

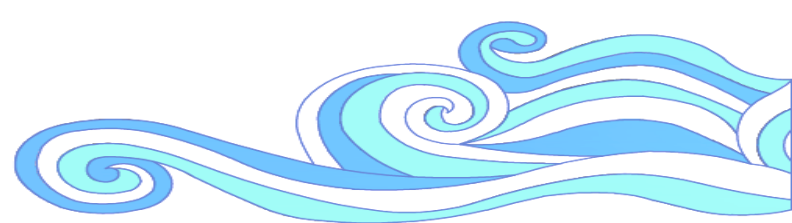
Assessment of fish passes in the Duero river basin

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1. Introduction



Since 2007, Duero River Authority -CHD- has promoted, according to the Water Framework Directive, several actions to recover longitudinal connectivity of the rivers: obstacles inventory, dam removal and fish passes building. Particularly, it was demanded to the owners of about 80 small hydropower plants (<10 MW) to develop by themselves improvements on the existent passes or the construction of new ones: normally pool-type fishways, Denil fishways, nature-like fishways or locks. On 2014, the CHD Itagra research center (University of Valladolid) began the assessment of some of those structures, to identify and to solve the main problems of each one.

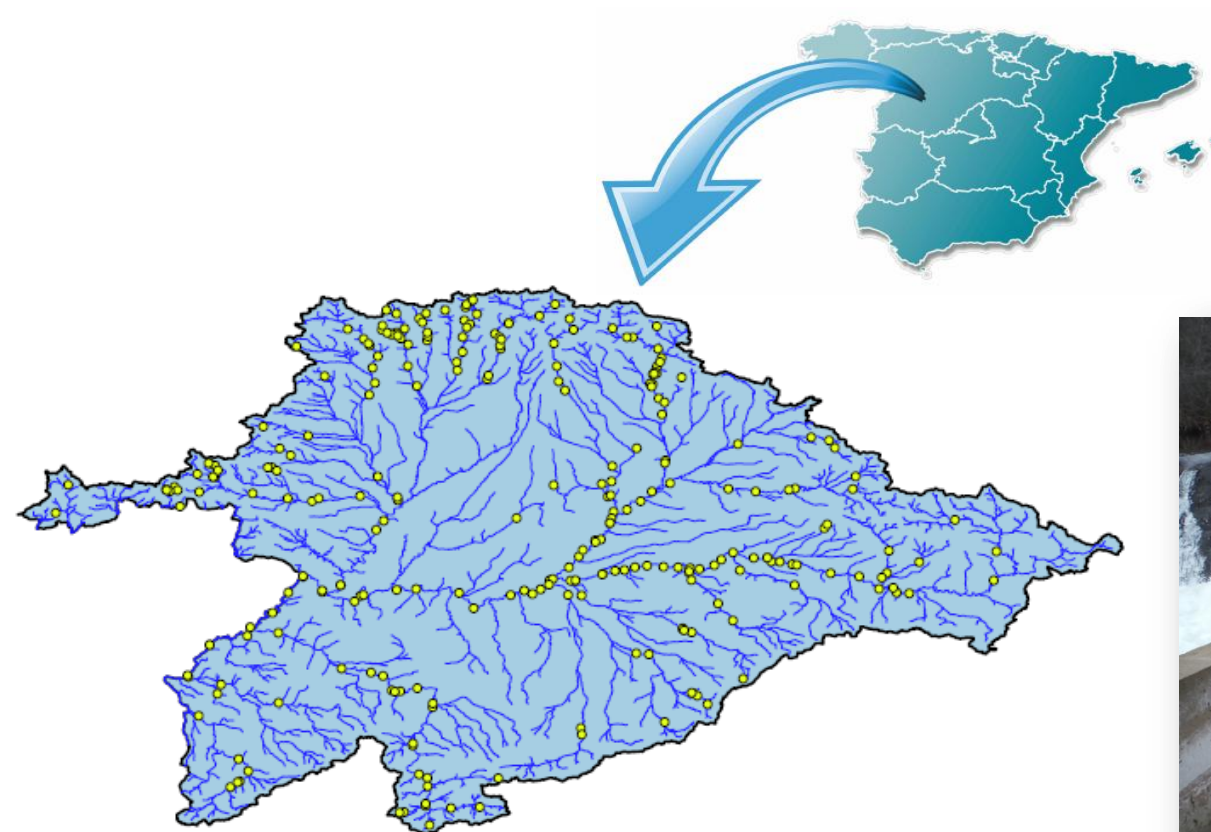


Figure 1. Distribution of the hydropower plants in the Spanish part of the Duero river basin.

