# The Australian Water Resources Assessment (AWRA) Modelling System Implementation Project: Getting Australia's data and model infrastructure ready for the future

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**Abstract:** The Australian Water Resources Assessment (AWRA) Modelling System underpins the Bureau of Meteorology water information services that are federally mandated through the Water Act (2007). The AWRA model has been developed for more than six years through the Water Information Research And Development Agreement (WIRADA) collaboration between the Bureau of Meteorology and the Commonwealth Scientific and Industrial Research Organisation (CSIRO). While a prototype AWRA Modelling System was developed through WIRADA the AWRA Modelling System has been significantly refactored and enhanced through the Bureau of Meteorology AWRA Modelling System Implementation (AWRAMSI) Project.

The AWRAMSI Project commenced two years ago and initially focused on installing, running, understanding and maintaining the WIRADA prototype. In the past year (particularly the past six months) there has been significant development in the AWRAMSI Project that has led to an AWRA Modelling System that is platform independent, while also being more efficient, functional, and easily maintainable than the WIRADA prototype.

The AWRA Modelling System consists of a landscape (AWRA-L) and river (AWRA-R) model, with both models running at daily resolution and AWRA-L covering the Australian continent at 0.05° (or approximately 5km) spatial resolution and AWRA-R a node-link model applied to regulated rivers. The AWRA-L model is typically run for the period 1 January 1911 to yesterday that corresponds to the availability of the input forcing data, the AWAP (Australian Water Availability Project) meteorological grids of daily rainfall, minimum and maximum air temperature, and solar radiation. The AWRA-R model is typically run for the period 1 January 1970 to 30 June 2013 that corresponds to the availability of observed streamflow (at gauged stations), with AWRA-R using observed streamflow when available and modelled flow otherwise. Both models (AWRA-L and AWRA-R) can be run further back in time by relaxing the reliance on observational data (e.g. by using meteorological climatology or modelling streamflow). To be able to run AWRA-R up to now (like AWRA-L) more efficient methods of extracting and processing the recent streamflow observations need to be developed.

The AWRA Modelling System also contains other components (other than just the models) such as visualisation and benchmarking. The visualisation for AWRA-L allows the plotting of maps or timeseries for any specified region such as Australia, a state, a catchment, a bounding box, or a pixel. The visualization for AWRA-R is yet to be developed but is likely to simply be timeseries for a set of locations. The benchmarking for AWRA-L consists of statistics (NSE, bias, correlation) and plots (timeseries, scatterplots, box and whiskers, and CDF) of the model outputs (catchment aggregated gridded runoff, soil moisture, evapotranspiration (ET) and deep drainage) against in-situ (streamflow, soil moisture probes, flux towers, recharge sites) and remotely sensed soil moisture (AMSR-E and ASCAT) and ET (CMRSET and SLST) products. The benchmarking of AWRA-R is simply against in-situ observations and will soon be developed.

The AWRA Modelling system can be run in three primary modes. These are interactive (that allows simulation, plotting and benchmarking over arbitrary areas and time periods), calibration (using specified observations, statistics, time periods and areas), and scheduled run (automatic updating of model output using live data feeds). The scheduled run readily lends itself to an automatically updated data service and website of the AWRA model inputs and outputs. This will be developed and released to the community (together with the model code) in the next two years.

***Keywords:*** *Water Act, water information services, WIRADA, AWRA, community model*