



The impact of climate change on Fantanele reservoir operating rules

Ramona Dumitrache and Andreea-Cristina Galie

National Institute of Hydrology and Water Management, Romania (andreea.galie@hidro.ro)

The FP 7 research project ECLISE – Enabling Climate Information Service for Europe has the overall objective to develop an European service that meets the needs of climate information of the Member States of the European Union. In this project, four major areas of impact (cities, coasts, water and energy) are analysed.

This paper presents the results of the climate change impact on a reservoir with hydropower use. A case study, for a Romanian reservoir (Fantanele reservoir located on the Somes River corresponding to Mariselu hydropower station), was performed.

The operating curves/rules, relying on the monthly average discharges, were designed for current state. The modified discharges derived from hydrological model that assumed four climate models (CNRM_RM5.1_ARPEGE (A), HC_HadRM3Q0_HadCM3Q0 (B), SMHI_RCA3_BCM (C), SMHI_RCA3_ECHAM5 (D)) for future water resources estimation were used to design the modified operating rules in case of climate change.

Operation lines in assured regime were determined using "Water Supplies - Demand" balance. The water balance has been achieved, in the cross-section of the Fantanele dam, as difference between natural inflow into the lake and regulated discharge for every 30 years, for each month, of the years 2020-2050, respectively for each of the four cases.

In order to assess the future turbinated discharge, needed to be used for the design of future operation rules, the regulated discharges were determined for each month and for each of the four cases, applying graphical - analytical method called "wire stretched".

Further, a comparative analysis, on the operation lines, in assured regime designed for the period 1984-2010 (current state) and future state (A, B, C and D cases), was performed. The energy production requires higher water quantities, in all four cases.

In addition, the paper will estimate the climate change impact on hydropower production. The amount of energy produced by hydropower station Mariselu was calculated in various assumptions (A, B, C and D cases) of inflow values in the reservoir. The amount of electricity produced by the hydropower plant Mariselu is directly correlated to the inflows of the Fantanele reservoir.

The production of hydropower station Mariselu in current demand (previously computed) was compared with the energy production in case of climate change (A, B, C and D cases). The analysis has shown that the monthly average hydropower energy will decrease in summer and increase in winter.