Project 3.1

SUSTAINABLE WATER ALLOCATION

COOPERATIVE RESEARCH CENTRE FOR CATCHMENT HYDROLOGY

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Integration of Water Balance, Climatic and Economic Models

Project Objectives

With the advent of water markets, authorities are now attempting to optimise the use of the water resources allocated to them within the constraints imposed by the regulatory frameworks. The economic aspects of the water resources have largely been ignored.

We aim to devise and implement an integrated planning and seasonal water allocation modelling approach that allows the optimisation of the economic and environmental value of water, subject to hydrological and climatic constraints.

Expected Outcomes

- Development of a set of desirable capabilities for an integrated modelling framework, and criteria for assessment of existing seasonal allocation and planning models
- Review of the processes simulated by currently established models, IQQM & REALM and the sensitivity of their outputs to various inputs and model characteristics
- Identification of modelling gaps and functionality requirements
- Development, validation and testing of new modelling modules which will provide water managers with more powerful tools to simulate new seasonal water allocation scenarios, and to assess their performance in terms of hydrologic, economic and environmental criteria.
- Documentation of new modules including results of applications to focus catchments

Target problems

The Council of Australian Government (COAG), based on traditional market theory, introduced water trading as a mechanism for achieving an optimal distribution of water entitlements. The market, however, will be constrained by hydrological capacity to supply and by regulatory constraints, including environmental flow requirements. Bulk entitlements for water have been determined for a number of catchments in several states mainly by converting previously existing water demands. The economic aspects of the water resources have largely been ignored, yet the interconnection of hydrologic and economic aspects to achieve an economic and technological efficiency is clear.

Detailed system simulation models such as IQQM and REALM are currently the basic tools to assess a water resource system's response to different combinations of climatic inputs, water demands and water management scenarios. These models are typically run over long historical or stochastically generated climate sequences to assess the long-term system performance (security of supply). However, to produce realistic outputs for planning purposes, the models need to closely reflect the seasonal allocation and system operation decisions made by the water authority for a shorter operating horizon (typically the remainder of the current season). The changed allocation and water use frameworks created by COAG initiatives and other reforms, e.g. water trading markets, on-farm adaptation strategies and changed regulatory frameworks, have brought a new dimension to these modelling tasks.




The Cooperative Research Centre for Catchment Hydrology is a cooperative venture formed under the Commonwealth CRC Program between:

- Brisbane City Council
- Bureau of Meteorology
- CSIRO Land and Water
- Department of Land and Water Conservation, NSW
- Department of Natural Resources, Qld
- Department of Natural Resources and Environment, Vic
- Goulburn-Murray Water
- Griffith University
- Melbourne Water
- Monash University
- Murray-Darling Basin Commission
- Southern Rural Water
- The University of Melbourne
- Wimmera Mallee Water

Associates:

- Hydro-Electric Corporation, Tas
- SA Water
- State Forests of NSW

Research Plan

There is currently increasing pressure on water authorities to make fuller use of the resources available in a season, by allowing temporary or permanent transfers of water to areas of high demand and by reducing inefficiencies in water use. However, such seasonal allocation decisions require new decision support tools and need to be checked for consistency with long-term performance targets and regulatory constraints. A range of enhancements to existing models is desirable to address emerging modelling needs and to allow integration with improved climate and economic models developed in other CRC for Catchment Hydrology projects.

Enhanced real-time modelling capabilities to support the day-to day operation of water resource systems are also seen as important for water authorities and users. Many of the features of the enhanced planning and seasonal allocation models would be readily applicable to real-time modelling systems, but these would require a number of additional modelling capabilities.

Key Research Tasks - 2000-2003

- Develop conceptual modelling framework and criteria for model assessment
- Assess existing catchment models such as REALM and IQQM
- Prepare strategy for development of new/enhanced modules
- Develop new/enhanced modules for identified high priority modelling capabilities
- Apply new models with existing benefit/loss functions to determine socio-economic and environmental performance

Linkages

This project will link with the following CRC projects:

- Project 1.1 Modelling toolkit
- Project 3.2 Enhancement of the water market reform process
- Project 5.1 Modelling and forecasting hydroclimate variables in space and time
- Project 5.2 National data bank of stochastic climate and streamflow models

End users and Stakeholders

Water authorities, catchment management authorities and consultants will be the primary users of the research outcomes.

Staff Involved

Project Leader	Associate Professor Gary Codner (Monash University)
Researchers	Associate Professor Hector Malano (The University of Melbourne) Mr Erwin Weinmann (Monash University) Mr Barry James (Department of Natural Resources and Environment, Vic) Mr Robert O'Neill (Department of Land and Water Conservation, NSW) Mr Mariyapillai Seker (Goulburn-Murray Water)

Participating Organisations

Department of Land and Water Conservation, NSW • Department of Natural Resources, Qld • Department of Natural Resources and Environment, Vic • Goulburn-Murray Water • Monash University • The University of Melbourne

For Further Information: Associate Professor Gary Codner Cooperative Research Centre for Catchment Hydrology
Department of Civil Engineering, PO Box 60 Monash University, Victoria, 3800
Tel: 03 9905 4969 • Fax: 03 9905 4944 • Email: gary.codner@eng.monash.edu.au

www.catchment.crc.org.au/waterallocation