Australian Government

MURRAY–DARLING BASIN AUTHORITY

Science and knowledge – modelling

River systems are very complex and modelling is an important water management tool because it can show the impact of different policies and operational decisions for different users and under different conditions.

The scientific work undertaken to inform the development of the Basin Plan was the best available at the time (2009–12). We need to always work towards building upon our understanding of what climate change and other environmental factors and impacts are likely to mean for the hydrology of our rivers, the way we operate them, the effect on water quality and the Basin's water-dependent ecosystems.

Types of modelling and their uses

The Murray–Darling Basin Authority (MDBA) and its river management partners use a variety of models to support the planning and running of the Murray–Darling Basin's rivers.

Hydrological models

A hydrological model is a computer software tool that simulates the flow and behaviour of water along a river system, taking into account:

- the movement of water through the river channel and associated floodplains, wetlands and anabranches
- losses and gains as water moves through the landscape, and
- how we manage the storage, supply and use of water for various purposes.

These models take a variety of input data such as measured data for rainfall, temperature, evaporation and stream flow, for a given period of time.

Key facts

The MDBA and its river management partners use a variety of models to support the planning and running of the Murray–Darling Basin's rivers.

A 'model' is a **computer-based representation of a system** and is useful because it allows ideas to be tested first.

Modelling **provides objective and scientific advice** and has helped solve emerging challenges over the years.

Individual models have been used in **Basin water resource management** for many years – in some cases, for more than 40 years.

The modelling platform used by the MDBA is **the best available.** However, as they contain assumptions and elements of uncertainty, model results must be considered in context and using expert analysis.

Each individual river system model the MDBA uses is calibrated by its originating agency, with most having been **rigorously peer reviewed and accredited**.

The MDBA uses **24 individual river system models** linked together to describe the surface water resources of the Basin.

Modelling is typically undertaken **using historical climate data collected over 114 years** (from 1895–2009) and includes the federation and millennium droughts.

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Scenario modelling

Additional information and conditions are specified for a given scenario, such as diversions, agreed water sharing rules and river operating rules, as well as landscape information for floodplains, wetlands and various infrastructure constructed in the system.

These models then use mathematical calculations to simulate the behaviour of a river system for this given set of inputs and conditions, to investigate how consumptive users and the environment are affected as changes occur.

The information output from various modelling scenarios can also be used as input for other models and assessments to allow more detailed environmental, economic and social assessments to further inform decision-making processes and policy development.

Importantly, when used this way, the models do not provide a forecast of what might happen in the future, but broadly show the impacts of various scenarios over the range of climatic conditions specified.

Hydrodynamic modelling

Hydrodynamic models consider the topography of the river channel and floodplain, and can include structures such as wetland regulators. Hydrodynamic models are calibrated using the best available data, including measured flows, water levels and satellite images of flooding.

These models help water managers and river operators with:

- predictions of the likely inundated area during environmental watering, and
- documenting inundated area after watering events and estimates of environmental water-use.

This information also contributes to long-term planning models. It is used to compare the advantages and risks of different operating strategies for environmental watering schemes on the River Murray.

National Hydrologic Modelling Strategy

The National Hydrological Modelling Strategy (NHMS) was adopted by the Council of Australian Governments in 2008 to ensure that future water planning is informed by the best modelling practice.

The NHMS was recently updated and endorsed by the National Reform Committee in 2018.

A key output from the NHMS is the Source integrated modelling system (Source IMS).

The Source IMS can simulate the water resource systems at a range of scales, such as urban, catchment and river basin, to support integrated planning, operations and governance including human and ecological influences.

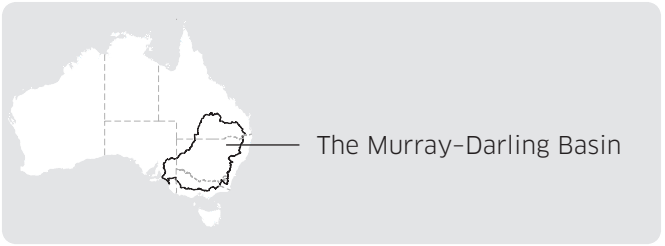
The Source IMS is the product of more than 25 years of collaborative research by the Cooperative Research Centres (CRC) for Catchment Hydrology, CRC for Freshwater Ecology and the eWater CRC.

Development of the Integrated River System Modelling Framework

The Commonwealth Scientific and Industrial Research Organisation (CSIRO) developed an Integrated River System Modelling Framework (IRSMF) that allows 24 river system models to be linked and used.

The Basin states and the MDBA have been developing Source models to support water resource plan development and these improved models will be implemented in the IRSMF.

A review of the current modelling tools with consideration for known future modelling activities is underway to continue to provide a more efficient Integrated River System Modelling Framework.



Connect with us.
The MDBA has offices in Adelaide, Albury-Wodonga, Canberra, Goondiwindi, Griffith, Mildura, Murray-Bridge, Toowoomba, and regional engagement officers around the Basin.

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