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Integrated resource assessment of the Drina River Basin

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The integrated assessment and management of resources: water, energy, food and environment is of fundamental importance, yet it is a very challenging task especially when it is carried out on the transboundary level. This study focuses on the Drina River Basin (DRB) which is a transboundary basin in South East Europe spreading across Bosnia and Herzegovina, Serbia and Montenegro with a total surface area of 19,982 km2. Water resources from the Drina River Basin are shared among many activities in the basin: domestic water supply, electricity generation, fishery, tourism and, to a lesser extent, irrigation, industry and mining. The region has recently experienced repeated events of floods and droughts causing significant damage to the economy, showing a high vulnerability of the area to the effects of climate change. The assessment of the Drina River Basin is carried out in the framework of the project "Water food energy ecosystems nexus in transboundary river basins" under the UNECE Water Convention.
This study aims to: 1) Improve the cooperation in the operation of dams and hydropower plants in the DRB for optimized production; 2) Explore the opportunities generated by electricity trade between the DRB countries as a mechanism to enhance cooperation and as an enabler for the synchronised operation of hydropower plants; 3) Motivate the implementation of energy efficiency measures to reduce the electricity production requirement from hydro and thermal power. In order to achieve that, a multi-country electricity system model was developed for the three countries of Drina river basin using the Open Source energy MOdelling SYStem (OSeMOSYS). The model represents the whole electricity system of each country, with special cascade representation of hydropower plants along Drina river and its tributaries.
The results show that, in a scenario of synchronised operation of all power plants along Drina and its tributaries, those downstream can significantly increase their production, without the electricity generation upstream being compromised. Optimising the use of flow-regulation infrastructure could help minimise the negative effects of high or low water flows, thus providing not only flood response but also more efficient hydropower generation. The coordination of different sectors would help in better defining and ensuring environmental flows, taking into consideration the needs of ecosystems and communities. Furthermore, the reduction of electricity demand –due to the implementation of energy efficiency measures- would have a higher impact on reducing the stress on thermal (coal) power plants in the three countries. Finally, the analysis shows that all the three countries have potential to increase trade between themselves and with the other neighboring countries. To which extent, it depends on the electricity surpluses generated by hydro and coal. Improved cooperative management of hydro power plants and water flows as well as effective implementation of energy efficiency measures are proven to increase the electricity surplus.