iea Energy Technology Network
Experts' Group on R&D Priority Setting and Evaluation

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Energy-Water-Ecosystems nexus: reducing transboundary tensions

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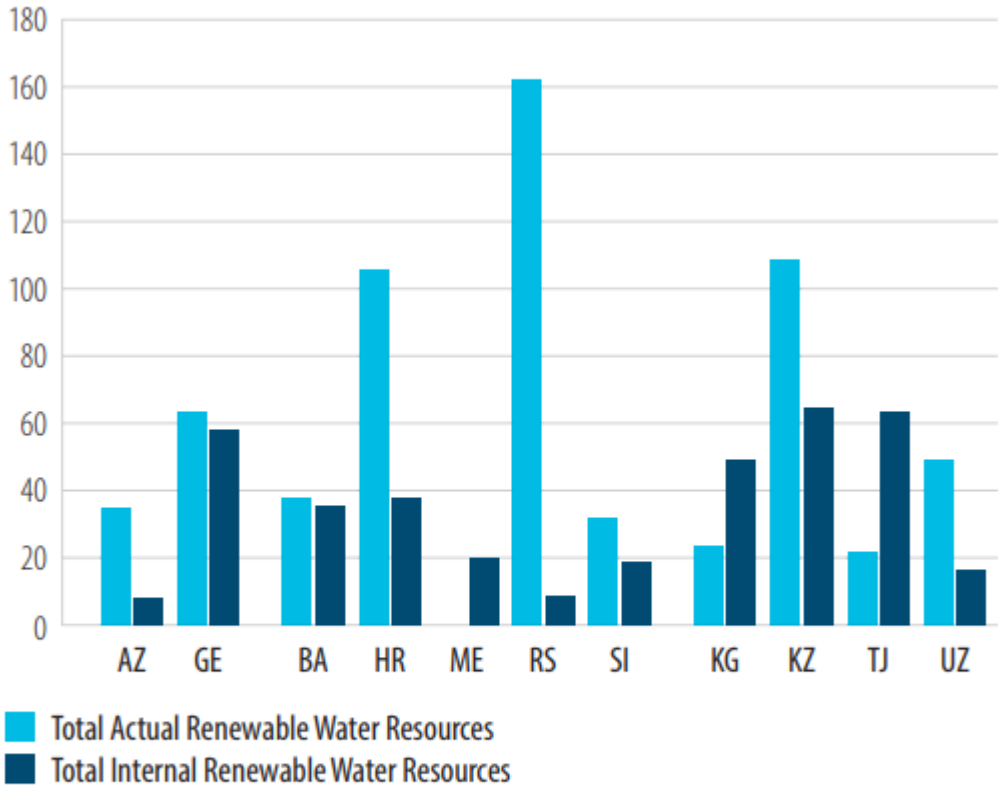
Addressing the energy-water nexus through R&D planning and policies
European Commission DG Joint research Centre

sharing water resources

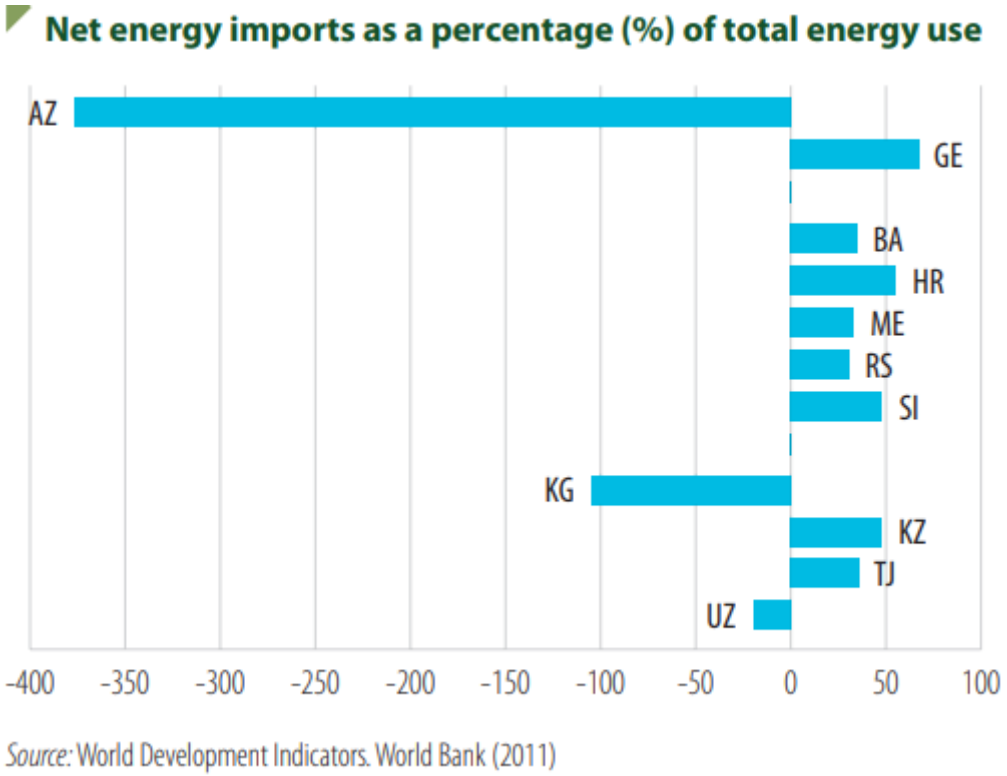
Renewable water resources by country, shown with two different indicators (km³/year)