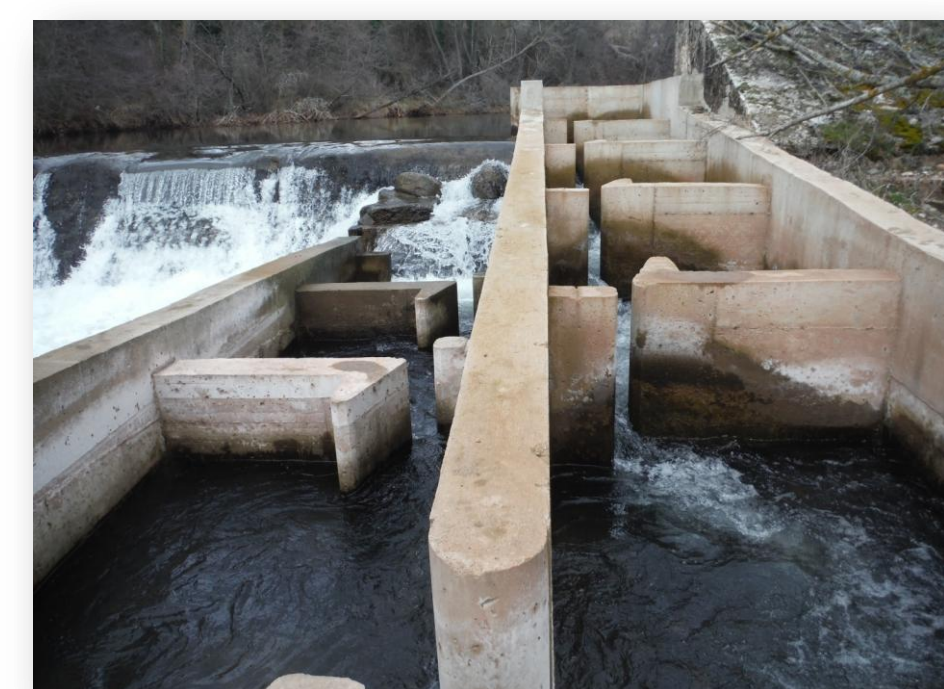


Figure 2. Pool-type fishway with vertical slots assessed to know its functionality about fish pass in the Duero basin.



Figure 3. Topographic data collection is the first step to assess a fish pass.

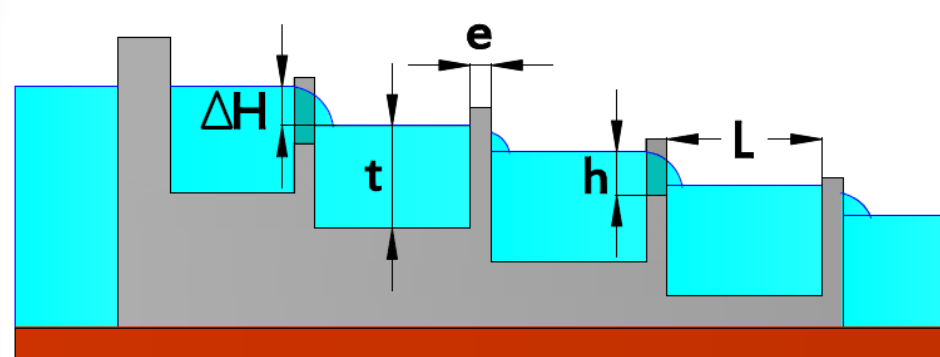
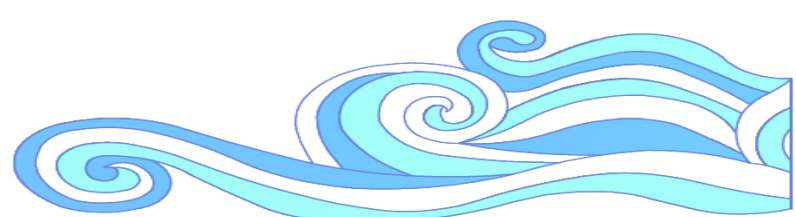


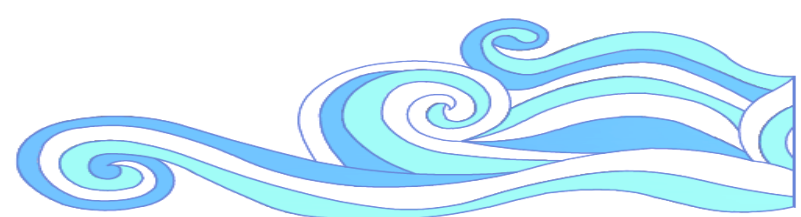
Figure 4. Some hydraulics variables considered in the assessment process.

2. Methodology



The assessment process consists in evaluating the placement of the fish pass on relation with the obstacle and the river environment; its attraction for the entrance of fishes; and the analysis of the passage on both directions, upstream and downstream, using bio-hydraulics criteria (previous experiences and bibliography). Also, the flow of the fish pass (which is part of the ecological flow), the state of preservation and the maintenance works are evaluated. Finally, some improvements are proposed (if they are necessary) and different options for downstream migration are considered.

3. Results



After the first group of assessments have been completed, a positive evolution along the years about the fish passes designs and construction has been observed. Problems related to maintenance are very common (e.g. obstructions). Many structures can greatly increase their functionality with some simple improvements (e.g. concentrating flow near the fish pass entrance and favoring fish attraction; installing baffles into the pools, etc.). The final results of this work will be used by the CHD to implant a control and monitoring program of those structures, and to improve their current and future design and maintenance.



Figure 5. Example of an obstruction at the entrance of a fish pass, as result of a poor maintenance.



Figure 6. Example of a fishway that requires design improvements.

