

Is Climate Change Evident in Wellington Rainfall Records?

Implications for stormwater
catchment modelling

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MfE guidance

Table 15: Percentage increase in rainfall per degree increase in temperature. Most likely change in bold with the range provided in brackets. Values based on Regional Climate Model results across New Zealand (from Table 13 of MfE, 2018).

Duration	1% AEP
1-hour	13.6 (10.7-19.4)
2-hour	13.1 (10.1 – 19.6)
6-hour	11.5 (8.5 - 17.4)
12-hour	10.1 (7.3-15.4)
24-hour	8.6 (5.2-12.8)

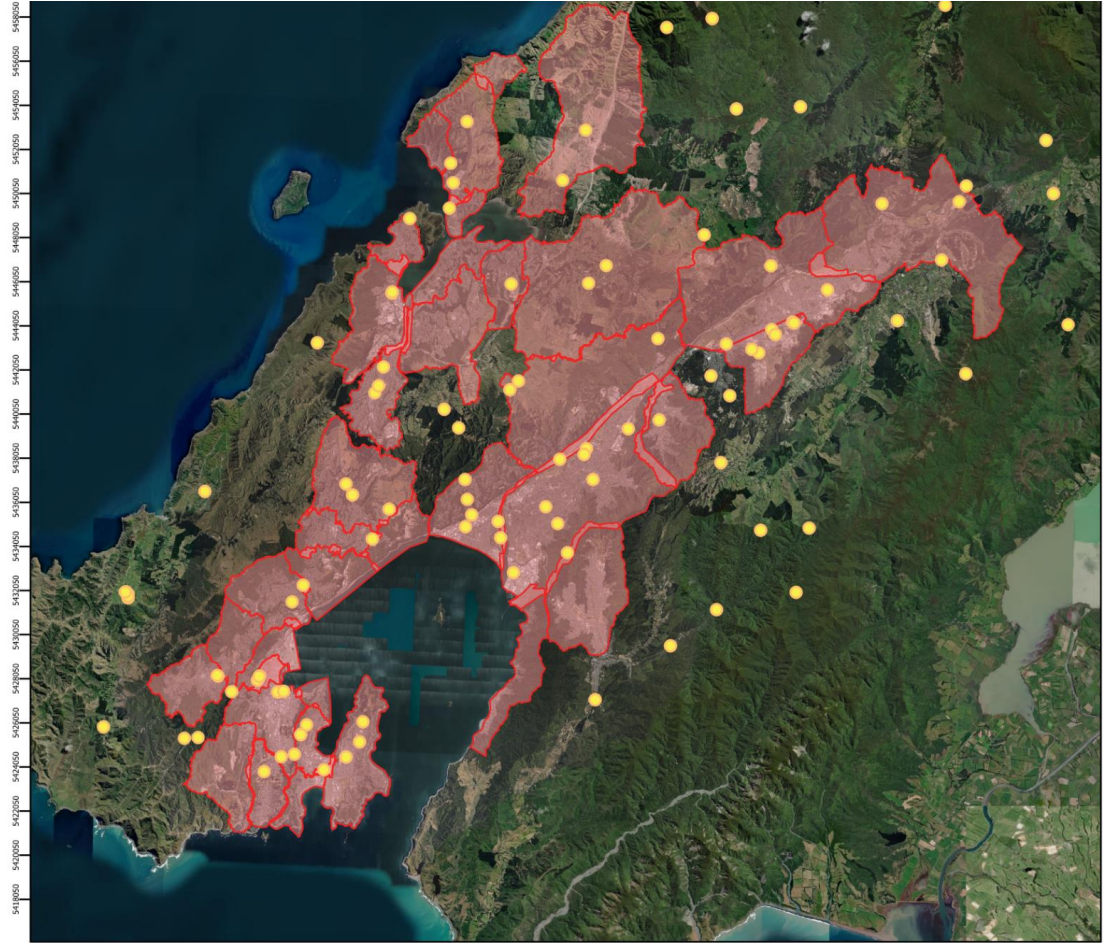


Methodology

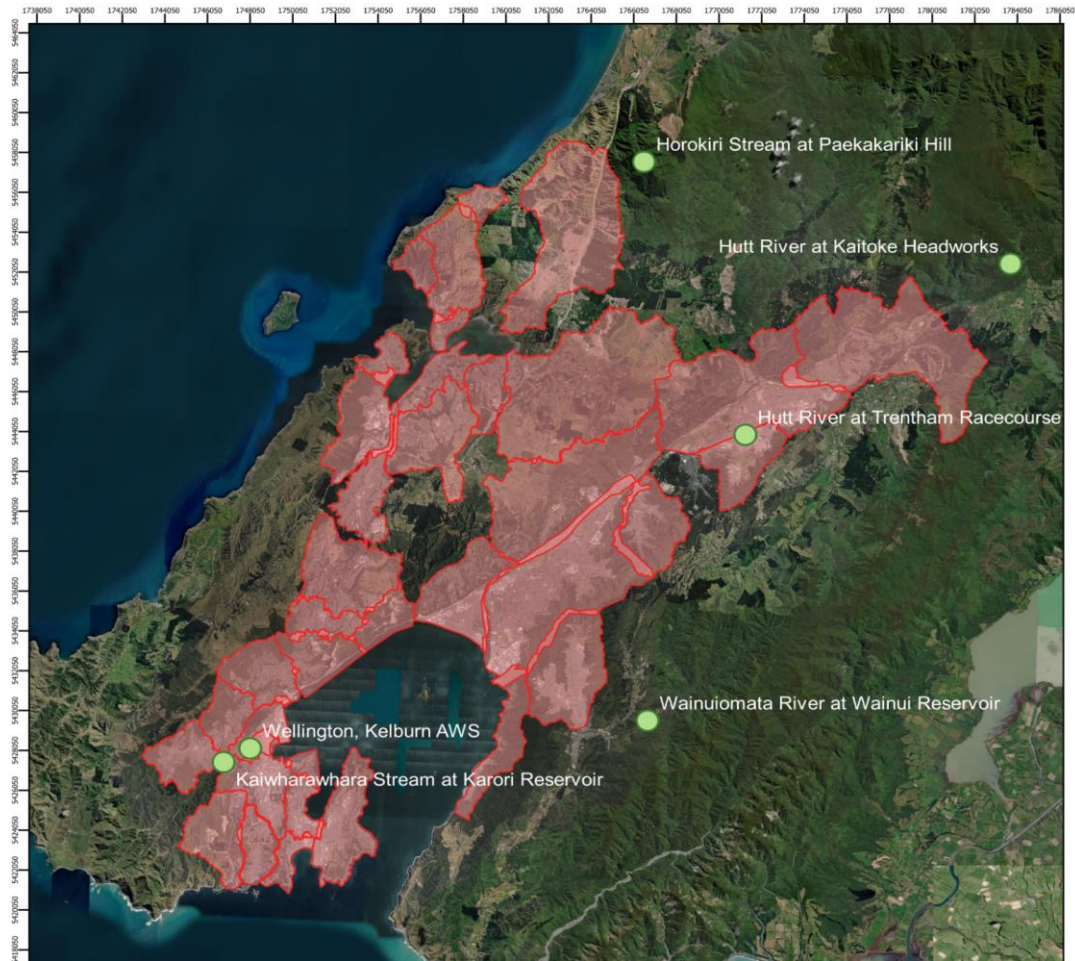
- Investigated annual and seasonal rainfall – maxima and totals
- Also consider if frequency of large events was increasing
- Compared these to climate indices such as IPO and SOI



