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# Phase II Nexus Assessment for the Drina River Basin

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## Summary



The *Phase II Drina Nexus Assessment* was developed within the framework of the SEE Nexus Project, funded by the Austrian Development Agency (ADA) and implemented by GWP-Med in partnership with the UNECE.

Its main aim is to deepen the analysis of two crucial issues for sustainable development and transboundary cooperation in the Basin, namely:

- The development of the electricity sector in the Basin – and in the riparian countries overall – primarily related to renewable energy and hydropower, and

- Agreeing on key aspects of flow regulation in the Basin, considering all water uses and functions, and progress towards formalising some of these aspects.

THE MAIN FINDINGS OF THESE ANALYSES ARE PRESENTED BELOW.



MODELLING OF THE  
WATER-ENERGY NEXUS IN  
THE DRINA RIVER BASIN



OPCIJE UPRAVLJANJA  
ZA FORMALIZACIJU  
MODALITETA REGULACIJE  
TOKAUBASENUREKEDRINE



A NEXUS ROADMAP FOR  
THE DRINA RIVER BASIN



# MODELLING OF THE WATER-ENERGY NEXUS IN THE DRIN A RIVER BASIN

A key Nexus-related issue identified as one of the most prone to causing friction is the operation of the cascade of dams for hydropower generation, which affects other water uses, the watercourse and water-dependent ecosystems. Effectively addressing potential Water-Energy Nexus issues early on implies avoiding or reducing negative inter-sectoral and environmental impacts across borders. This in turn requires empowering water managers and environment authorities to open and maintain an informed dialogue with the energy sector, including utilities. Such dialogue, especially to the extent it looks into mid- and long-term infrastructure investments, can benefit from a model-based scenario analysis.





A **cost-benefit** analysis of potential policies and investment decisions aimed at supporting renewable energy development in the Drina River Basin, was developed, under varying external conditions. The analysis is based on an open-source model of the electricity supply mix of the three riparian countries, including a detailed representation of cascaded hydropower in the Drina Basin. The model runs a **least-cost optimisation** of the electricity supply and demand outside and inside the Basin up to 2040, determining the supply mix and needed investments for each year. The analysis provides insights on the role that hydro and non-hydro renewables in and outside the Drina River Basin may play in the future electricity supply, under different policy decisions and accounting for different potential climate change impacts.

**Several scenarios** are analysed, each representing potential alternative ways the water-energy system could evolve in the Drina River Basin in the next two decades.



The **Business as Usual** (BAU) scenario works as a reference, where limited action occurs, and it assumes no noticeable climate change occurs. It takes into account currently established policies and committed investments in power supply infrastructure. Since the plans for hydropower development in the Drina River Basin are not fully confirmed, no hydropower development is allowed in the Basin.



A **Hydropower Plant Development** (HPPDev) scenario aims to investigate how the change of hydro vs non-hydro renewable generation in the Drina River Basin would change in the case that new hydropower infrastructure is built. It assumes that three new hydropower plants are to be built, among those for which planning is at the most advanced stage: Buk Bijela, Foča, and Paunci.



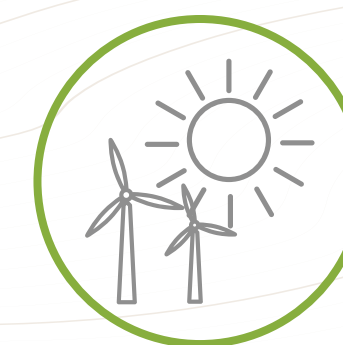
A **Renewables** (RES) scenario investigates the effect of decreasing investment costs in non-hydro renewables on the fuel mix and the emissions of the power system. It is developed starting from the HPPDev scenario and compared with it in the results section.



A **Climate Change** (CC) scenario evaluates the impact of climate change on hydropower generation and the entire electricity mix under different Representative Concentration Pathways (RCP2.6, 4.5 and 8.5). For robustness purposes, this impact is evaluated starting from several different projections of climate variables.



The **Entering the Emission Trading Scheme** (ETS) scenario introduces a carbon taxation scheme, to emulate the entrance of the countries in the ETS. It uses ETS price projections for 2035 and 2040 by the Energy Community (2021) for the Drina River Basin riparians.



