



BE PREPARED: GENOA, ITALY



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GENOA'S DEMO

Decision Support System for the competing uses of source water including protection of water intakes

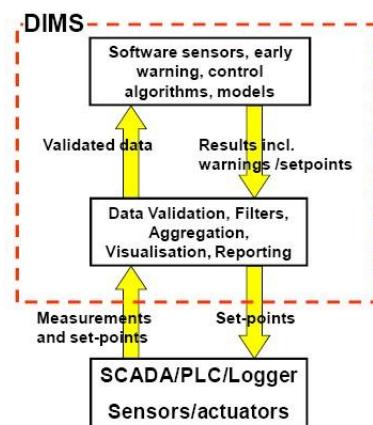
In the Genoa water resources system (GWRS), the opportunities for the improvement of water resources management have increased since 2006, when the three utilities supplying Genoa merged into a single company.

Interconnections between the three downstream network distribution tanks allow for more management flexibility.

This relatively recent change in operational practices prompted modelling of the system to map, understand and evaluate the potential for improvements. Scenarios of increased variability of available water and the non functioning of important headworks (one dam is already out of order for maintenance and a second one is planned to be out of order soon).

Operational improvements may be achieved at different levels: from securing water supply during abnormally dry periods, to ameliorating energy management (i.e. increase hydropower production and decrease pumping from wells and other sources whenever possible).

Short to medium improvements include the substitution of resources with better ones and the extension of service to areas presently supplied from vulnerable or costlier sources.



The Decision Support System aims at assisting the operations of Genoa's headwork system in their daily practice. It is based on a bookkeeping system – a daily diary of water resources useful to monitor water availability; integrating and developing information from the data provided by the extensive SCADA system of Genoa's headwork system; and a series of rules that establish the priorities for water exploitation.

The DIMS platform of DHI is the environment for merging information coming from different sources: the SCADA system, already wrapped in the DIMS environment; the rules for the management of resources; and the results of simulations obtained with a water resource model.

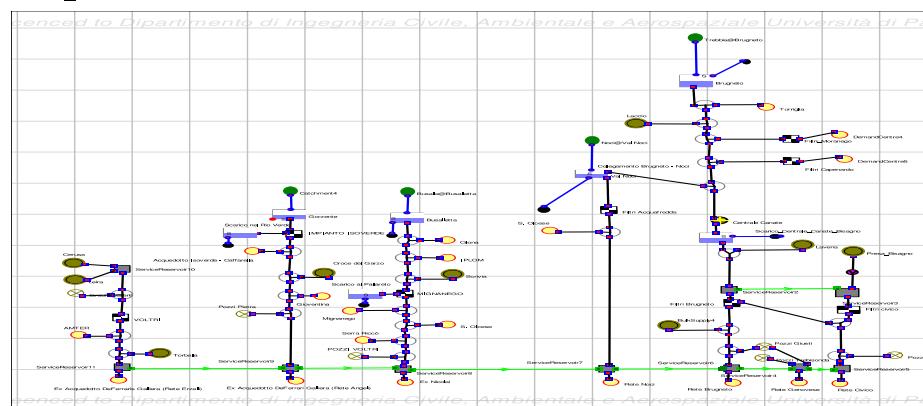
Improving the existing operation rules requires an extensive analysis of past operational data, some hydrological modelling and the use of optimisation algorithms.

Simulation of water resources system behaviour can be carried out through dedicated software packages: AQUATOR by Oxford Scientific Software and MIKE BASIN by DHI are currently being tested (in cooperation with Palermo University).



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Aquator Academic Version - Not For Commercial Use



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SUCCESS STORIES

Reducing the impact of extreme conditions such as drought or flood events on water supply

Genoa's water resources system basically relies on the storage capacity of some reservoirs and, to a lesser extent, of aquifers to manage seasonal variability of water resources. The system has been upgraded around 50 years ago for less variable climate conditions. Project results aim at improving the management of water reduction scenarios due to increased water resources variability with the existing assets or under failure scenarios of multiple sources due to water quality or structural grounds. This should reduce service failures to citizens.

Ensuring water supply to the city with the minimum waste of water and energy

Fear of unknown and unpredictable future dry events sometimes leads to over-conservative management rules with increasing usage of lower-quality surface water from river intakes and to excessive hedging of reservoirs. This affects hydropower production, certainly a secondary but not negligible purpose of Genoa's headwork system (around 65 MWh/year). Data analysis and simulation of optimised rules may help to increase confidence of water managers in less conservative rules. As is well known, increased hydropower production offsets CO₂ emissions and hence protects the environment.

CHALLENGES

Climate change magnifies physical phenomena that already affect the city of Genoa:

Dry periods: Long periods of no rain may occur with higher frequency, with the consequence of less availability of water and water of worse quality. The supply system Genoa is however not designed to such scenarios. Preparing for management in these conditions is a challenge for Genoa's water managers.

Heavy rainfall events with high return periods may hit the city of Genoa with higher frequency. In the last decade, Genoa and the Liguria Region experienced many flooding events. In November 2011, the flood affecting the east part of the city has caused victims and damages not only to the city but also to the assets of the water resources and supply system, hence impacting on water resources availability. Modelling such scenarios and integrating them into the decision-making process concerning resources management is another challenge.

PARTNERS



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