Rainfall gauges

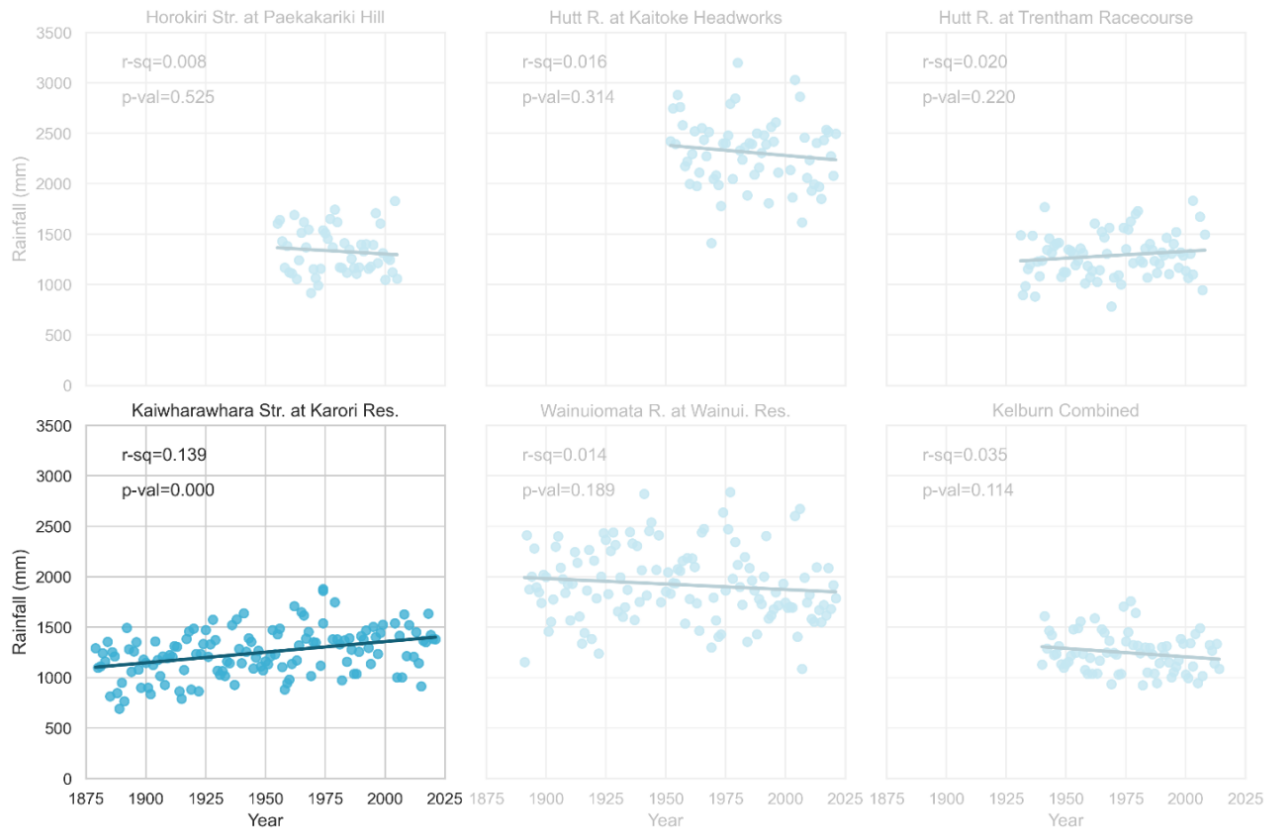


Site Selection



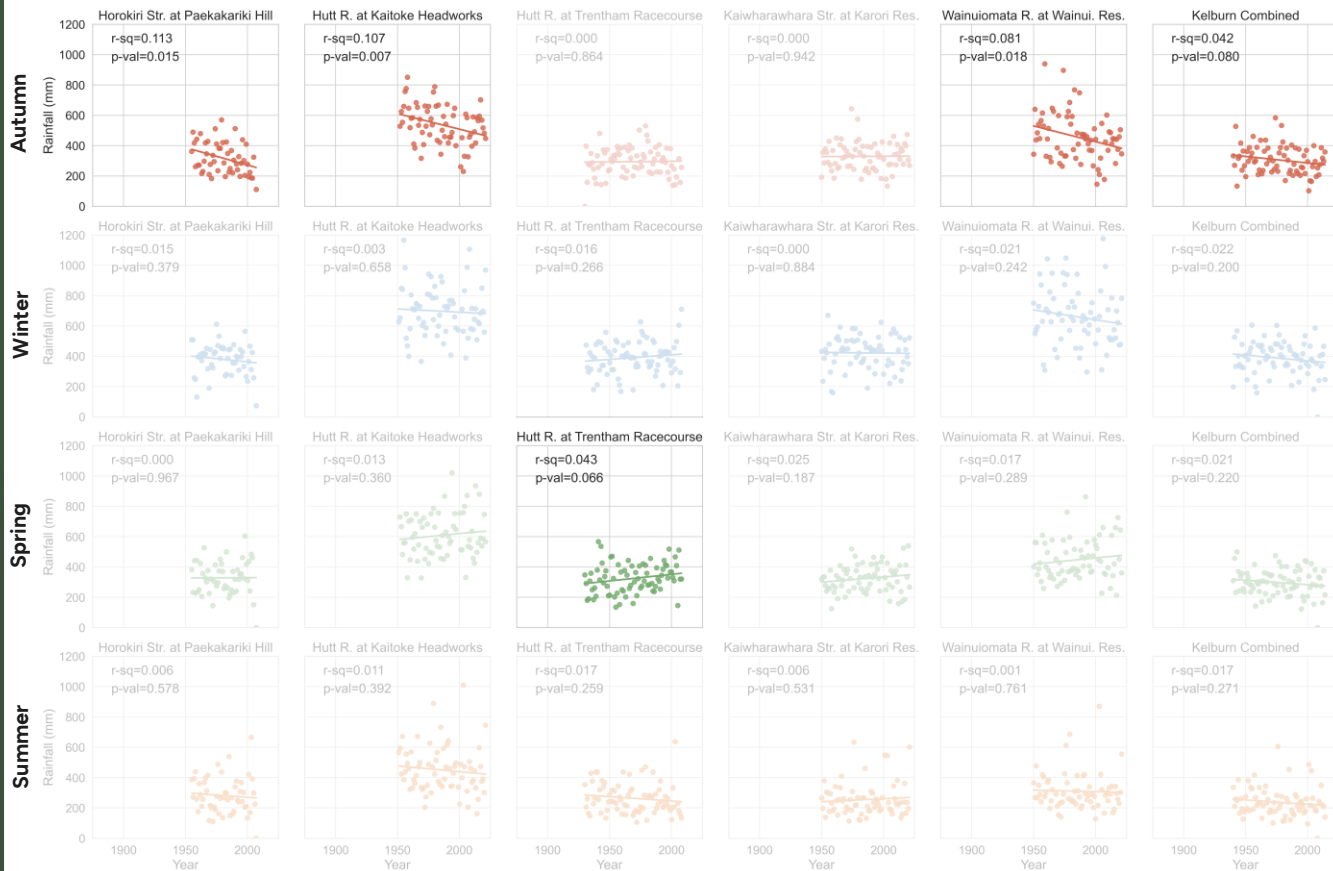


Annual Totals





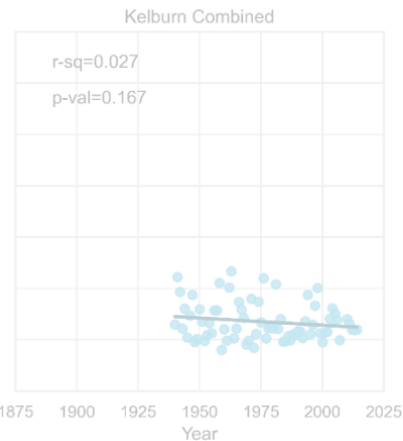
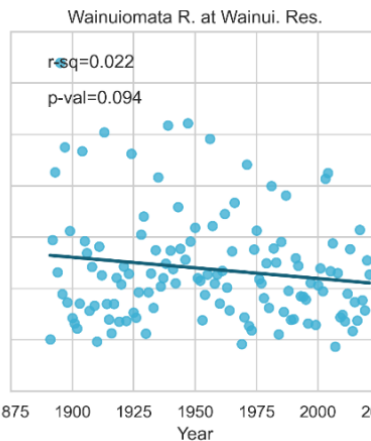