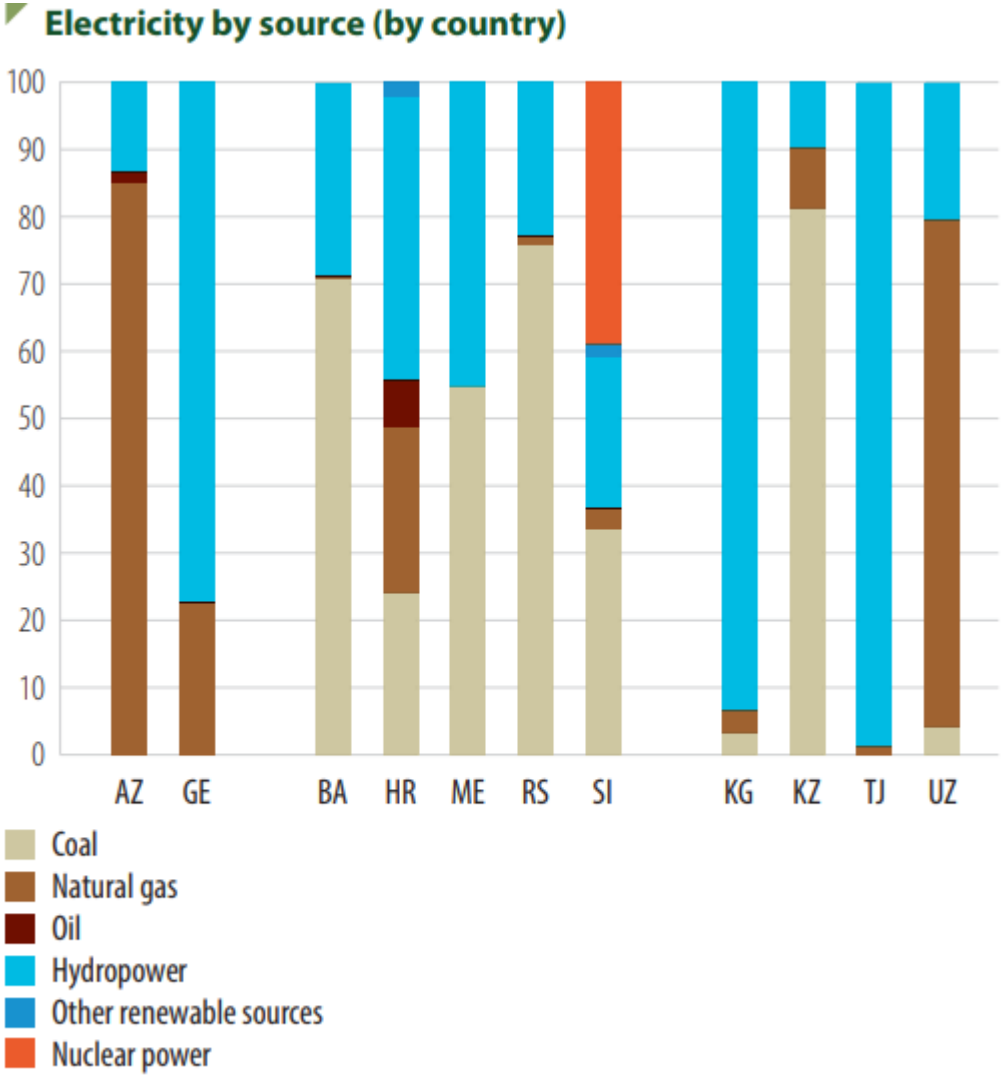
The difference between the values is mainly explained by the Total Renewable Water Resources (TRWR) accounting for inflows and outflows that the country has agreed with neighbours.

Sources: FAO Aquastat country reports, as of 2014. The value for Montenegro is an estimate of renewable surface water resources taken from the Environmental Performance Review of Montenegro, UNECE (2015).

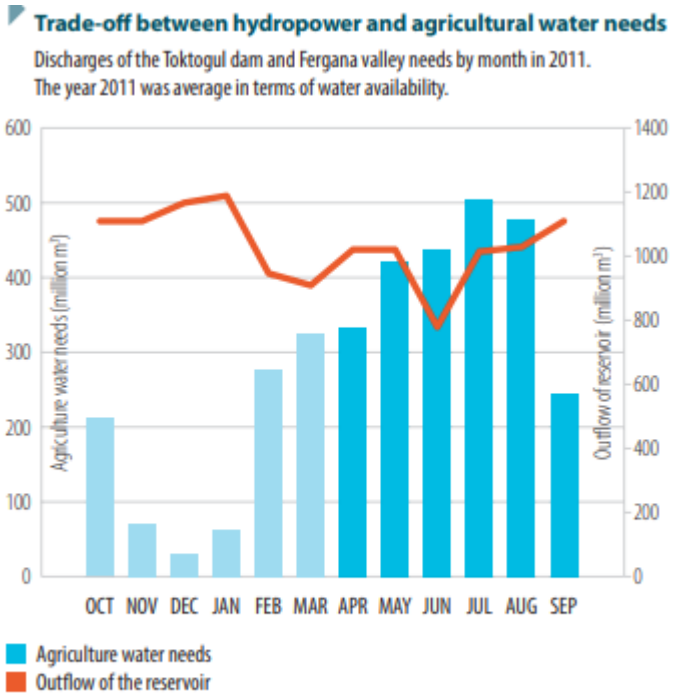
energy trade



hydropower



Source: World Development Indicators. World Bank.