The **Ambitious** (AMB) scenario investigates the impact of energy efficiency measures and further technological advancements in non-hydro renewable energy on generation investments and profiles in and outside of the Basin. It applies an annual 0.8% reduction of the electricity demand in each of the riparians, interpreting the European Union's Directive 2012/27/EU on energy efficiency.



## Key findings from the modelling analysis include:

- **The role of hydro and non-hydro renewables is paramount in decreasing emissions**, where their cost is reduced, or policies become more favourable. Total CO<sub>2</sub> emissions per country show a considerable decrease, in the RES, ETS and especially AMB scenarios, compared to the BAU and the HPPDev scenarios (where renewable energy expansion is limited and old thermal plants are mainly replaced by new ones).
- **Non-hydro renewables can be competitive with coal generation but not with hydro generation**. The increased share of non-hydro renewables in the RES, ETS and AMB scenarios does not significantly influence the share of hydro power; it affects coal generation instead, significantly reducing the need for it and making the electricity supply mix overall greener.
- **The establishment of an Emission Trading Scheme would have significant effects on the least-cost electricity supply mix**. The power output of existing thermal power plants will be lower by 80% in 2028, compared to 2020. By 2040, total non-hydro renewables will cover 38% of the total electricity supply.
- **Depending on the assumptions on future climate change trends, very different water flows in model results may be observed** in the short- to medium-term (next three decades) and therefore the impact of climate change on the productivity of hydro power plants cannot be predicted with confidence.

## Some **recommendations** for policymakers can be drawn from this analysis:

- A capacity expansion of renewable energy technologies facilitated by policy, will be cost-competitive compared to coal-fired generation and allow significant reductions of CO<sub>2</sub> emissions, under two alternative assumptions: reductions in capital investment costs of non-hydro RES technologies, or the implementation of an Emission Trading Scheme. Therefore, more room should be given to joint discussions between the riparians regarding the potential role of non-hydro RES as a *cost-competitive* low-carbon supply option.
- The technical feasibility of a system with high shares of non-hydro RES should be studied in detail, jointly with the integration of transmission infrastructure. High shares of non-hydro RES could be feasible where the electricity transmission infrastructure across the broader region becomes more integrated.
- If power system developments follow the current policies assumed in the BAU scenario, there is a risk of technological lock-in, in particular if a carbon border tax adjustment mechanism is implemented at EU level. Making plans for expansion of such generation exposes the countries to the risk of locking into infrastructure that is not the most cost-competitive and could become stranded in the mid-term, before its end of life. Furthermore, keeping high reliance on thermal power, even if old power plants are replaced by new efficient ones, would not allow significant reductions in emissions.
- Hydropower plant and dam investments have a lifetime that is comparable with longer-term climate change projections, so it is necessary to investigate potential risks for the investments in the long range, to avoid lock-in into potentially unprofitable electricity supply mixes.





# GOVERNANCE OPTIONS FOR THE FORMALISATION OF FLOW REGULATION MODALITIES IN THE DRINA RIVER BASIN

The study on flow regulation in the context of the Phase II Drina Nexus Assessment further explored and promoted discussion about formal flow regulation mechanisms between countries (agreements, protocols, discharge/operation rules, etc.), highlighted good practices in transboundary water allocation taking into account approaches to environmental and minimum flow as well as clauses for hydrological extremes, and laid out some possible directions to help the Drina riparian countries in further development of their cooperation.





The study was based in part on interviews with representatives of key institutions for their perspectives and up-to-date policy developments and management practices, and was developed in consultation with the Drina Expert Group on Flow Regulation and Environmental Flows, building up on UNECE's "Desk Study on Environmental Flows and Flow Regulation in the Drina River Basin" (2020).

The study looked at inconsistencies in the governance of the Drina River Basin in comparison with the obligation of Parties to the Water Convention to establish appropriate joint bodies based on principles of "equality and reciprocity" to implement the Convention. The report analysed alternative ways to further develop the institutional and legal arrangements to cover the Drina Basin through an improved international cooperation that is inclusive and effective.

