

C1.3 Modelling in IWRM

Characteristics

Modelling and Decision Support Systems (DSS) are complementary tools. A *model* is a simplified description of a system to assist calculations and predictions. A *Decision Support System* is a means of collecting data from many sources to inform a decision. Information can include experimental or survey data, output from models and expert or local knowledge.

Modelling at the sub-catchment or river basin level can integrate the hydrological, technical, ecological, environmental, economic, social, institutional and legal aspects of water problems into a coherent framework. Presently hydrological models simulating water balance elements (such as river run-off, groundwater and evapo-transpiration) are quite well developed. So are water quality models for rivers, groundwater and lakes. However, models for most other water aspects (ecological, environmental, economic, social, institutional and legal) need significant improvement.

At the river basin level, GIS-based modelling techniques can allow policy-makers and managers to test "what if" scenarios, on topics like integrated water quantity, water quality and environmental regulation, the impacts of land use changes on flow regimes, climate change effects on flood and drought frequency / severity, inter-sectoral water allocation policies, effects of uncertainty and risk on water resources management and the impacts of economic incentives for pollution control, water conservation and more efficient irrigation.

A multi-objective DSS (MODSS) allows users to integrate data in five phases, each requiring consultation with all potential stakeholders:

- *Issue identification* - identifying priority issues, available information, and key stakeholders;
- *Defining management options* - identifying potential land and water management options;
- *Establishment of decision criteria* - defining criteria for selecting among options;
- *Data acquisition* - gathering and entering data into the MODSS;
- *Decision support process* - examining the compiled information by stakeholders with diverse viewpoints.

Today, the output of many models is available and accessible on the Internet to any user with a personal computer and the necessary software. Easy access to the output of other models can greatly assist managers in developing their own DSS. There is a keen competition among research institutions, universities and consultants to provide modelling products, the price of which is small relative to the time required to learn to

use the models effectively. Users of models should be confident that they have access to relevant expertise to provide guidance in the application of these tools, and ensure that appropriate delivery methods been worked out

Before considering the use of a specific model, the user should answer the following questions:

- Is access available to relevant expertise to provide guidance in the application of these tools?
- Have the appropriate delivery methods been worked out?
- Delivery mechanisms must be clearly established and defined prior to modelling activities, preferably at the project proposal stage.

Lessons learned

Putting models on the Internet in user-friendly form has many advantages. It is transparent, in that nothing is hidden on computers back in the computer laboratory; makes all model inputs and outputs available for peer review; facilitates improvements in modelling in future projects, and ensures that future work can build on past research.

However, access to the Internet is difficult in some regions. Also, modelling has its limitations, and seemingly irrational human factors may determine final selection of options.