Source: Central Asia Water Info database (ICWC-SIC).

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issues can also be indirectly linked

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Energy production

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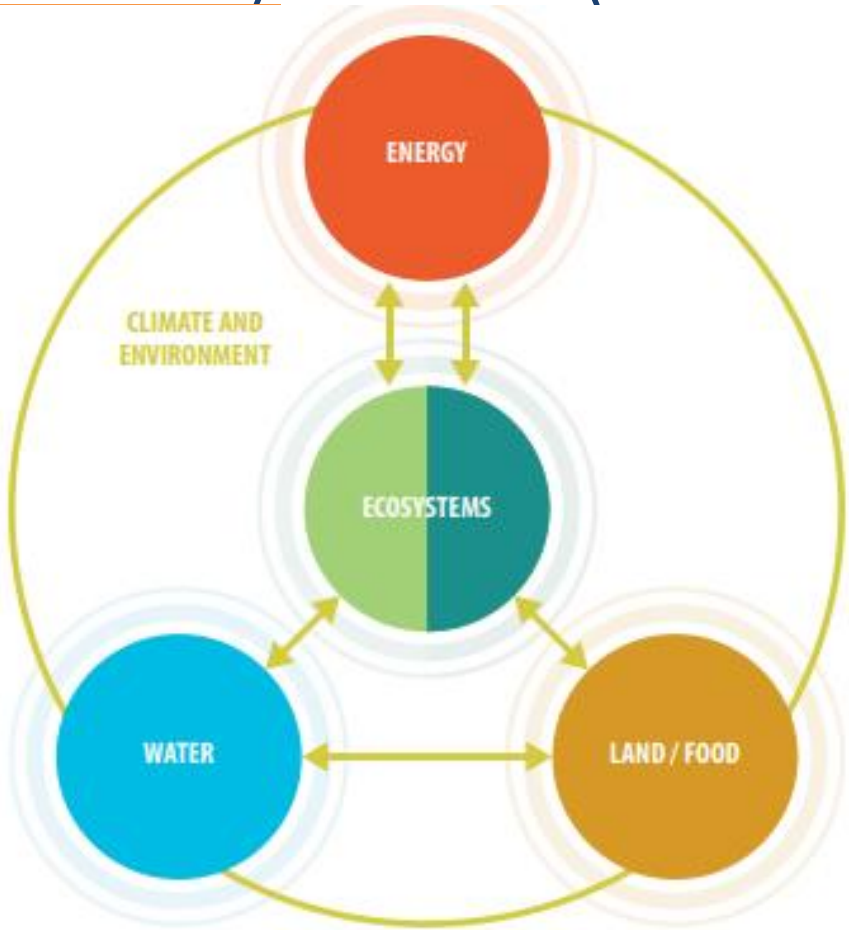
Water supply

Agricultural damage



Ecosystem service

water
capacity

the Water Convention nexus project

Convention on the Protection and Use of Transboundary Watercourses and International Lakes (Water Convention) : A legal and institutional framework for cooperation in water management. UNECE provides the secretariat

–> the Nexus Task Force (2013-).

"Water-Food-Energy-Ecosystems Nexus in Transboundary Basins" (nexus project)

Objectives:

1. Foster transboundary cooperation through identification of
   - inter-sectoral synergies
   - measures to reduce inter-sectoral effects
2. Assist countries in:
   - resource use optimization
   - capacity building
3. Create a platform for dialogue among sectoral stakeholders an international level
4. Provide support to:
   - integration/harmonization of policies
   - inter-sectoral coordination (institutions, actors)
   - RBM planning

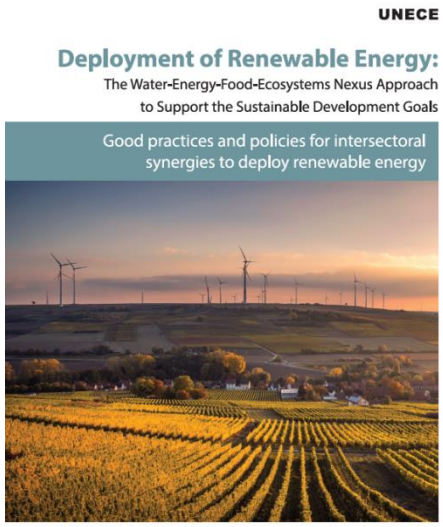
nexus activities UNECE/Water Convention

Nexus project: 6 river **basin assessments** (one aquifer)

