Realm: Freshwater | **Biodiversity threat:** Nutrient pollution; Change to morphology; Chemical pollution | **Stakeholders/sectors:** Environment, agriculture, water supply, sanitation, flood protection | **Strengths:** Integrative policy objectives; Modelling; Biodiversity indicators; Maps

Case Study 7 Biodiversity management for rivers in the Swiss Plateau

Prioritising ecosystem restoration:

Freshwater ecosystems in the Swiss plateau are threatened by multiple stressors that deteriorate water quality and hydromorphology. This is the result of channelization, dams, wastewater, and agriculture, among other causes. To restore these ecosystems and stop the biodiversity decline, multiple management measures will be implemented over the next decades. We propose methods for prioritising the location and timing of restoration measures to maximise their effectiveness, considering many sectors and multiple societal objectives.

Where and what were the challenges?

Case Study 7 is based in the Swiss Plateau, a relatively flat and densely populated area that facilitates agricultural production and urban development. Switzerland decided to fund the morphological restoration (i.e. river widening and removing artificial obstructions in the river) of one quarter of all morphologically degraded rivers over the next 80 years, to upgrade the 100 most important wastewater treatment plants to remove micropollutants, and to reduce pollution agriculture. Cantonal authorities were asked to provide a strategic plan for the morphological restoration of rivers over the next two decades, which will be updated every 12 years and is intended to increase the effectiveness of restoration measures

What was done?

Using the concepts underlying the AQUACROSS Assessment Framework, we developed a procedure to prioritise restoration measures by maximising the ecological state of a catchment under a given budget constraint, while considering other societal needs and other sources of impairment:

- In close collaboration with stakeholders from federal and cantonal authorities and environmental consulting companies, we integrated procedures for chemical, physical and biological assessment at the river reach scale and proposed a spatially explicit ecological assessment at the catchment scale.
- We applied the catchment scale assessment to search for management strategies that optimise the overall ecological state of catchments, while increasing or not significantly decreasing services (e.g. recreation) demanded by society.

What did we find?

We developed a methodology that supports environmental managers in the integrative assessment of restoration measures at the catchment scale. This methodology is based on ecological principles, such as maximising resilience and fish migration potential and minimising fragmentation. An optimisation procedure provides a set of near-optimal combinations of measures to reach the highest ecological state for a given budget. This list of potential measures can support the development of a cantonal planning, which also requires stakeholder involvement.

General lessons learned for managing biodiversity:

Location matters: to prioritise river restoration, managers need to consider location and also consider broad descriptors of ecosystem health. The consideration of different types of impairments, such as hydromorphological degradation and chemical pollution, is important to increase effectiveness.

Local impact:

Given that Swiss environment policy is planned over decades, local impact will occur over time. Already, though, Yael Schindler Wildhaber and Bänz Lundsgaard-Hansen (Federal Office for the Environment Switzerland), and Irene Wittmer and Christiane Ilg (Swiss Water Association) report that they will use case study 7's models to *"adapt or develop"* indicators of specific human impacts on biodiversity. Additionally, regarding the case study's method and results for prioritising where to restore ecosystems, local policy stakeholders believe this could be useful for *"better coordination of the different management measures in a catchment"* and that it *"has potential for use for the selection of new monitoring sites"* and *"future collaboration"*.

Find out more about Case Study 7 on the AQUACROSS Information Platform and aquacross.eu

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