



Low flows and reservoir management for the Durance River basin (Southern France) in the 2050s

Eric Sauquet and the R²D² 2050 (Irstea HHLY-MALY-HBAN, EDF LNHE-DTG, Acteon, UPMC, LTHE, SCP) Team

Irstea, Villeurbanne, France (eric.sauquet@irstea.fr)

The Durance River is one of the major rivers located in the Southern part of France. Water resources are under high pressure due to significant water abstractions for human uses within and out of the natural boundaries of the river basin through an extended open channel network. Water demands are related to irrigation, hydropower, drinking water, industries and more recently water management has included water needs for recreational uses as well as for preserving ecological services. Water is crucial for all these activities and for the socio-economic development of South Eastern France.

Both socio-economic development and population evolution will probably modify needs for water supply, irrigation, energy consumption, tourism, industry, etc. In addition the Durance river basin will have to face climate change and its impact on water availability that may question the sustainability of the current rules for water allocation.

The research project R²D²-2050 "Risk, water Resources and sustainable Development within the Durance river basin in 2050" aims at assessing future water availability and risks of water shortage in the 2050s by taking into account changes in both climate and water management. R²D²-2050 is partially funded by the French Ministry in charge of Ecology and the Rhône-Méditerranée Water Agency. This multidisciplinary project (2010-2014) involves Irstea, Electricité de France (EDF), the University Pierre et Marie Curie (Paris), LTHE (CNRS), the Société du Canal de Provence (SCP) and the research and consultancy company ACTeon.

A set of models have been developed to simulate climate at regional scale (given by 330 projections obtained by applying three downscaling methods), water resources (provided by seven rainfall-runoff models forced by a subset of 330 climate projections), water demand for agriculture and drinking water, for different sub basins of the Durance River basin upstream of Mallemort under present day and under future conditions.

A model of water management similar to the tools used by Electricité De France was calibrated to simulate the behavior of the three reservoirs Serre-Ponçon, Castillon, Sainte-Croix on present-day conditions. This model simulates water releases from reservoir under constraints imposed by rule curves, ecological flows downstream to the dams and water levels in summer for recreational purposes. The results demonstrate the relatively good performance of this simplified model and its ability to represent the influence of reservoir operations on the natural hydrological river flow regime, the decision-making involved in water management and the interactions at regional scale. Four territorial socio-economic scenarios have been also elaborated with the help of stake holders to project water needs in the 2050s for the area supplied with water from the Durance River basin.

This presentation will focus on the specific tools developed within the project to simulate water management and water abstractions. The main conclusions related to the risk of water shortage in the 2050s and the level of satisfaction for each water use will be also discussed.