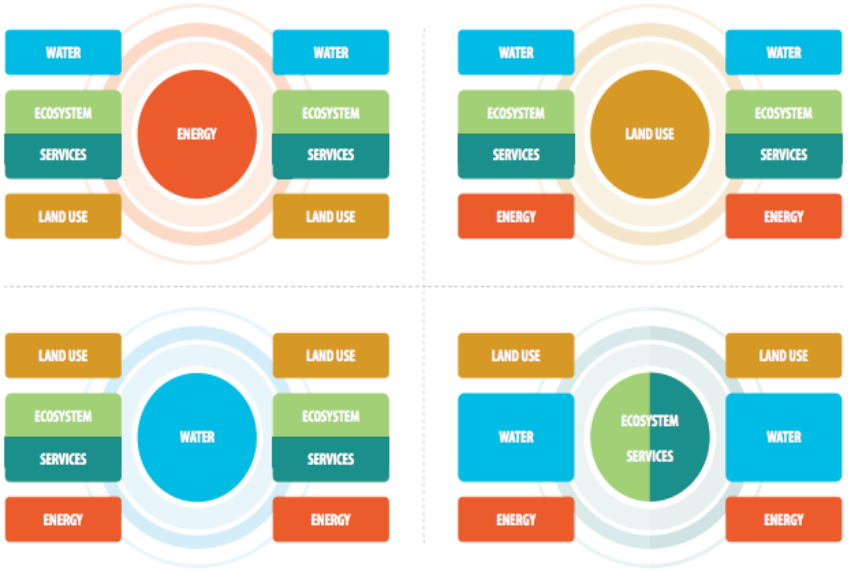
Publications: technical reports, a participatory nexus assessment methodology for transboundary basins, policy briefs

Exchange of experience, science-policy dialogue: e.g. Global Stock-Taking Workshop on Nexus Assessments and Response Measures in Transboundary Basins (Geneva 2016) - reviewed methodologies, tools etc.

Cooperation with other frameworks/organizations to raise awareness about intersectoral impacts and opportunities: work of the Renewable Energy Expert Group (GERE), Fora on Energy for Sustainable Development (Baku 2016, Astana 2017), European Commission-GIZ Regional Nexus Dialogues (Central Asia, Latin America), advocacy related to the SDGs



methodology - pillars



- Participatory process
- Knowledge mobilization
- Sound scientific analysis
- Benefits and opportunities

