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Info-telematic Systems in Real-Time Management of integrated water resources

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Abstract

Knowledge of hydrological, hydro geological, technological, social, economical and environmental processes, provide, with the monitored indicators, the necessary elements for the identification of the status of the water resources system. Knowledge of this status is then used for an efficiency test of the system, in comparison with the optimal possible status consistently both with the actual conditions and with different managing, social, economical and environmental conditions, which can be configured aiming at short, medium or long term optimisation of the system. This can be achieved comparing the actual situation with different virtual simulations in alternative hypothesis of immediate or medium to long term realisations. Objectives and management policies may change depending on the preferred social, economical and environmental purposes.

Choosing the optimal solutions is necessary to define the limits of global and sectorial sustainability in short, medium and long term that will be assigned to the dynamic system, and the acceptability thresholds for each intervention. These programming limits enable modelling of a great amount of alternative schemes with possible projections, simulations, optimisations and comparisons among alternative solutions. The choice of mathematical models available for these purposes is very wide, ranging from deterministic, stochastic and probabilistic ones to generation of synthetic series, from the application of fuzzy systems to neural networks, from cellular automes to self-learning systems and artificial intelligence. These treatments will be followed by a wide-range comparison of different planning hypothesis aiming to dynamics optimisation, by means of a costs/benefits analysis at social, economical and environmental level; this will involve the assessment of social

and environmental parameters. Comparison of alternative solutions will be performed with the aid of decision support systems, adopted with different criteria and regulations.

The results attended in this step of program are:

- Analysis of water resources and water supply systems;
- Simulation and forecasting with alternative objectives optimisation;
- Socio-economical-environmental cost/benefits analysis;
- Decision support systems.

Knowledge achieved will help to define an informatic, on line management system, suitable extended, resilient and articulate, capable of real time data acquisition and validation, generation and comparison of scenarios, and water resources management, both as short-term optimal utilisation and medium and long-term strategic objectives.

Here follows the main issues:

- telematic on-line connection of the monitoring network with the information system and the decision makers, with warning service for the water distribution services;
- real-time reporting and broadcasting of attention, alert or danger thresholds referring to water resources, the networks, quality and quantity of waste waters;
- real-time reporting and broadcasting of attention, alert o danger thresholds referring to deviance of elementary or synthetic indicators or dynamic descriptors of the water resource systems in comparison with the expected dynamic systems evolution;
- description of alternative scenarios of actual water resource systems by means of alternative optimising criteria;
- interactive generation of alternative scenarios arising from technical, managing, economical administrative or political intervention in short-medium and long- term, with individuation of possible actions chancing the state or the trend of the evolving situations and of consequences in the socio-economical-environmental system.

In conclusion, the final result is the realization of the real-time management of the water resources system, of the decision support system, of the alternative choices, of the diffusion of the information, of the criteria of attention and alarm threshold.

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