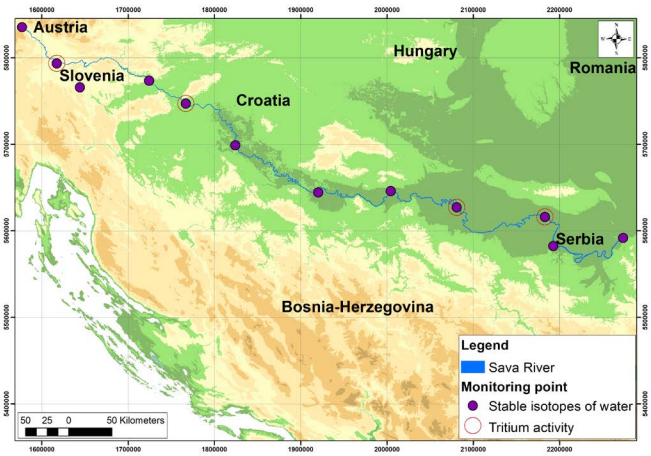
Groundwater – Surface Water Interactions and Influence of Climate Change on Water Resources in the Sava River Basin

A case study under **IAEA TC Project RER7013** – Evaluating Groundwater Resources and Groundwater – Surface Water Interactions in the Context of Adapting to Climate Change

Slovenia, Croatia, Bosnia and Herzegovina, Serbia

Case Study Focus

Investigating the influence of climate change on groundwater resources in the Sava River basin



Monitoring sites in the participating countries along the Sava River

The opportunity

The Sava River Basin (SRB) has a catchment area of ~98,000 km^2 and is one of the major recharge areas for the alluvial aquifers in the Danube River basin, particularly in the transboundary upper part of the watershed in Slovenia and Croatia. However, details of the interactions between the Sava River and groundwater are not yet well understood. A closer study of the Sava River is important because it serves as a natural border between Croatia and Bosnia and Herzegovina, and many of its associated groundwater bodies have important transboundary characteristics. Isotope investigations have the potential to better delineate the influence of climate change on water resources in the SRB and to consequently help identify and implement measures for their sustainable management.

The proposal

Precipitation, surface water and groundwater sampling, and analysis of environmental isotopes (hydrogen and oxygen stable isotope ratios and tritium activities) and other parameters will be used to determine the hydrological and hydrogeological conditions in the river basin. The case study participants will form an international working group whose primary goal will be to establish new Global Network of Isotopes in Precipitation (GNIP) and Global Network of Isotopes in Rivers (GNIR) monitoring stations and a long term oriented framework for isotopic investigations in the SRB.

Partners: Faculty of Mining, Geology and Petroleum Engineering, University of Zagreb, Croatia; Geological Survey of Slovenia, Slovenia; Slovenian Environment Agency, Slovenia; Jožef Stefan Institute, Slovenia; Geological Survey of Federation of Bosnia and Herzegovina, Bosnia and Herzegovina; Geological Survey of the Republic of Srpska, Bosnia and Herzegovina; Faculty of Sciences, Department of Physics, University of Novi Sad, Serbia.

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Pumping a groundwater well close to Radovljica, between the Julian Alps and Karavanke Mountains. (Photo: Nina Rman)

Groundwater – surface water interactions will be characterized in the different parts of the SRB and the parts of the river with a higher influence on groundwater resources will be identified.

Sampling campaigns started in 2021 and will last for a minimum two hydrological years. Nine monitoring sites have been established in Slovenia, Croatia and Serbia (three in each country) and two in Bosnia and Herzegovina. Precipitation, surface water and groundwater will be sampled at these 11 locations.

