Will changes in climate affect the efficacy of raising the Falls Dam?

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The Manuherikia Catchment Water Strategy Group is currently assessing the feasibility of raising the Falls Dam to increase its storage capacity. Currently, 25,000 ha of land within the Manuherikia valley are irrigated by this dam and studies have shown that this could be increased to 35,000 ha by increasing the height of the dam wall by 27 m. Current plans for the Falls Dam upgrade assume that the rainfall in the catchment will be the same in the future as it has been in the past. The general expectation is that changes in climate will, broadly speaking, increase rainfall on the West coast of New Zealand and decrease rainfall on the East coast of New Zealand. So where does this leave changes in precipitation in the catchment of the Falls Dam?

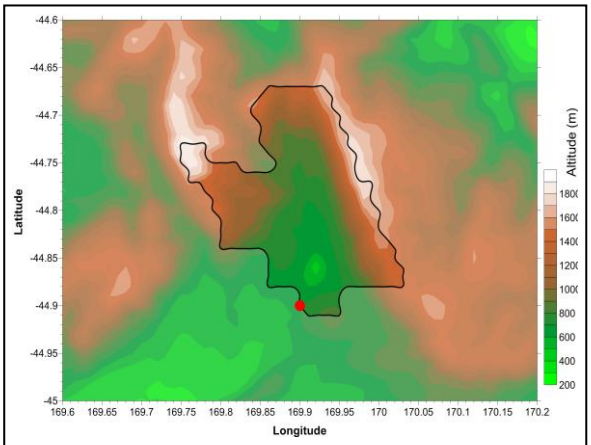

Figure 1: The topographical view of the Falls Dam Catchment. The red point is the location of dam wall. The outlined area represents the area over which rainfall will flow into the Falls Dam lake.

We have investigated the impacts of future changes in climate on rainfall in the Falls Dam catchment. Projections from five simulations obtained from the NIWA regional climate model through the Climate Changes Impacts and Implications programme (CCII; www.ccii.org.nz) were analysed. We first determined the catchment of the Falls Dam i.e. the region in which rainfall flows into the dam. Using a digital topographic database, and in-house developed software, we identified all model grid cells uphill of the lake behind the dam. The software defined the 33,300 ha area shown in Figure 1.

We then selected this catchment area from the output of the regional climate models for analysis. To improve the accuracy of the predictions we took an average over five different model versions. In order to model a range of possible outcomes, we analysed the predictions under three different greenhouse gas emission scenarios. The results of each scenario can be seen in Figure 2.

The A2 scenario represents a future where GHG emissions increase rapidly, while under the A1B scenario it is assumed that GHG emissions grow with 'business as usual'. Under the B1 scenario, the uptake of green technologies leads to decreasing GHG emissions. None of the changes in rainfall in the Falls Dam catchment shown in Figure 2 (i.e. A2=21.6 mm/100yr, A1B=8.5 mm/100yr, B1=17.9 mm/100yr) are statistically significant and all are small. Our recommendation therefore is that based on current climate model projections, climate change effects on annual total precipitation need not be taken into account when making decisions regarding the extent to which the Falls Dam needs to be raised. The same may not be true for other catchments in other parts of the country.

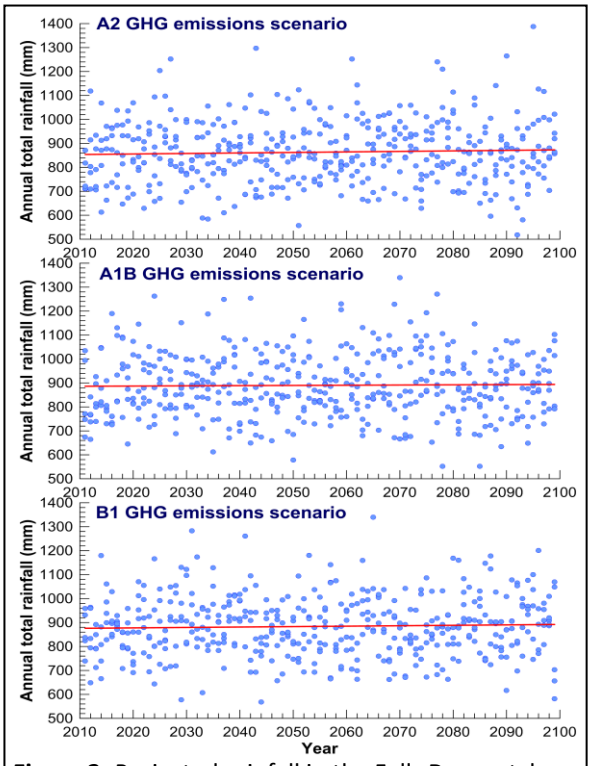

Figure 2: Projected rainfall in the Falls Dam catchment for three different greenhouse gas emission scenarios.