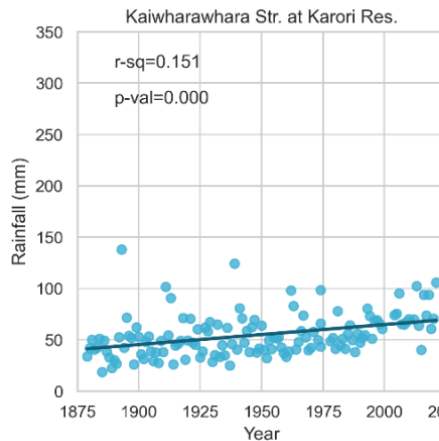
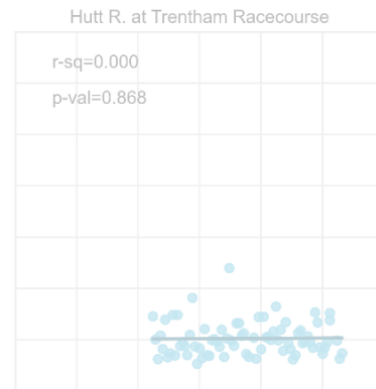
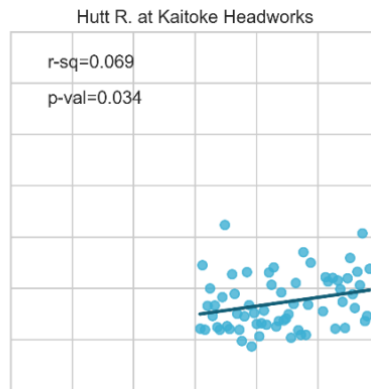
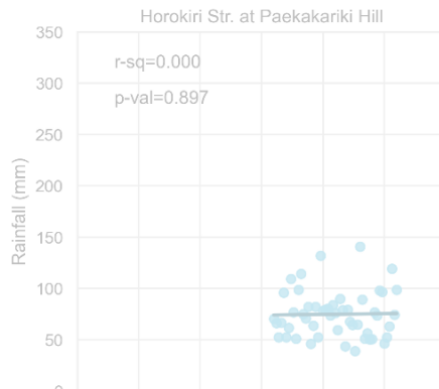
Seasonal Totals