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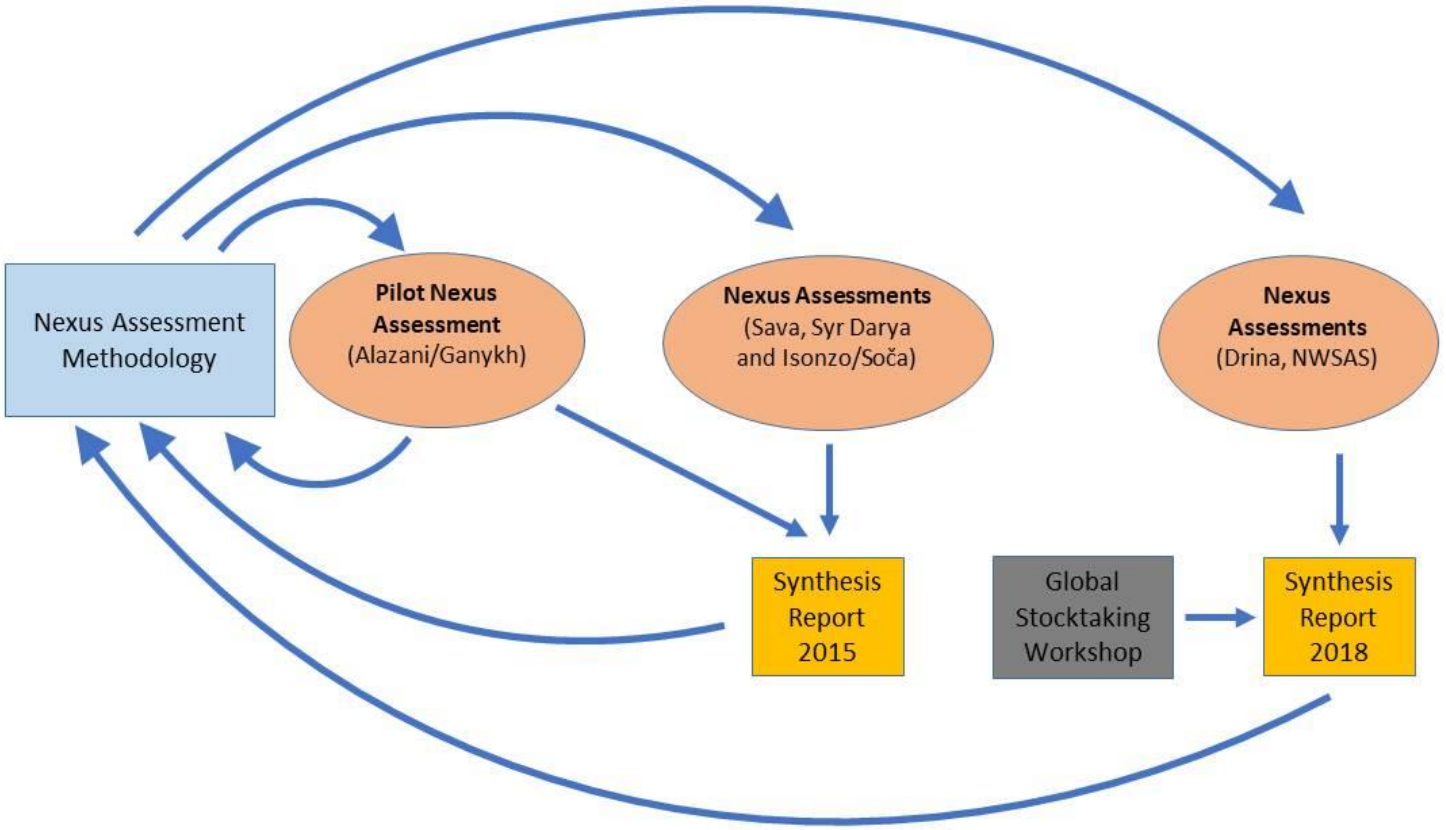
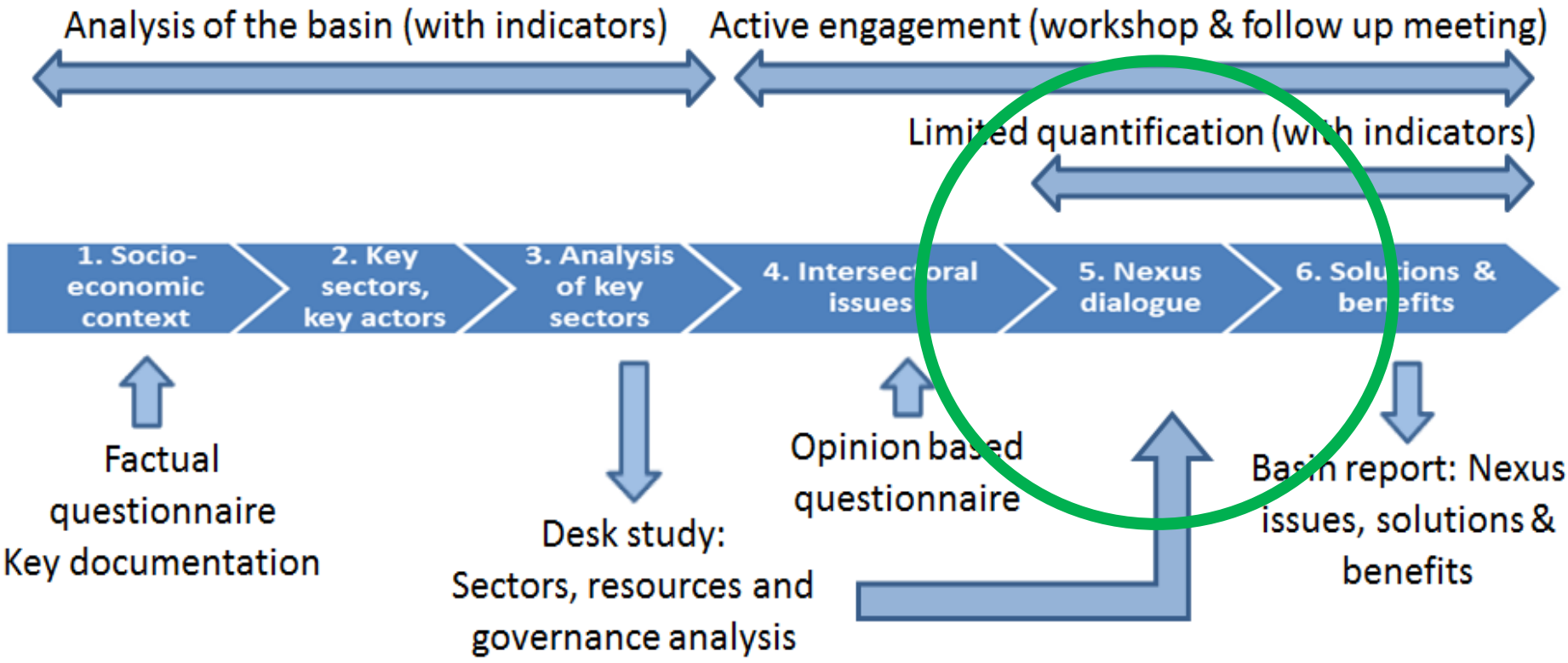
experience so far



analysis of the nexus in a transboundary basin



engaging policy makers and experts in the process

Analysts

Desk study

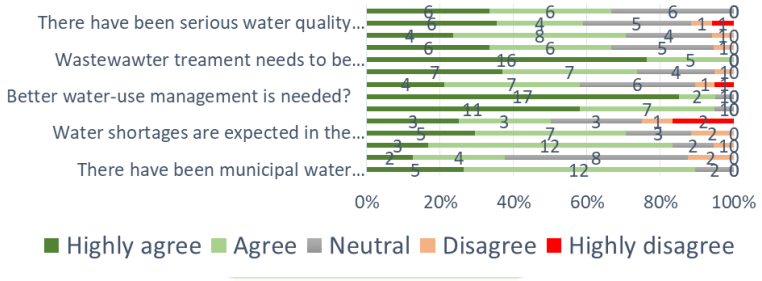
In-depth analysis of issues and solutions

