to analyse Danube basin-wide virtual water flows and transboundary policy coherence.

Assumptions & potential Risks:

- Multi-regional models require consistent data across countries.
- Computational and methodological complexity increases.
- Political coordination for transboundary policy is challenging.

Mitigation measures:

- Use multi-regional input-output databases (e.g. Exiobase).
- Focus on key bilateral trade flows.
- Engage through existing Danube basin governance structures (ICPDR).

Conclusions / Final Remarks

- **One-size rules fail:** Blanket water restrictions can place high burdens on some sectors, while delivering limited overall savings.
- **Efficiency delivers savings:** Targeted agricultural efficiency measures can deliver significant water savings at low economic cost.
- **Check impacts early:** Policymakers should assess sector-specific effects before applying restrictions.