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Simulating the impacts of reduced streamflow on localised groundwater recharge in NSW

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Abstract: The new climate data and modelled streamflow produced by DPE-Water for the development of NSW regional water strategies have been used to investigate how a drying climate could impact groundwater resources across NSW. The new climate data consists of two 10,000-year sequences of stochastically generated daily rainfall and potential evapotranspiration representing historical and future (dry scenario) climate conditions, respectively. Future rainfall projections have a wide range of uncertainty; hence a dry scenario was chosen to allow the assessment of an extreme climate risk. The modelled streamflow from the historical and future stochastic climate sequences were used to estimate changes to localised recharge through losing streams and overbank flooding. Changes in modelled streamflow were used to estimate how stage height and thus in-stream recharge from losing streams may change. The changes in recharge from in-stream losses were estimated to vary from -55.4% to -3.4% across NSW. Overbank flooding recharge changes estimated from the streamflow changes were more extreme than the other estimated recharge changes, with a projected range from -90.5% to +56.1% (with only a single gauge, out of 42 investigated, producing an increase).

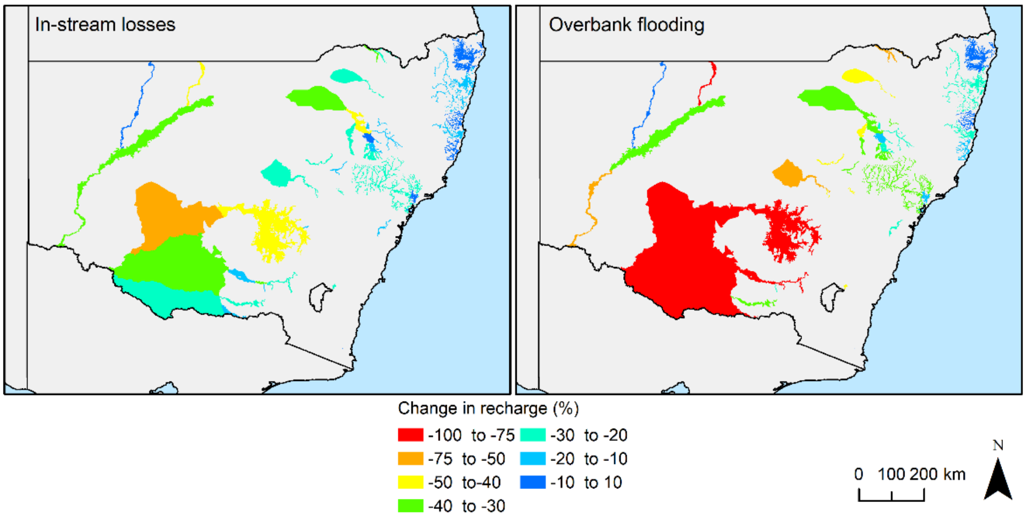

Figure 1. Projected change in localised recharge due to in-stream losses and overbank flooding

While our results highlight the potential for significant reductions in localised recharge across NSW groundwater sources (Figure 1), a major focus of the research has been to identify future research needs. Groundwater sources that have a high proportion of recharge from localised sources all require more detailed investigations to ascertain the proportion of recharge due to flooding, losing streams, irrigation drainage and diffuse recharge. Methodological limitations impacting confidence in the estimated changes also require further investigation, such as the impact of changes in rainfall extremes on flooding and hence overbank flood recharge, the need for methods that are more physically based to estimate recharge from flooding, and the assessment of the fit-for-purpose of the numerical groundwater models currently used in resource planning and management.

Keywords: *Groundwater recharge, climate change impacts, surface water–groundwater interactions*