Actions in response to solutions

Authorities and stakeholders

Factual questionnaire Relevant documentation on the basin

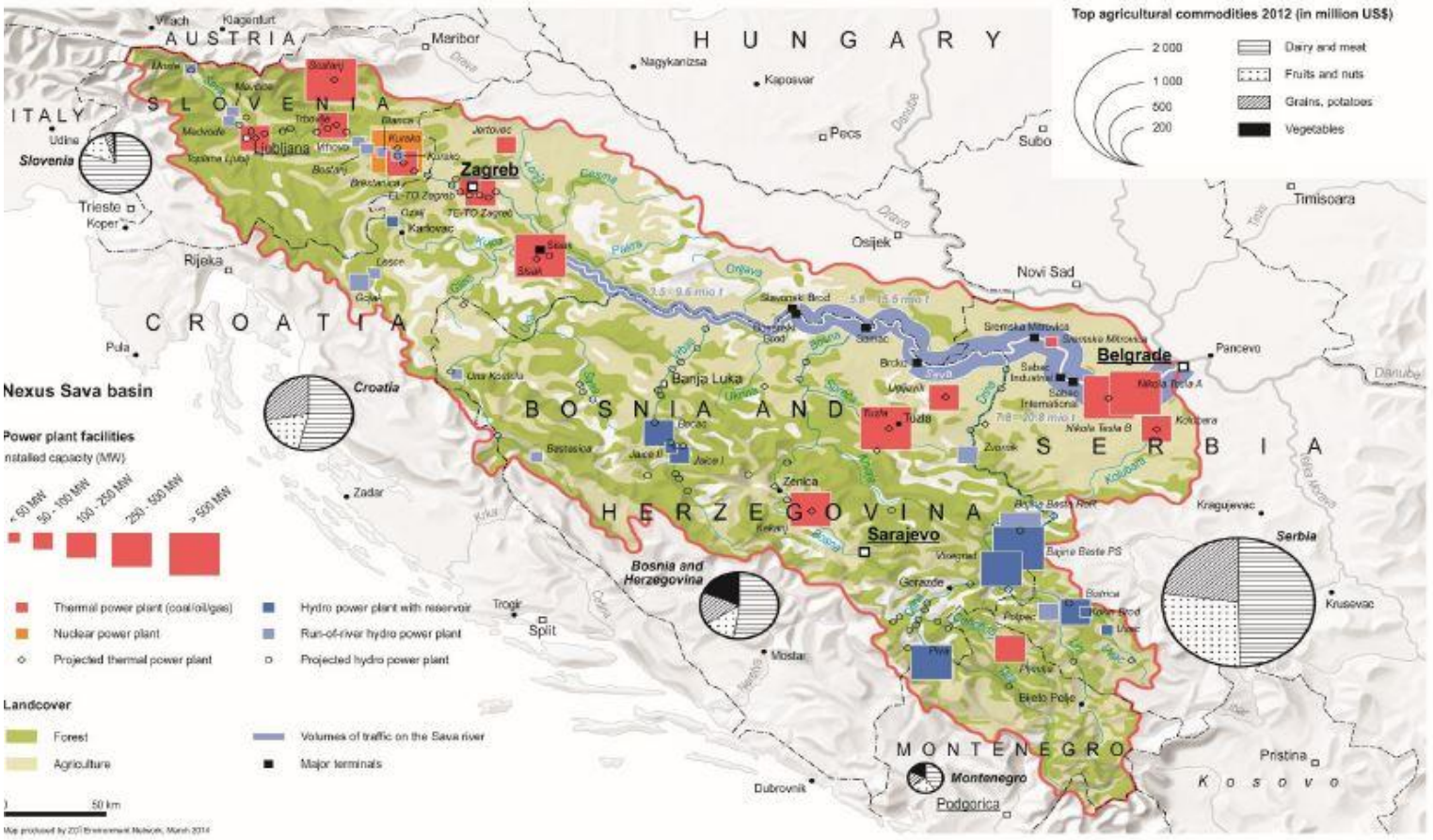
Opinion-based questionnaire



common issues in transboundary contexts

- Challenges in coordinating flow regulation (hydropower operations)
- Reliance on inefficient infrastructure (power plants, irrigation systems, water supply networks)
- Water pollution (from agriculture and municipal waste/wastewater)
- Insufficient water available - particularly for ecosystems
- Degradation of environmental assets (forests, wetlands, fertile soils, etc.)
- Gaps and overlaps in institutional mandates – particularly at basin level
- Incoherence between sectoral policies (conflicting goals, different timelines)
- Difficulties in the implementation of policies and environmental regulation