Daily Rainfall

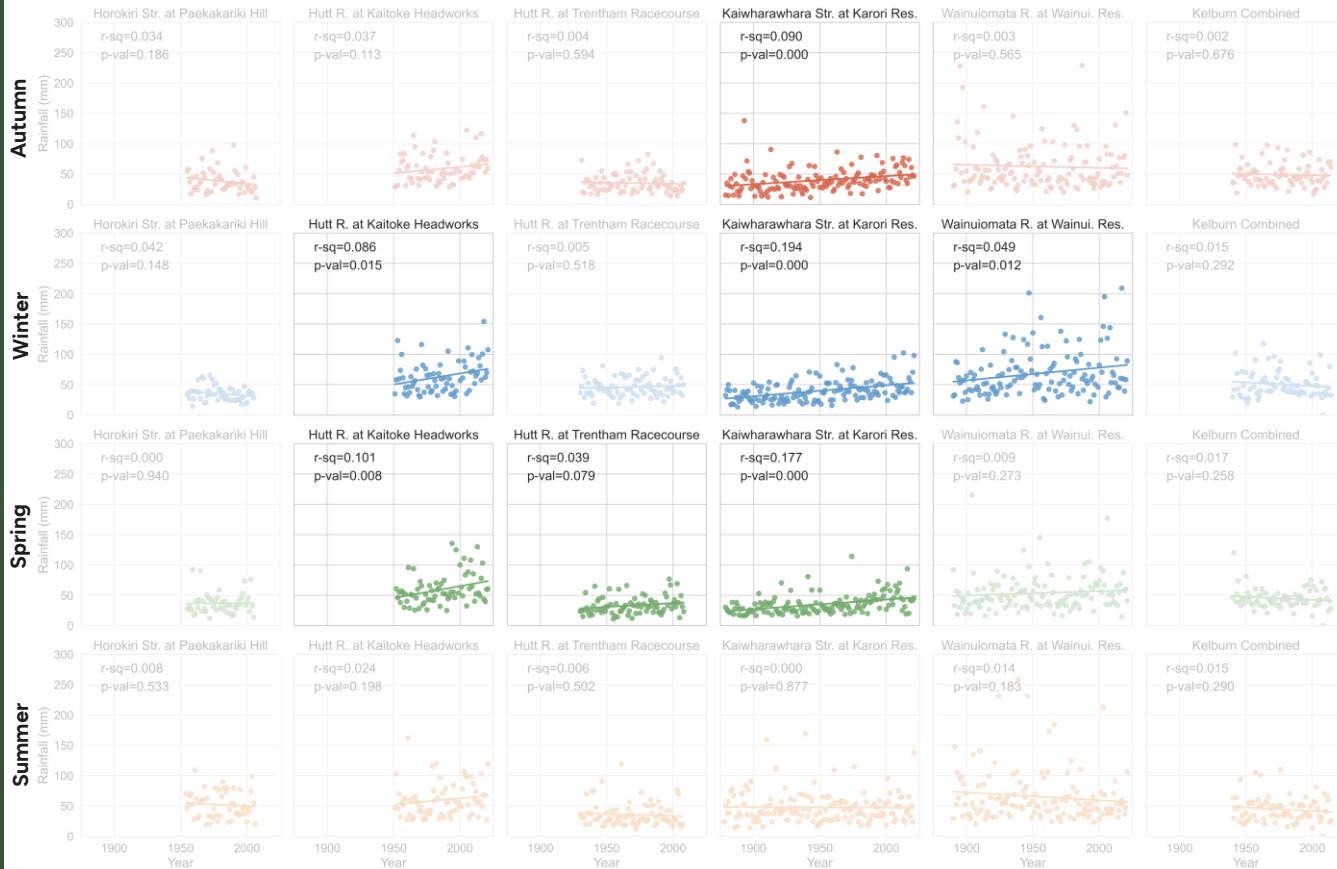
Annual Maxima





Daily Rainfall

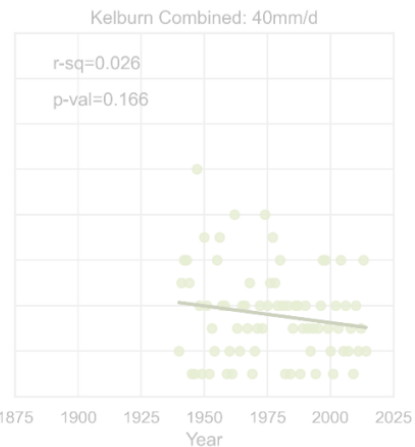
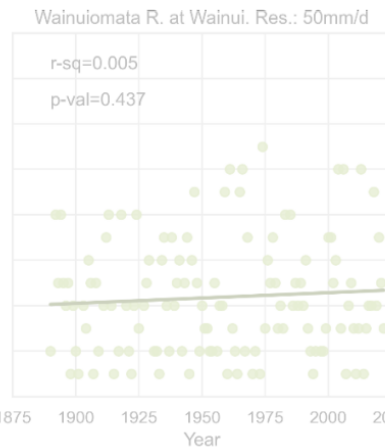
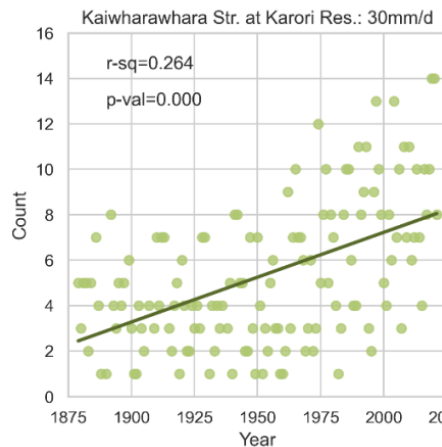
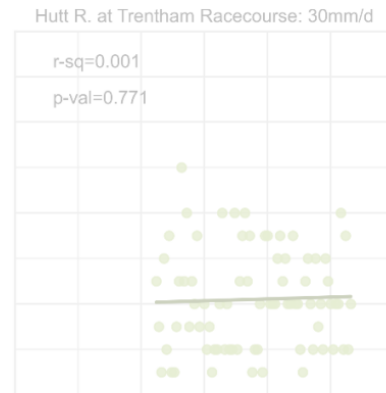
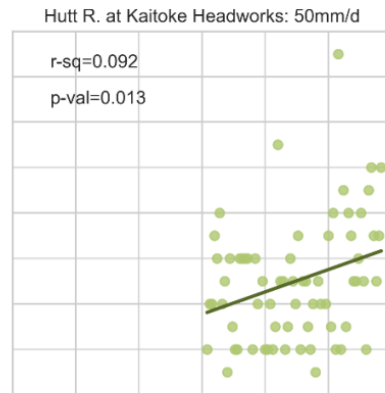
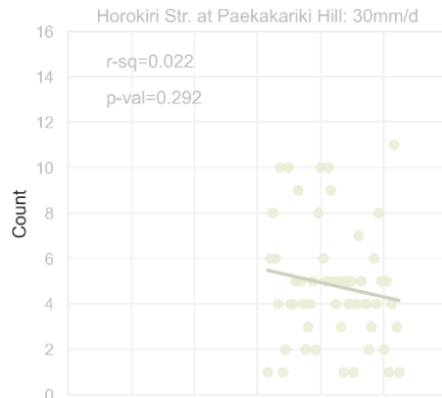
Seasonal Maxima





