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Streamflow reduction due to projected climate change in the southwest of Western Australia – a review

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Streamflow to reservoirs supplying the city of Perth has declined by more than 40% due to below-average rainfall for several decades. General Circulation Models (GCMs) predict that rainfall in the southwest of Western Australia will decrease further due to increased greenhouse gases. The availability of water resources may diminish further, threatening water supplies, environment and biodiversity.

The impacts of projected climate change on water resources have been studied at four catchments in Western Australia. The LUCICAT catchment hydrology model used the down-scaled rainfall from GCMs for predicting reduction in streamflow. Using CSIRO Mk3 GCM simulated rainfall based on the IPCC SRES A2 emission scenario, LUCICAT model predicted that an 11% reduction in rainfall would cause a 31% reduction in streamflow into the Stirling Dam reservoir by mid-century. At the Serpentine Dam catchment downscaled rainfalls from four GCMs – all modelling the A2 emission scenario – were used to predict the changes in streamflow. CCAM and Mk3 were developed by CSIRO Australia, HadAM3P by the Hadley Centre in the UK and ECHAM4 by the Max Planck Institute in Germany. The CCAM and Mk3 modelled reductions in rainfall ranging from 12% – 14% by mid century, and corresponded to a streamflow decline by 30% – 44%. The HadAM3P projected, for the 2070 –2099 period, a rainfall decline of 24% rainfall which corresponded to a streamflow reduction of 69%. At the Murray-Hotham catchment rainfall was projected to decrease by 13% by mid-century,

with corresponding 49% and 30% reduction in streamflow and salt load respectively.

As the A2 scenario corresponds to a constantly increasing emission rate, predicted reductions in streamflow are the extreme possible outcomes, and would differ depending on other emission scenarios. At the Denmark River catchment, we are investigating the impacts of A1B and B1 scenarios. By 2100, rainfall and annual streamflow are projected to decline by 5% and 8% respectively.