mapping the nexus



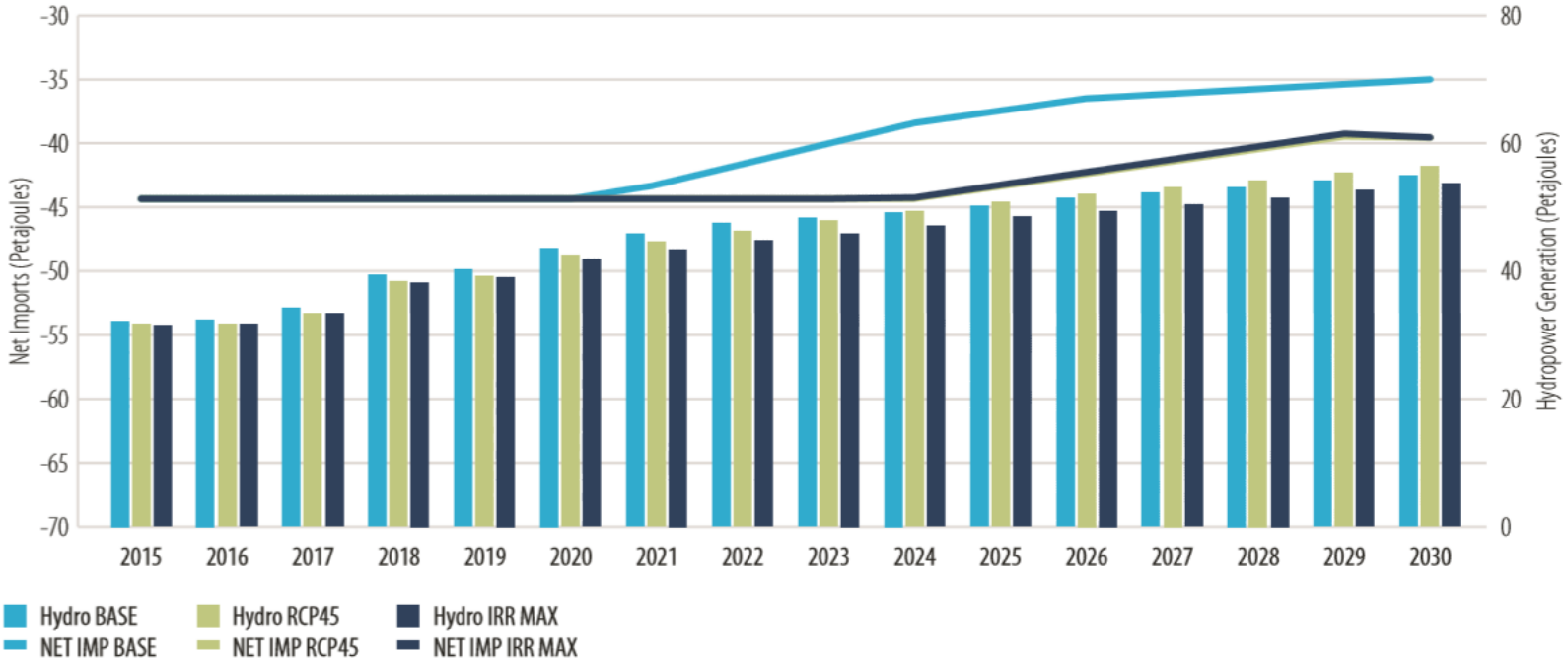
modeling the (water–energy) nexus

Indicative value of water use for hydropower and planned power plant expansions in the Sava Basin

The figure shows the importance of the impact (in terms of additional costs and GHG emissions) of removing 1 m³/s of water from the hydrological system currently feeding the electricity generation system of five riparian countries in the Sava Basin if, instead, the same amount of electricity had to be generated from other sources. Also, the capacities of the existing and planned thermal and hydropower plants in each country are shown as bar charts on the map (MW, with existing capacity in the darker shade).

Annual Wat

ELECTRICITY TRADE COMPARISON FOR BOSNIA AND HERZEGOVINA, ALONG WITH HYDROPOWER GENERATION, FOR THE DIFFERENT SCENARIOS. BOSNIA AND HERZEGOVINA IS FEATURED AS AN EXAMPLE BECAUSE IT IS THE LARGEST NET EXPORTER OF ELECTRICITY.