Daily Rainfall

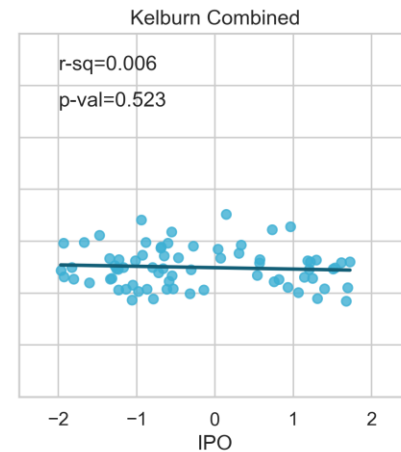
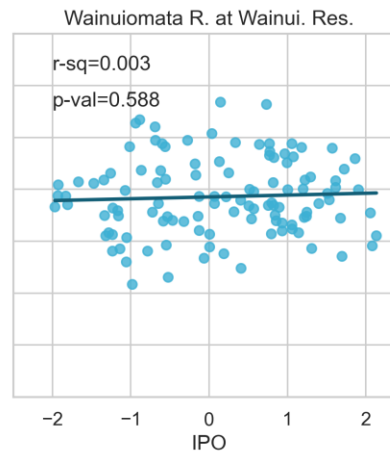
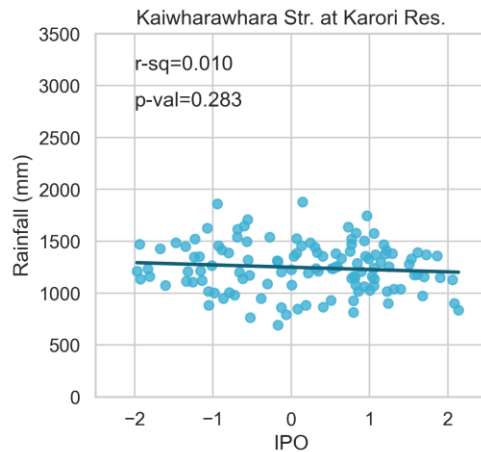
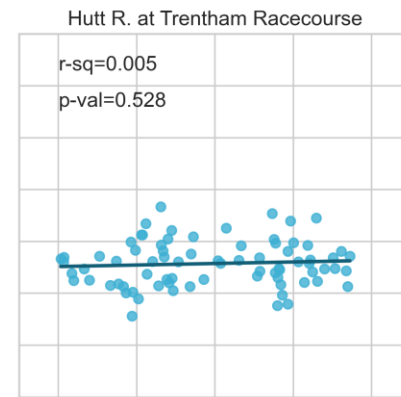
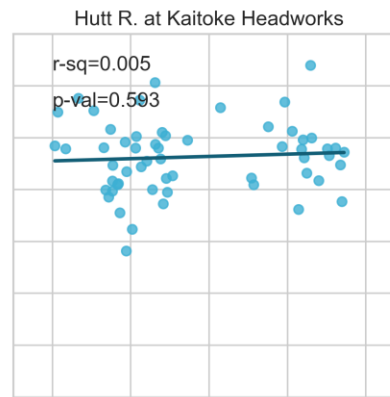
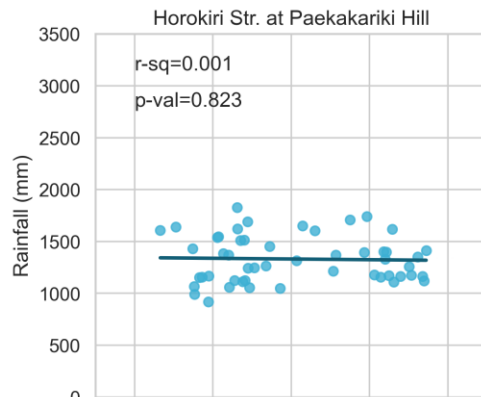
Threshold Exceedances





Daily Rainfall

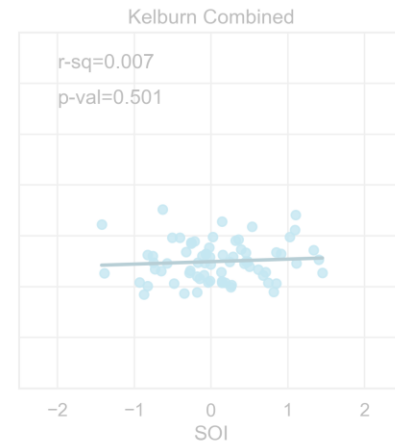
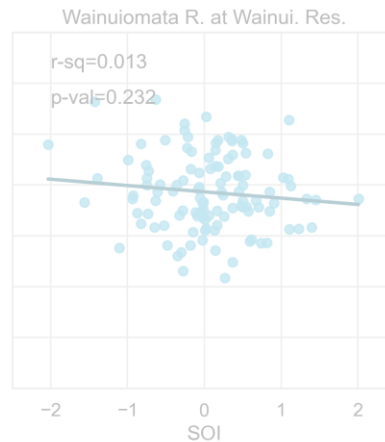
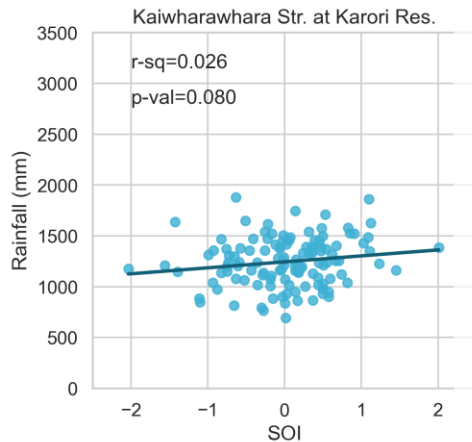
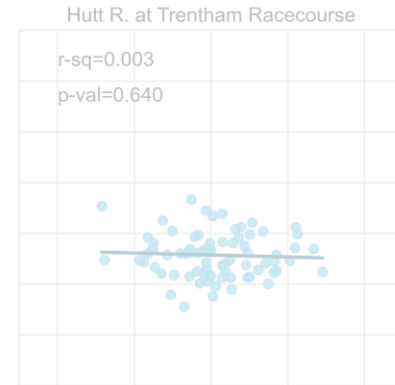
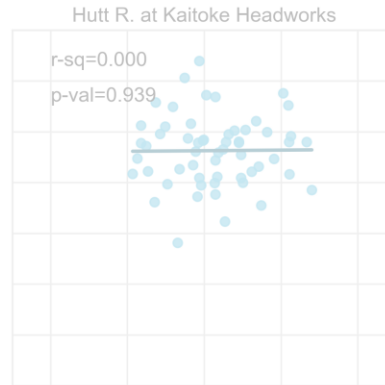
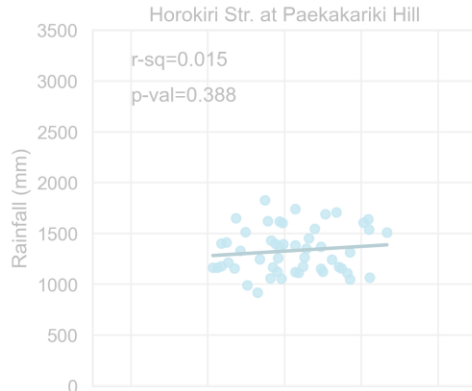
Climate indices: IPO