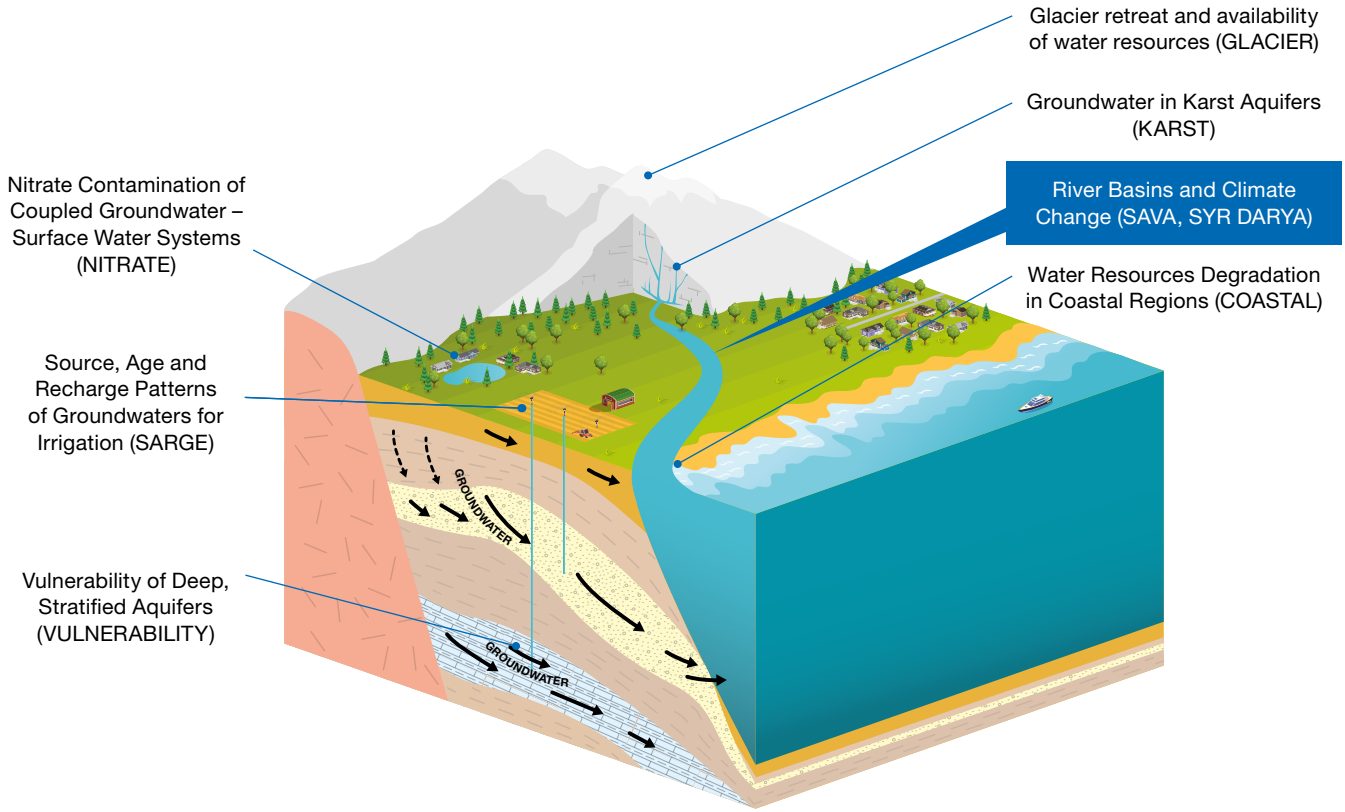
As well as conducting sampling for isotope analysis, different meteorological, hydrological and hydrogeological data will be collected for evaluation and interpretation at each station. In addition, a GIS database will be established under the framework of the project.

The benefits

A better understanding of groundwater – surface water interactions will contribute to more effective integrated water resource management in the SRB. Long term hydrological and meteorological data will be coupled with this recent study to determine the hydroclimatic variations in the basin and their impact on water availability and water use. Fluctuations in precipitation and in river and groundwater levels will be analysed and compared to the seasonal and continental isotope effects observed in precipitation, river and groundwater.

Based on the observed intensity of groundwater – surface water interactions, the spatial areas showing greater resilience to climate change or anthropogenic impacts will be assessed. This information is also important for the new planning of hydropower plants on the Sava River.

The case study will also contribute to general education and capacity building around groundwater, as the results will be widely disseminated through a series of workshops, meetings and conferences, as well as the publication of scientific articles.



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