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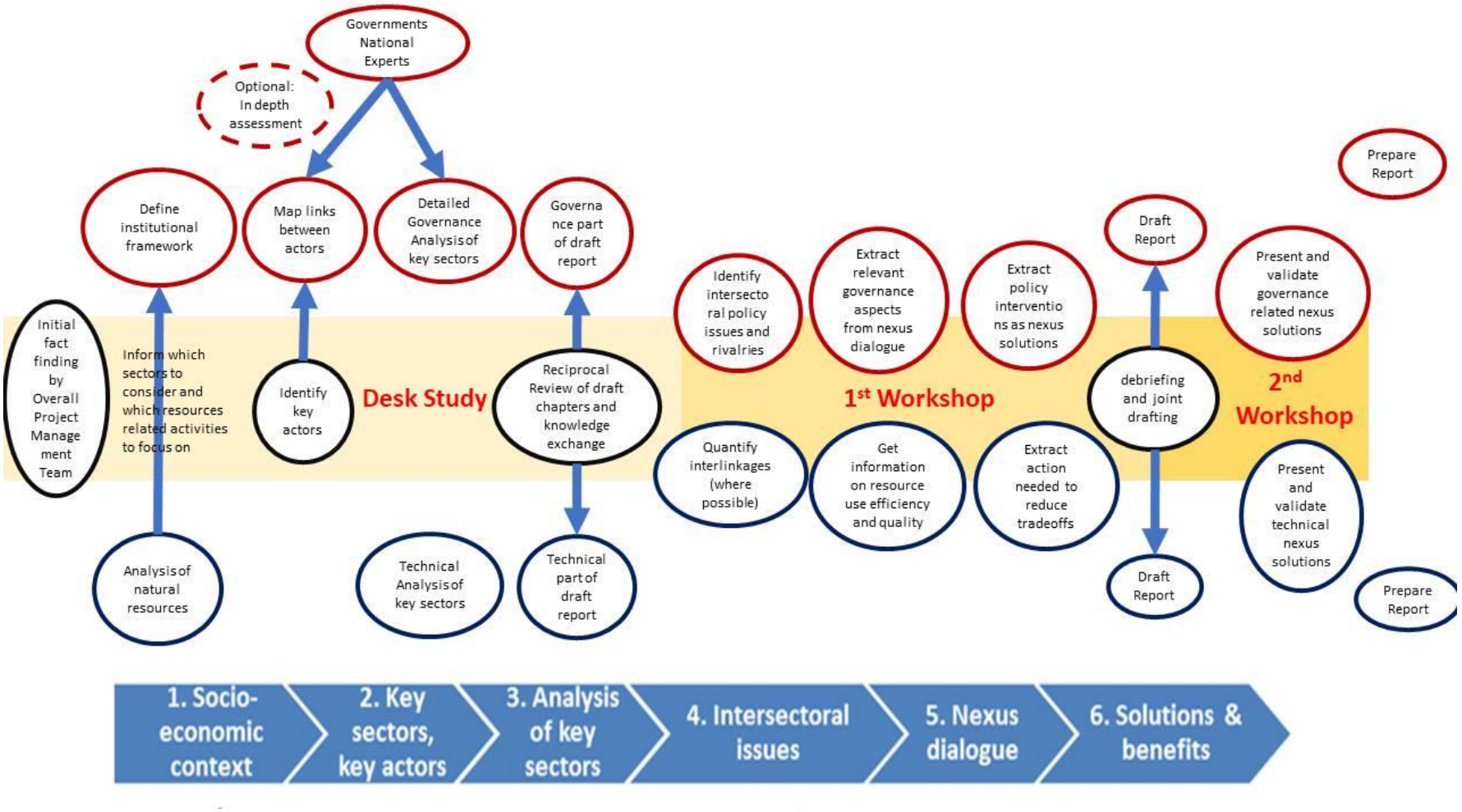
considering governance



various types of cooperative solutions

- **Institutions** (inter-sectoral, multiple level governance, engaging resource users, responsibilities etc.)
- **Information** (multi-sector information to support policy, assessing impacts across sectors, guidelines etc.)
- **Instruments** (mixes of regulatory, economic and information instruments)
- **Infrastructure** - built and natural (investments, operation, multiple use designs etc.)
- **International coordination and cooperation** (sharing information, plans, good practices etc.)

linking solutions to benefits of cooperation

1. identify the benefits of transboundary water cooperation (in a participatory fashion)

2. assess them (through sound analysis)

3. communicate them (through knowledge sharing and dissemination)

advancing with the SDGs

SDGs 2, 6, 7 (Water, Energy, Food) + 8, 13, 14, 15, 17 ?

Intersectoral (nexus) approach to achievement of the SDGs: insights from assessments under the Water Convention

Water is a necessary for provision of sustainable energy for all and for food security, as well as protection & sustainable use of ecosystems.

Transboundary cooperation helps SDG implementation & the Water Convention provides a platform for dialogue, tools/resources, supports to SDG implementation by providing:

- **Insights to understanding sectoral SDGs interdependencies**: Mapping intersectoral governance (across scales); assessing what implications sectoral development plans and targets may have; identifying the trade-offs in managing water, energy, land and ecosystems

- **Jointly identified possible synergic solutions to development challenges**: 5 I's -> possible cooperative ways forward

- **Lessons learned from other basins**: how to ensure broad participation of sectors in a dialogue about balancing development and the environment (platforms); possible solutions to common problems

three key messages

1. **Beyond water and energy: the functioning of ecosystems is central in the transboundary nexus (and agriculture is strategic)**
2. **Cooperation in transboundary basins is necessary to improve overall resource use efficiency, and science can provide evidence for it (but solutions are workable only if their benefits are well understood and clearly communicated)**
3. **Need to improve transdisciplinary nexus research: the analysis of the governance of natural resources is necessary for understanding why nexus issues exist and how they can be overcome**

Thank you

http://www.unece.org/env/water/nexus

UNECE, 2015. Reconciling resource use in transboundary basins: assessment of the water-food-energy-ecosystems nexus. United Nations Economic Commission for Europe.

de Strasser, L.; Lipponen, A.; Howells, M.; Stec, S.; Bréthaut, C., 2016. A Methodology to Assess the Water Energy Food Ecosystems Nexus in Transboundary River Basins. Water 8, 59.