

Namoi and Murrumbidgee Water Balance Tool – an integrated approach for river system management

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Abstract: Water balance is fundamental to river system modelling and water resource management. It quantifies water movement within a catchment including water gains, losses, and unaccounted differences (AUD). Reach or catchment scale water balances also support evidence-based decision making for river operations, water allocation and auditing, model calibration, and compliance. Clear visuals of water balance also make complex data easier for both technical and non-technical audiences to understand.

The Water Balance Tool, developed by the NSW Department of Climate Change, Energy, the Environment and Water, tracks daily water flows in NSW regulated rivers. It calculates inflows, outflows, and any AUDs at the river reach scale. First implemented in the Namoi River, it now also supports the Murrumbidgee River using the same system. The tool uses real-time data from sources like Hydstra (flow), SILO (rainfall and evaporation), and water usage records.

Inflows include upstream and tributary inflows (gauged and ungauged) and direct rainfall to a reach. Outflows cover downstream flows, offtakes, evaporation, river losses, and licensed extractions. Storage changes are also tracked. AUD reflects the difference between observed and modelled downstream flows. The daily water balance is calculated using the eWater Source model, and results are shown at a monthly scale for each water balance component in Tableau dashboards.

A key feature of the framework is its automated operational workflow. This workflow imports real time data from multiple sources, checks data quality, runs water balance models, post-processes output, stores them in an SQL database, and publishes the results to the web using the Tableau visualisation tool, providing near real-time insights to end-users.

The overall workflow is hosted and executed within a Jenkins environment. Jenkins is an open-source automation server that can run a wide range of user specified workflows, with a rich web-based user interface for configuring and monitoring jobs. Jenkins is linked with source code version control repositories and is used to run automated build, test, and deployment workflows in response to version control updates and fixed schedules.

The Water Balance Tool is fully operational in the Namoi and Murrumbidgee valleys ([water balance tool](#)) at the reach scale. In Namoi, catchment-scale implementation is complete, while in Murrumbidgee, work is underway to expand it to the catchment level. A roll out to additional river systems is also planned. The tool improves water resource management by providing stakeholders timely and accessible information. This increased access to data improves transparency and builds trust in how state and Commonwealth agencies manage water resources, while the tool's detailed analysis supports modellers and river operators in making evidence-based decisions for effective water management.

Keywords: *Water balance, Hydrological modelling, Data visualisation, Real-time data integration*