Daily Rainfall

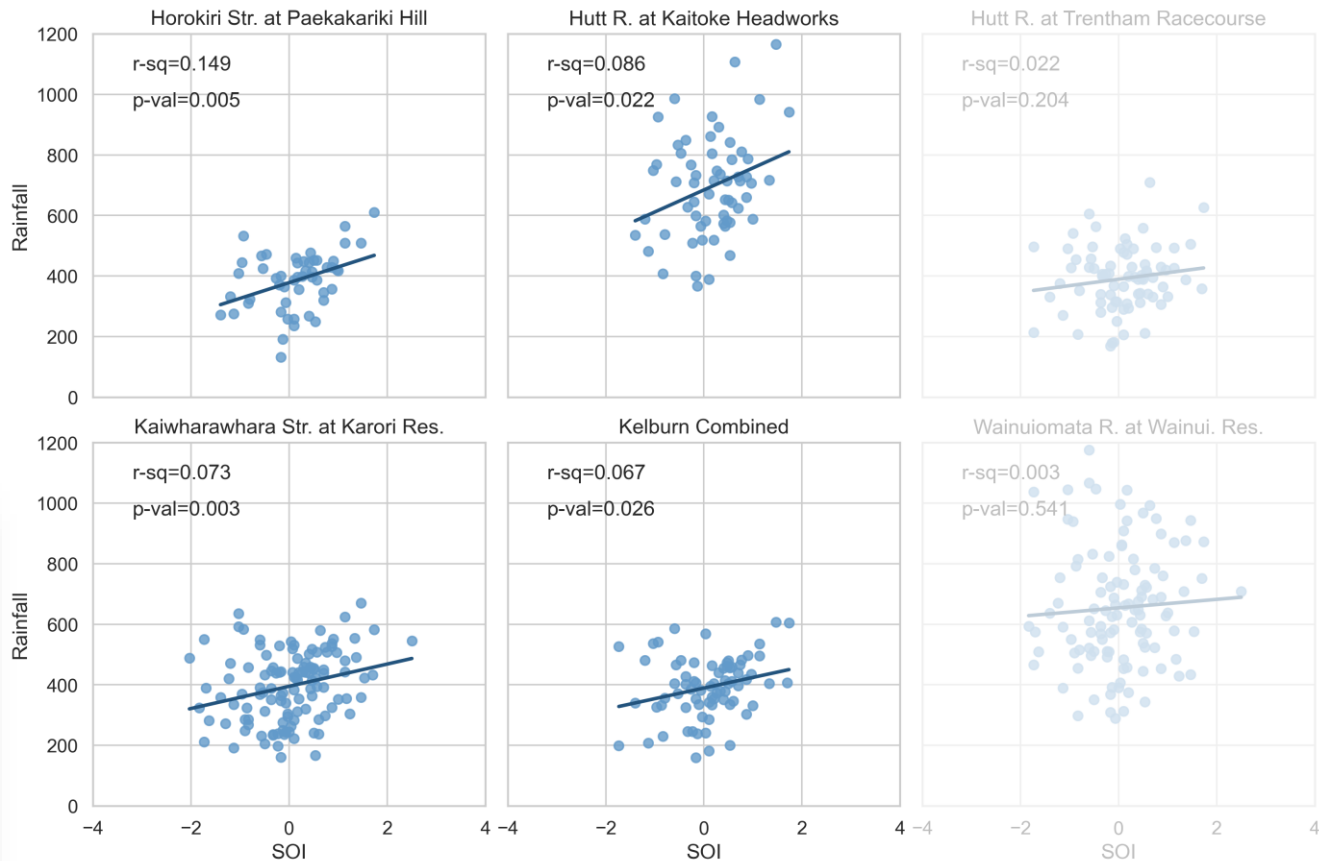
Climate indices: SOI





Daily Rainfall

Climate indices: SOI





Initial findings

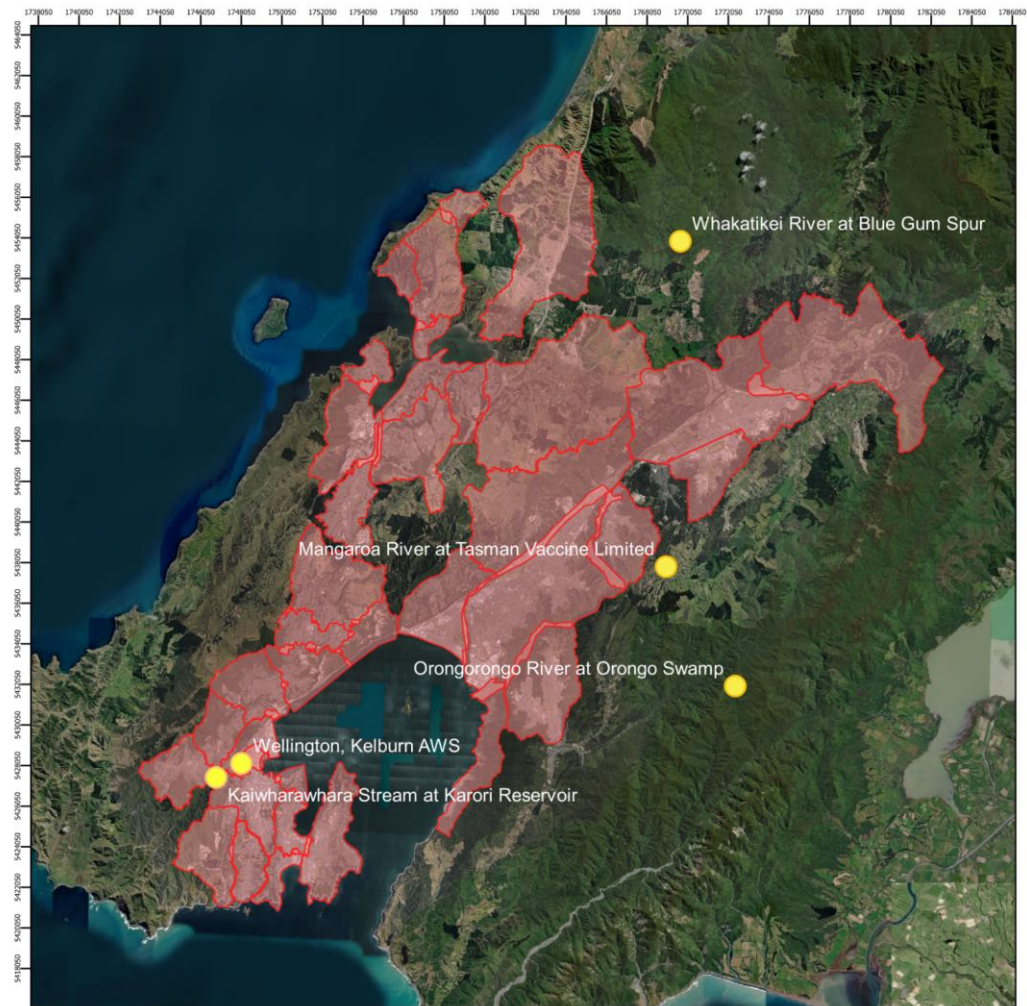
- Very little obvious or consistent trends in daily rainfall across Wellington

But...

