



River water balance accounting to assess uncertainty in 2030 water resources projections for the Murray-Darling Basin, Australia

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An assessment of the water resources impacts of feasible climate and development scenarios by 2030 was completed for the Murray-Darling Basin (Australia) in early 2008. Several tens of largely existing river models were used and often taken well beyond original boundary conditions. We assessed the adequacy and uncertainty in each model (internal uncertainty) and compared it to external uncertainty (i.e. in scenarios). A ‘multiple lines of evidence’ considered: prior model review and testing; data availability and completeness of gauging; calibrated climate range; model performance in reproducing different streamflow aspects; agreement between modelled and accounted water balance terms; and a change-uncertainty (C-U) index indicating the significance of scenario changes given model uncertainty. Monthly water balance accounts (1990-2006) were developed for river sections by integrating streamflow and diversion data, remote sensing estimates of evapotranspiration from water, wetlands, floodplains and irrigation areas, and ungauged inflows estimated by a regionalised rainfall-runoff model. Apparent gains and losses that could not be explained remained as an unattributed term (including measurement error). The greatest model uncertainties were in the lower river reaches due to break-out flows and floodplain losses. Models generally reproduced medium and high flows well, but low flows less well. C-U ratios provided useful information but the influence of model bias needed to be considered. Overall internal model uncertainty and external uncertainty in development projections were generally considerably smaller than external uncertainty in climate scenarios.