

Master's thesis or Project work FS 2023



Versuchsanstalt für Wasserbau, Hydrologie und Glaziologie

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Sediment monitoring in the Chienti river close to Le Grazie dam, Marche region, Italy

The sedimentation process taking place in artificial reservoirs due to watercourse damming determines the progressive loss of reservoir capacity and a reduced hydraulic safety caused by the potential obstruction of the dam outlet works. In this context, the objective of a sustainable management of artificial reservoirs can be pursued by applying various techniques such as sluicing, dredging or removal by mechanical means. An innovative technique applicable in artificial reservoirs with hydroelectric purposes involves the sediment conveyance via power waterways under controlled conditions. The implementation of this technique requires a first phase of accurate sediment transport monitoring upstream and downstream of the dam. In addition, a specific monitoring system of the turbined flow and suspended sediment rate is also necessary.

The case study of this project is Le Grazie dam (Fig. 1), located in Marche Region (Italy) and built in the 1960s along the Chienti river mainly for hydropower production. It was characterized by an initial storage capacity of $1.7 \ 10^6 \ m^3$, but a deposited sediment volume of about 900,000 $\ m^3$ currently reduces its capacity substantially.

In the first task of the thesis, a temporary measuring network will be set up at several locations upstream and downstream of the reservoir for the measurement of both discharge and suspended sediment concentration, by selecting the most appropriate measuring techniques. In the second task, a layout of the monitoring system of the Kaplan turbines (with 2.8 MW nominal power, Fig. 2) in the powerhouse will be designed, aimed at investigating the erosion process by turbined fine sediments at the runner and appurtenant turbine parts such as guide vanes.

This project offers the possibility to get insight in a topic of increasing importance based on a real case, and to contribute to the sustainable management of artificial reservoirs for hydropower production.





Fig. 1: Overview of Le Grazie reservoir.

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Remarks:

Fig. 2: One of two Kaplan turbines in the powerhouse.

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up to 2 students for a Project work or 1 student for a Master's thesis; report in English; short visit of the Le Grazie dam and Chienti river and field work as part of the thesis