Mathematical Modelling, Computational Science and Environmental Modelling at the ANU

This program comprises a team of researchers specialising in mathematical modelling, computational science and environmental modelling at The Australian National University. Members belong to the Mathematical Sciences Institute, The Fenner School of Environment and Society and other areas of the University.

Building Practical Solutions to Industry Problems and Natural Resource Management issues

Australia's technically advanced society and environmental challenges have put it at the international forefront of mathematical modelling in general and environmental modelling in particular. Because of global climate and other changes like salinisation and deforestation, we face critical environmental problems: for example, allocation of scarce water resources to meet increasing economic, water-quality and ecological demands; and improved ability to predict and respond to extreme events like floods, droughts and tsunamis. The program embraces mathematical modelling and computing tools which are increasingly being called upon to help resolve these problems and provide innovations in our science, thinking and community policy options.

Working with Researchers and Industry

The program combines theoretical and methods research, to underpin strategic needs of mathematical modelling for industrial and other applied problems, with collaborative project-based research to ensure relevance and direct engagement with industry. The program has teams that are skilled and experienced in developing integrated solutions to industry problems and environmental management issues.

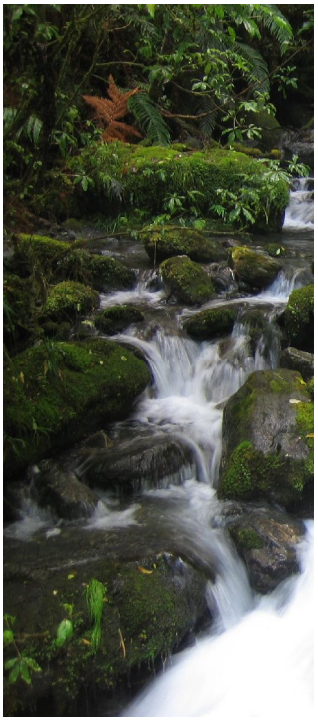
Being located within a teaching and research University ensures academic rigour and strong linkages with current and future researchers. Members are very active in establishing networks of industry and resource management specialists, conducting undergraduate and postgraduate modelling and computational science courses.

Students have the opportunity to gain understanding of the dynamics of working in research teams; the research delivery and policy process; grant application procedures; and the different ways to publish. They may also participate in paid part-time employment on projects.

Staff in the Program

Senior staff have international profiles as experts in their fields. Key research staff are:

- Dr Stephen Roberts, Inundation modelling, predictive modelling, sensitivity analysis
- Dr Barry Croke, Streamflow, water quality, groundwater modelling
- Dr Markus Hegland, Machine learning, data mining, computational biology
- Dr Carmel Pollino, Ecosystem modelling, risk assessment, Bayesian networks
- Dr Linda Stals, Efficient solution of large scale computational problems
- Professor Tony Jakeman, Integrated environmental assessment and modelling
- Dr Lachlan Newham, Water quality modelling, spatial data analysis
- Professor John Norton, Dynamic systems, uncertainty and sensitivity assessment
- Dr Jenifer Ticehurst, Landscape processes, hydrology, Bayesian decision networks
- Dr Wendy Merritt, Hydrology, climate impacts, decision support systems
- Dr Natasha Herron, Hydrological modelling, surface-groundwater interactions, decision support systems
- Dr Bob Anderssen, Applied mathematical modelling



STRATEGIC DIRECTIONS

The program's strategic directions are fourfold:

- Consolidate and expand our leading-edge capabilities in computational science, mathematical and environmental modeling
- Educate and train internationally competitive disciplinary and interdisciplinary researchers, industry and policy advisors
- Expand our role as a hub for collaboration between researchers, industry and policy makers
- Widen the practice of integrated environmental assessment to improve sustainability outcomes

DISCIPLINARY AND INTEGRATION EXPERTS

The program has core expertise in integrated environmental assessment and management, especially:

- developing frameworks, methods and software for relating management and policy drivers to catchment health outcomes
- modelling pollutant mobilisation and transport at local and basin scales
- catchment-scale modelling of the impacts of land use and infrastructure (e.g. dam development) on water yield to streams
- integrated modelling of environmental / economic trade-offs associated with water management, particularly issues such as water allocation and environmental flows
- engaging stakeholder groups and effectively communicating research methods and results.

PARTNERSHIPS

The program has established good working relationships with:

- Geosciences Australia
- CSIRO Land and Water
- CSIRO Mathematical and Information Sciences
- CRC for Cotton Catchment Communities
- Australian Centre for International Agricultural Research
- Land and Water Australia
- Murray Darling Basin Commission
- National Water Commission
- NSW Department of Environment and Climate Change
- Queensland Environmental Protection Agency
- Ecowise and ACTEW, ACT
- Victorian Department of Sustainability and Environment and Department of Primary Industries
- NSW, Victorian and Tasmanian Catchment Management Organisations
- Hornsby, Eurobodalla, Great Lakes and several other Shire Councils.