Several steps are recommended to be implemented at **national level** in all Drina countries, in order to advance their cooperation in the field of flow regulation:

Integration with national Disaster Risk Reduction planning (Sendai Framework)

Expanded scope of transboundary SEAs with respect to relevant plans, programmes and policies on a pilot basis. Renewable energy planning with state-of-the-art SEAs

Better integration in planning, with inter-sectoral exchange of information, including through national structures or arrangements for continuous coordination of activities

Coordination of national level permitting process as a means of implementing basin-wide consensus, through integrated permitting in conjunction with periodic SEAs (i.e., upgrading permitting procedures and relevant legal and institutional context in order to ensure optimal realisation of basin-wide coordinated policy outcomes)

In consideration of the number of matters related to the **joint transboundary management** of the river basin including flow regulation, the study recommends convening a meeting with participation at a high political level, capable of adopting decisions or initiating steps towards them. All existing cooperation frameworks should be taken into account in organising and conducting such a high-level meeting, with full consideration given to activities supported or

implemented under the Framework Agreement on the Sava River Basin (FASRB) and its protocols and related policies. It would be beneficial if the technical expert groups continue to make progress on priority issues pending the organisation of the high-level meeting, thus enabling a more precise formulation of the agenda of the high-level meeting based on those matters that are of primary interest or concern to the countries.



Such a **high-level meeting** could discuss and adopt decisions on the following issues:

a. **Integrated river flow needs assessment.** The meeting, also taking stock of the outcomes of recent and ongoing projects, could define the terms of an integrated river flow needs assessment, which could include:

- I. Baseline study on the historical flow regime (i.e., pre-channelisation, in relation to e-flows and biodiversity)
- II. Basin-wide flow requirement studies for different uses, e.g., drinking water, fish harvest (wild and farmed), recreational boating, biodiversity, flood protection,” hydropower operations
- III. Analysis of downscaled climate change impact studies for a range of climate scenarios
- IV. Expert-level cooperation on e-flows and other methodologies and assessment tools
- V. Evaluation of existing infrastructure and development, where appropriate, of re-mediation plans and strategies (e.g., to address impacts on species and biodiversity)

b. **Drina Platform on Flow Regulation.** The meeting could establish a Drina Platform on Flow Regulation, which would coordi-nate the needs assessment and also cover the following areas:

- I. Data quality and quantity, verification and comparability, information sharing.
- II. Taking into account all progress made in connection with the establishment of Sava GIS/ HIS, this could lead to a protocol on Data Exchange related to outcomes of the GEF project.
- III. A technical expert working group based on the existing Expert Group on Flow Regulation and E-Flows could be established to align methodologies that are used in different areas, such as e-flows, and to address identified problems such as shortcomings in taking into account cumulative impacts from multiple HPPs on e-flow requirements
- IV. Monitoring capacities, DRR – rapid communication (taking into account FASRB work, especially in flood management and control)
- V. Direct links across borders for related authorities and stakeholders
- VI. Coordination in practice (MOUs, Rulebooks, etc.)
- VII. Sharing costs and benefits
- VIII. Transboundary impacts
- IX. Climate regime – enhanced understanding of interactions and drivers of risk due to climate change, including impacts on quantity and quality of water, mitigation and adaptation measures
- X. Respect national priorities and uses





