

EXPLORING THE USE OF MODELLING TOOLS WITHIN THE PARTICIPATORY APPROACH TO PROTECT THE WATER RESOURCE

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Information and Communication Technology may provide relevant tools for water planning and management issues, as detailed, i.e. by the ICT4WATER initiative (www.ict4water.eu). In this regard, numerical modelling is a valuable and robust method to represent hydrological systems and relevant human stresses and to provide simulated answers to relevant water problems, such as protection of groundwater resources.

Because these tools require a high level of knowledge and skills pertaining to various disciplines (i.e., hydrology, physics, statistics, computer science, environmental sciences, etc.), they are often disregarded as too complex to be used or as “tricky games” whose results cannot be fully understood. This is of course a barrier to the uptake of existing and state-of-the-art technologies for water management.

Within the framework of the H2020 FREEWAT project (FREE and open source software tools for WATER resource management, www.freewat.eu; Rossetto et al., 2015), the use of modelling tools is combined to the participatory approach in order to follow a path where modelling activities are run together with the stakeholders involved or with interest in the water cycle (the so-called FREEWAT approach). FREEWAT is a free and open source, GIS-integrated modelling environment which incorporates spatially distributed and physically based codes (e.g., MODFLOW) for water planning and management.

The FREEWAT approach is tested in 14 case studies throughout Europe and beyond. In this communication, we will present what done for the Massaciuccoli lake case study. The Massaciuccoli lake is a coastal lagoon of fresh to brackish water located north of Pisa (Tuscany, central Italy), at the foot of the Apuan Alps. During the last decades, this area has been heavily affected by large land reclamation works for agriculture purposes. This caused severe subsidence (2 to 4 m during the past 70 years), which left the lake perched, having the land surface around the lake at -4 m with respect to the mean sea level. Water resources are further affected by salinization and poor water exchange, as result of water balance deficit during the summer period.

Because of this, the Massaciuccoli area has been the object of several activities aiming at protecting the equilibrium of the ecosystem and overcoming the issues presented above. Among these activities, the FREEWAT approach is tested to devise shared solutions in order to protect

the water resource. The focus of the FREEWAT experimental application is to revise the potential application of the measures foreseen in the Serchio River Basin Plan, according to the requirements of the Water Framework Directive.

A Focus Group (FG) was formed and it is composed of all the relevant (technical and non-technical) stakeholders for the area (river basin authority, municipalities, farmer's associations, research institutions, environmental protection agency, environmental associations, etc.). FG meetings are run about once a month. During such meetings, data used to build the model and model activities are discussed and shared. Model construction is performed through the application of the Farm Process embedded in MODFLOW-OWHM (Hanson et al., 2014), which allows to dynamically integrate crop water demand and supply from ground- and surface-water.

FG meetings aim at creating a common space for discussion and for sharing ideas and perceptions on the work done. Some of the issues brought to the discussion are: (i) estimate water volumes raised to the lake by the land reclamation areas; (ii) evaluate the water balance in the study area during the summer period; (iii) evaluate the consistency of water supply with respect to the actual water need of relevant crops.

FG also takes decisions on the scenarios to be simulated for planning and management of the water resource and discusses the final results, with the final scope of enhancing participatory approach and evidence-based decision making in water resource management.

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