

## Key elements for a homogeneous flood hazard assessment on Large Dams in Italy

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Within the context of flood risk assessment and management, recent scientific contributions have extensively explored how the hydrological response of a watershed can undergo substantial changes in the presence of artificial reservoirs. However, as of today, the methodological framework for evaluating the intrinsic attenuation capacity of individual reservoirs based on their geometric features and the average peak flow generated by the upstream watershed cannot be considered clearly defined.

This study aims to systematically outline the key aspects of the problem to allow for preliminary, yet as objective as possible, assessments of the effectiveness of peak flow attenuation in Large Italian Dams. The research seeks to avoid limiting solutions to a specific reference basin and instead aims for broader applicability on a national scale.

In a large-scale context, such as the national level, standardizing hydrological forcings and adopted hydraulic conditions is essential to ensure consistency and comparability of results. In this direction, the “natural” flood attenuation potential of 265 large reservoirs all over Italy is devised, in terms of the development of a Mitigation Efficiency Ranking. The resulting classification can be used to prioritise the implementation of Dam Emergency Plans in Italy and to support similar initiatives worldwide.

To maintain homogeneity in such a wide area, standardized hydrograph shapes are used and index-flood from the rational method is adopted as the incoming peak value, enhancing the results of a recent analysis of all Italian rainfall extremes (Mazzoglio et al., 2020). The attenuation index is computed by solving the differential equation of lakes. Twenty-four different design floods were derived adopting only two hydrograph shapes and minimal parameter options, i.e., the basin runoff coefficient, the time of concentration and the parameters of the Intensity-Duration-Frequency (IDF) curve. The study covers 265 reservoirs across Italy, selected on the basis of preliminary criteria of relevance, and their respective watersheds.

The results of the classification for the 265 dammed watersheds in all the tested configurations demonstrate to be strongly sensitive to the assumptions on the time of concentration and to some rainfall features, while, for instance, the hydrograph shape seems to exert much less influence on the ranking outcome.

### References

Mazzoglio P., Butera I., Claps P. (2020). I<sup>2</sup>-RED: a massive update and quality control of the Italian annual extreme rainfall dataset. *Water*, 12, 3308.