Editorial

Decision support and uncertainty in water resource management

Numerical modelling tools are irreplaceable in today's water resource management practise. It is important that these tools are used with the final objective of supporting a decision-making process in mind. Additionally, many are still used in a deterministic fashion despite the widespread acceptance that uncertainty is an unavoidable element in any modelling exercise.

These two aspects are addressed in this special issue. The first three papers give examples of improved tools for decision-making in different design procedures. The remaining two papers address the issue of uncertainty in environmental and hydrological modelling.

The first paper, by Le Gouevec and Blanplain, investigates the process of designing waste water sewerage systems in France. Current systems tend to under-perform. The authors state that reasons for this can already be found in the design process which is not sufficiently adapted to the complexity of decision-making. They propose a new methodology which applies elements of expert systems and multi-criteria analysis.

The papers by Montesinos *et al.* and Sharifi and Rodriguez describe modelling tools that combine environmental/hydrological model components with planning or economic models. Both papers demonstrate the use of these tools in case studies.

Montesinos *et al.* introduce a seasonal furrow irrigation model OPTIMEC (Economic OPTIMization in Spanish) which can be applied to obtain a quasi-optimum irrigation season calendar based on economic profit maximization. The model is optimised by means of a Genetic Algorithm (GA) and is compared to traditional approaches in a real world case study.

Sharifi and Rodriguez describe a more general planning support system for rural areas using a case study in the Western Mancha region in Spain. The objective is to support policy formulation for rehabilitation of the natural environment.

There is little consent on how uncertainty in environmental and hydrological modelling studies needs to be estimated and considered.

McIntyre *et al.* present a review of currently popular uncertainty analysis and propagation approaches. Those methods analysed in greater detail include Monte Carlo simulation, Generalised Likelihood Uncertainty Estimation (GLUE), the Metropolis algorithm and a set-based approach.

One major source of uncertainty is the problem of estimating a parameter set appropriate to represent the natural system at hand.

Wagener *et al.* introduce a new dynamic identifiability approach to hydrological modelling, using a solute transport model as a case study. Their methodology considers parameter identifiability as a time dependent entity. This allows more of the information available in a time-series to be used for model structure and parameter analysis, subsequently leading to a reduction of (parametric) uncertainty.

This collection of papers shows how the problem of water resource management in practise can be dealt with using integrated modelling approaches, and how uncertainty issues can be addressed.

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Guest Editors
May 2002