

Sustainable Hydraulic Structures: Use of Alpine Reservoir Sediments for Mineral Fertilizers

Sediments have played a crucial role in agriculture; for instance, the fertile soils of the Nile floodplains, enriched by sediment deposits from seasonal flooding, supported the growth of ancient Egyptian civilization. Against the background of sustainability within the erection and operation of hydraulic structures, the principal goal of this research is to investigate the potential use of sediments from Alpine reservoirs as mineral fertilizers in agriculture (example see Fig. 1).



Fig. 1: Reservoir Moserboden at HPP Kaprun, Austria (© Alexander Arch)

Given the constant depletion of storage volume of our Alpine reservoirs due to sedimentation, the research aims to explore how this sediment accumulation could be similarly harnessed for agricultural use in Switzerland, rather than being treated as waste. The locally available resource would reduce the need for imported fertilizers or raw materials for production, which subsequently would reduce CO₂ emissions. In the context of sustainable hydraulic engineering, the goal is to turn sediment management challenges into opportunities that contribute to soil fertility and sustainable agriculture as well as contribute to a circular economy. This research project provides a unique opportunity to get an insight into a cross-disciplinary research approach and contribute to sustainable engineering practices by turning a byproduct of hydraulic structures into a valuable agricultural resource.

In a first step the proposed Bachelor's thesis shall focus on conducting a comprehensive literature review regarding the use of (artificial) reservoir sediments for agricultural purposes. The outcomes shall be discussed in the context of the sustainable use and operation of Swiss Alpine storage reservoirs and should give an outline of the existing challenges and knowledge gaps. A rough guideline on how to treat reservoir sediments shall be proposed and exemplified at a Swiss test case.

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Remarks: Project-oriented thesis;
Topic can be distributed more than once