- We used daily data, so what happens when we look at shorter duration events?
- 12-hour, 6-hour, 2-hour, 1-hour, 30-min, 20-min and 10-min durations
- Needed to look at other sites that had finer resolution data

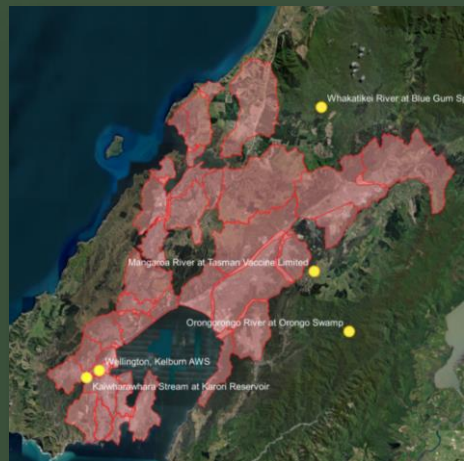


Site Selection



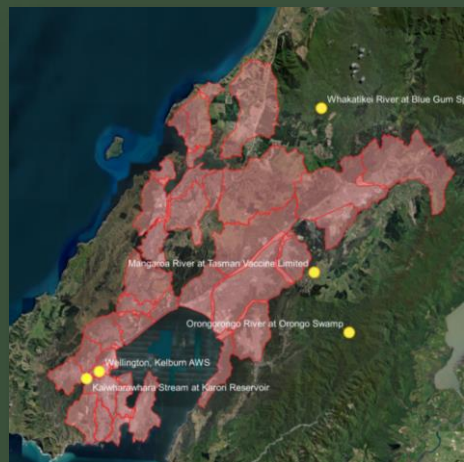
Shorter durations

Annual maxima



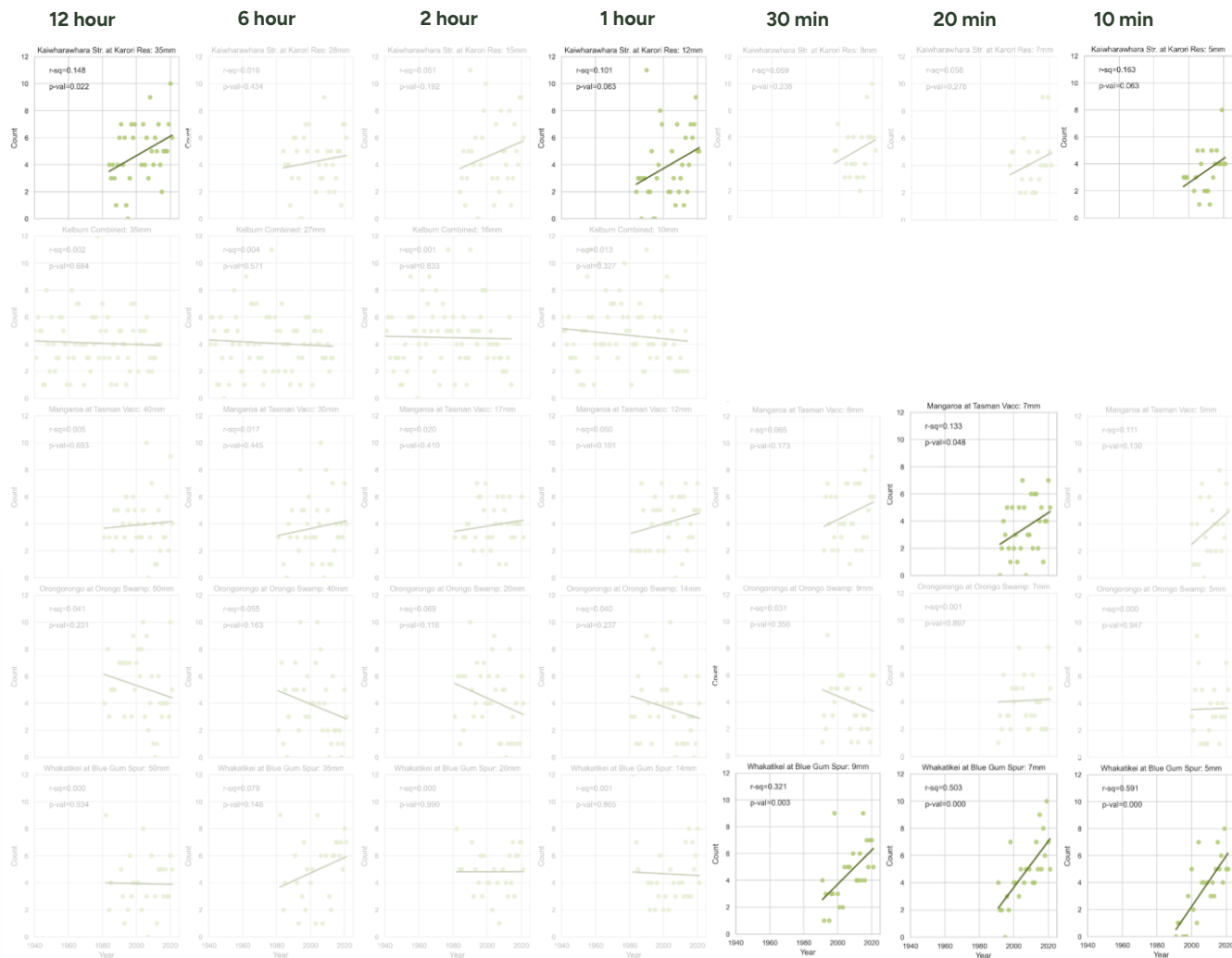
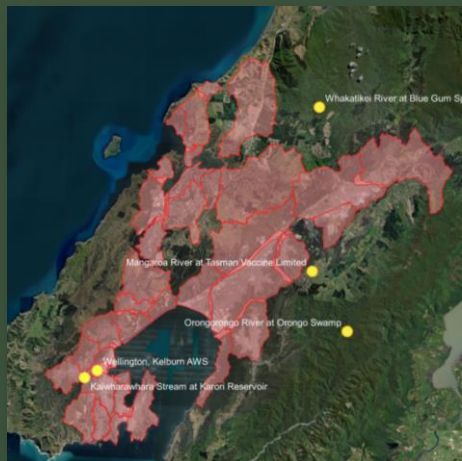
Shorter durations

Seasonal maxima



Shorter durations

Threshold exceedances



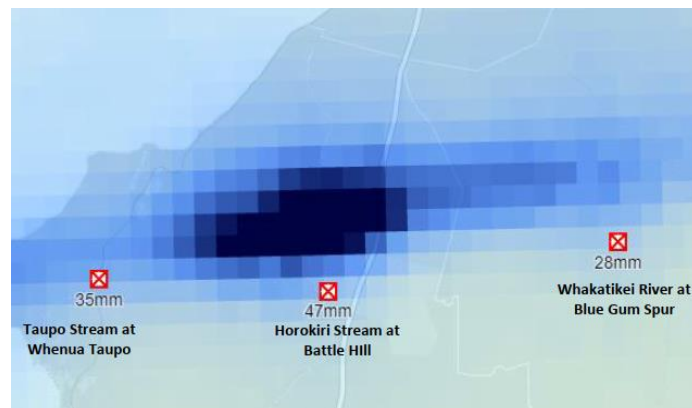


Overall findings

- There are no strong or consistent trends within and between sites and across event durations, especially for shortest duration events

