Abstract

With the introduction of the Water Directive the European Union has fortified the demand for a renaturalization of the European riverine systems on a basin-wide level.

Construction of reservoirs within the Ebro basin with a total capacity of 6,28 hm^3 throughout the 20^{th} century has caused the artificial regulation of this freshwater system. The mean flow characteristics of the lower Ebro river have changed from Q=582,24 m^3/s (1913-1935) to Q=319,15 m^3/s (1975-2002). Sediment transport has been diminished by 99% due to river dam building.

Applying peak over threshold analysis (POT) it could be proven that increasing available reservoir capacity has changed the extreme event distribution tail for the gauging data at Tortosa station.

A balance has to be reached between off-stream water uses such as agriculture, industry etc. and inflow requirements in order to maintain the habitat for riparian or aquatic life of the riverine ecosystem.

Contemporary modeling tools allow for calculation of instream flow requirements in order to preserve natural habitat. With the Tennant method, the Range of Variability Approch (RVA) and a physical habitat model (Phabsim) three models have been applied in this work for the lower Ebro reach.

The Tennant method delivers numeric results for the period october-march (pre-dam: 349,34 m^3/s, post-dam: 191,49 m^3/s) and for april-september (pre-dam: 465,79 m^3/s, post-dam: 255,32 m^3/s) for optimum flow and for flush floods (pre-dam: 1164,48 m^3/s, post-dam: 638,30 m^3/s).

The RVA does not deliver numeric values, but represents a good manner of describing the flow dynamics needed by river ecology and the magnitude of changes between two time-series.

Lastly the Phabsim model allows for generation of a annual calendar of instream flow for key species within the river ecology. At this moment though basic research and data availability needs to be improved in order to apply this model. Optimum flow could only be calculated for the chub (squalis) with around Q=50 m^3/s for adult/juvenile and sprawning lifestages and lower values for fry chub.

Combining habitat modeling with a 2D or 3D hydraulic model is very likely to allow for specific remodeling of river morphology to improve habitat availability as a metegating measure. This activity would allow for meeting EU Water Directive demands.