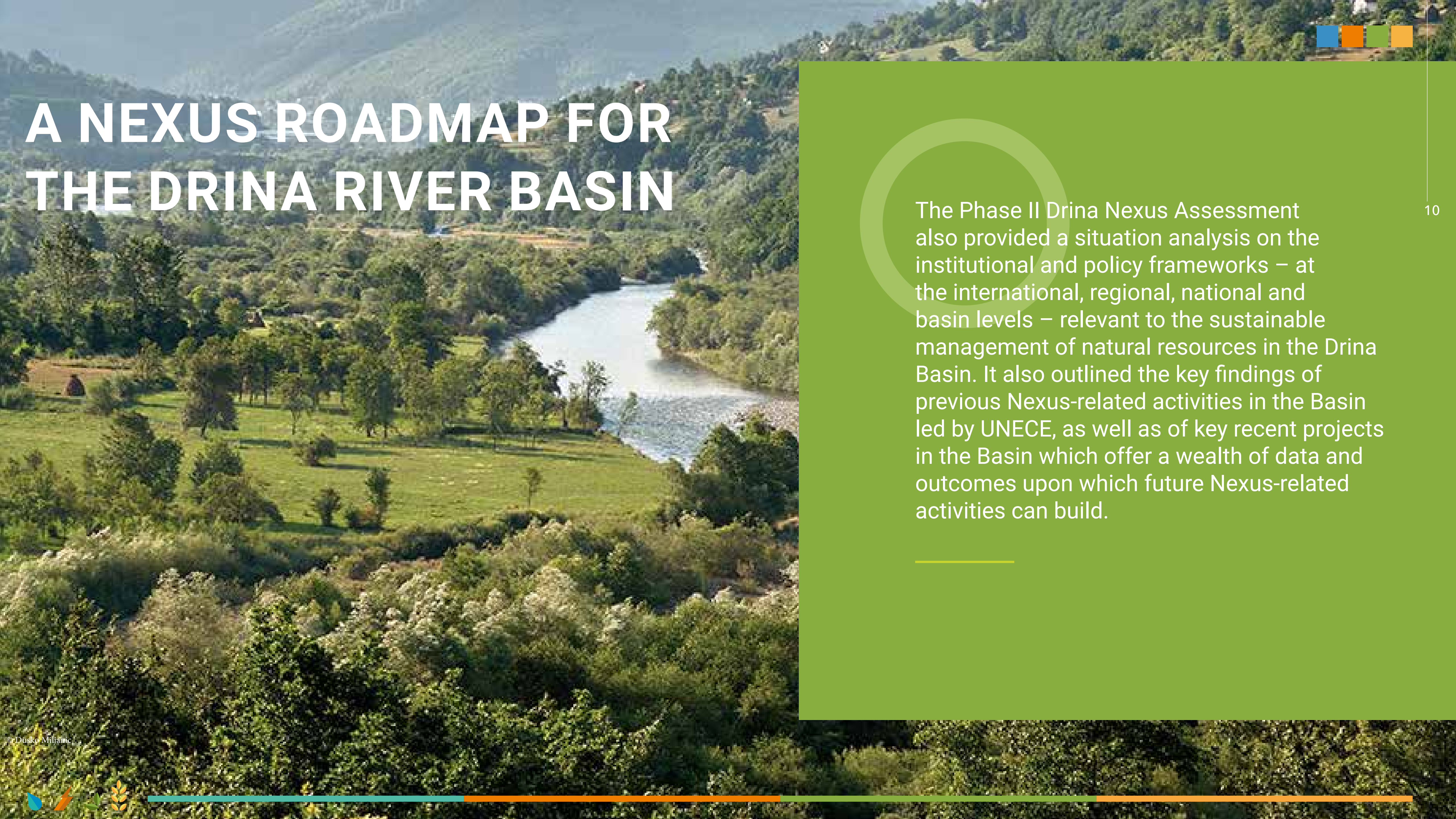
c. **HPP Platform.** The meeting could establish a HPP platform to adopt and endorse the DRB hydropower optimisation plan (WB project) at a high political level. It could cover some or all of the following issues:

- I. To discuss an energy agreement (including all Riparians) on HPP in the DRB as a platform for action plans, incorporating cost and benefit sharing. Should there be a transboundary hydropower agreement for the Drina Basin?
- II. Alternatives to further expansion of hydropower also to be discussed, entailing coordination with institutions and agencies responsible for the power sector, as well as related strategies and plans on renewable energy, climate change mitigation, etc.
- III. Participation and liaison with the technical expert working group established under the Drina Platform on Flow Regulation, particularly with respect to cumulative impacts from multiple HPPs on e-flow requirements.
- IV. How to incentivise trading electricity, or balances, to facilitate better cooperation between HPPs.
- V. Review of operational rules leading towards harmonisation.
- VI. Coordination among HPPs on flood protection, sediment management.
- VII. Balancing of HPP requirements dependent on other water management goals.
- VIII. Monitoring of SEA processes, coordinated and linked plans for hydropower development.

- d. Commitment to **coordination of permitting processes** on all levels as a means of implementing basin-wide consensus. Improved implementation and enforcement.
- e. A process (for example, a committee) to mark progress and assist, where appropriate, the efforts of the riparian countries in bilaterally resolving “**legacy**” issues (e.g., liability for past flood damage).
- f. Taking into account the outcomes of the GEF-SCCF project, and in concert with the 2nd Sava River Basin Management Plan (RBMP), making **progress towards the development of a Drina RBMP**.
- g. May recommend, as appropriate, **bilateral agreements or arrangements on specific matters**.