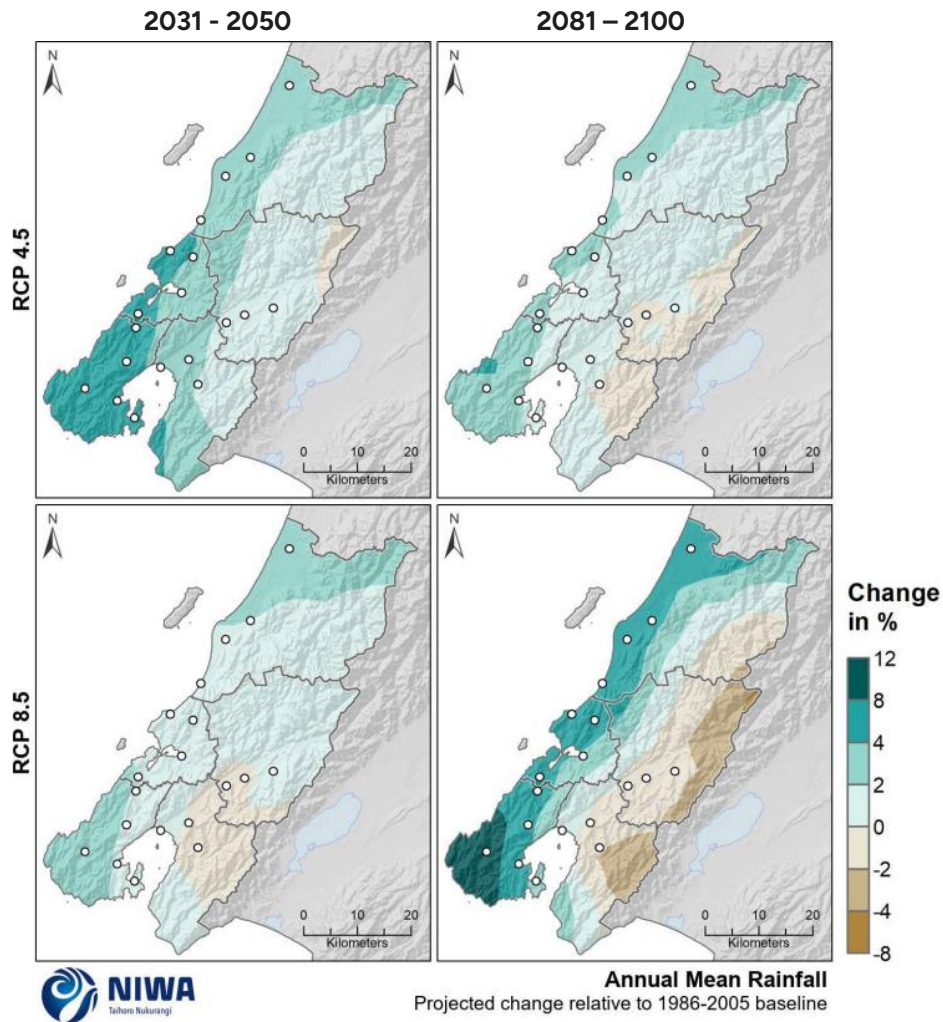
Why?

- Other atmospheric changes may influence rainfall – changes in turbulence, orographic effects, wind direction
- It may take several years of a sustained pattern for it to show up in the statistics
- Shortest duration events localised, maybe not always captured at the gauge network



Climate change projections for Wellington

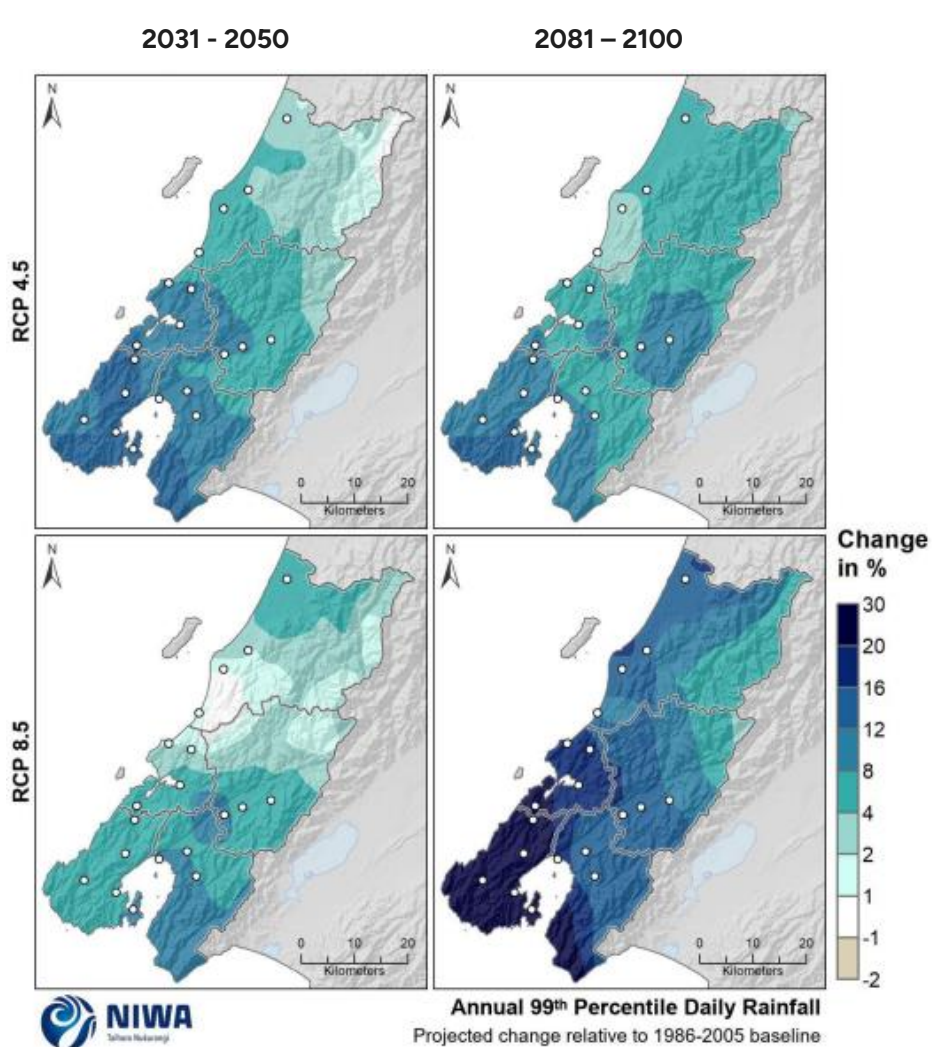
NIWA
Annual Totals



Climate change projections for Wellington?

NIWA

99th Percentile Daily Rainfall





Conclusions

Our results are fairly consistent with NIWA projections:

- Annual rainfall has been increasing in Wellington with decreases at Kaitoke and Wainuiomata
- For much of Wellington, the projected change is relatively small, i.e. $\pm 2\%$
- Extreme events (99th percentile) are expected to increase regionwide, but eastern areas tends to be decreasing
- MfE guidance provide adjustment factors for different event durations and AEPs but important to acknowledge the spatial variability of projected changes in rainfall as well



Making
Sustainability
Happen

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Questions?

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