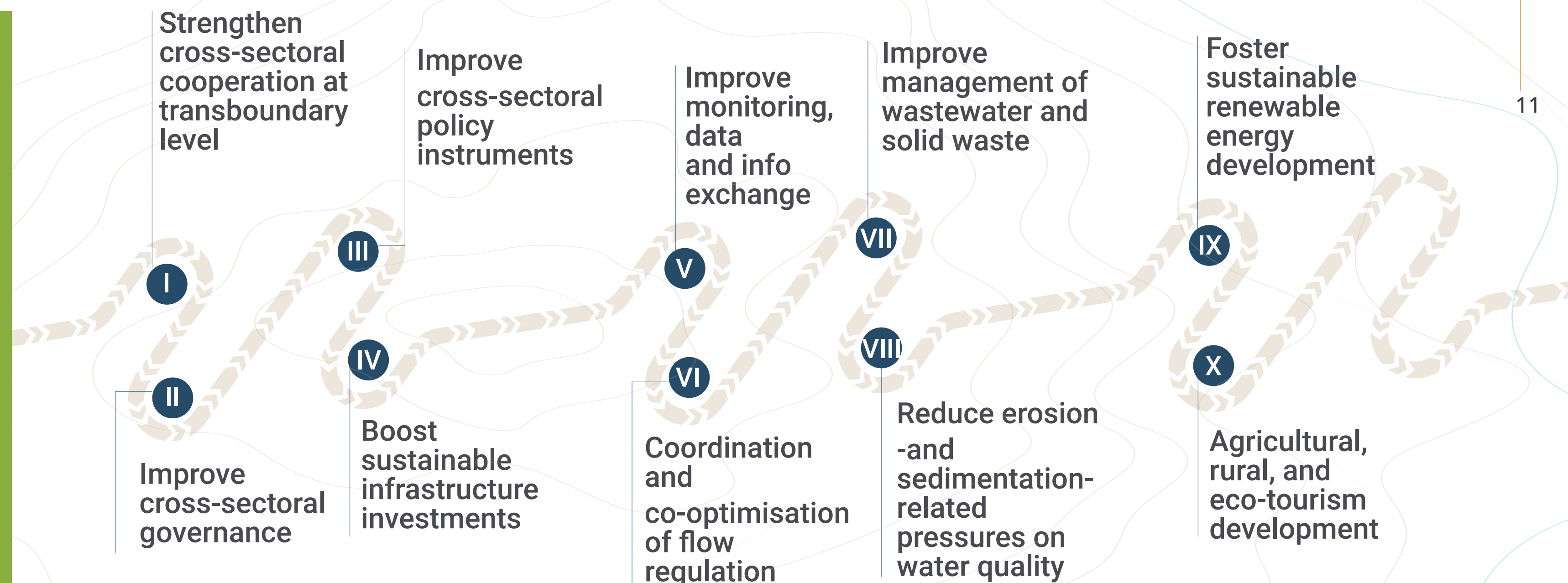
# A NEXUS ROADMAP FOR THE DRINA RIVER BASIN

The Phase II Drina Nexus Assessment also provided a situation analysis on the institutional and policy frameworks – at the international, regional, national and basin levels – relevant to the sustainable management of natural resources in the Drina Basin. It also outlined the key findings of previous Nexus-related activities in the Basin led by UNECE, as well as of key recent projects in the Basin which offer a wealth of data and outcomes upon which future Nexus-related activities can build.





Stemming from this analysis and the findings of the Phase II Drina Nexus Assessment, a *Drina Nexus Roadmap* was prepared, structured around the following 10 objectives, and suggesting main lines of action in order to achieve them.



The Roadmap is considered a “living” document that the riparian countries will have the opportunity to adjust during its implementation, as needed, by discussing among themselves, and agreeing upon detailed actions, timeframes, and budgets as they consider appropriate.

The Drina Nexus Roadmap was approved by the Steering Committee of the Nexus Activities in the Drina Basin, consisting of representatives from the related Ministries of the riparian countries.





The “**Phase II Nexus Assessment for the Drina River Basin**” was prepared within the framework of the project “Promoting the Sustainable Management of Natural Resources in Southeastern Europe, through the use of the Nexus approach” financed by the Austrian Development Agency (ADA), the operational unit of Austrian Development Cooperation, and implemented by Global Water Partnership-Mediterranean (GWP-Med) in partnership with the United Nations Economic Commission for Europe (UNECE).

