



Stormwater Conference 2023

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# 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	<b>13.6</b> (10.7-19.4)
2-hour	<b>13.1</b> (10.1 – 19.6)
6-hour	<b>11.5</b> (8.5 - 17.4)
12-hour	<b>10.1</b> (7.3-15.4)
24-hour	<b>8.6</b> (5.2-12.8)



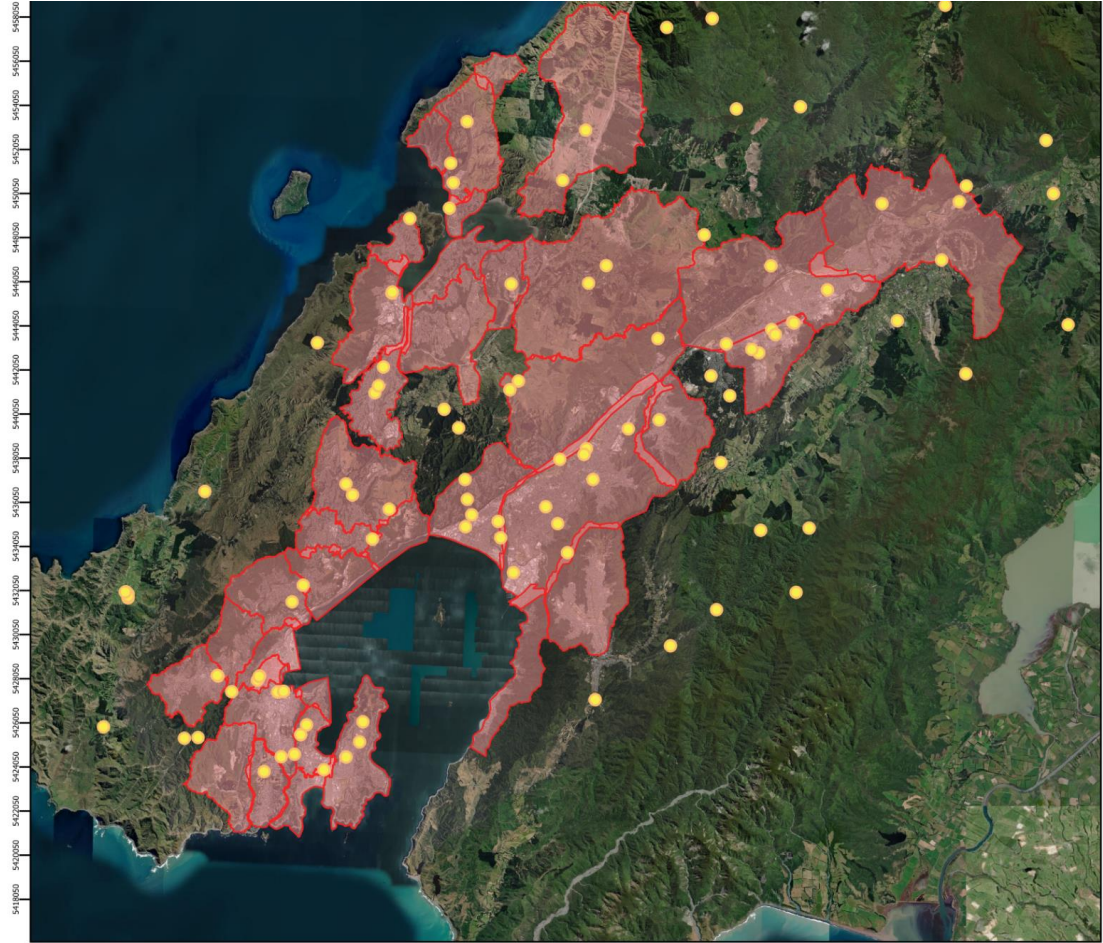
## Methodology

- 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

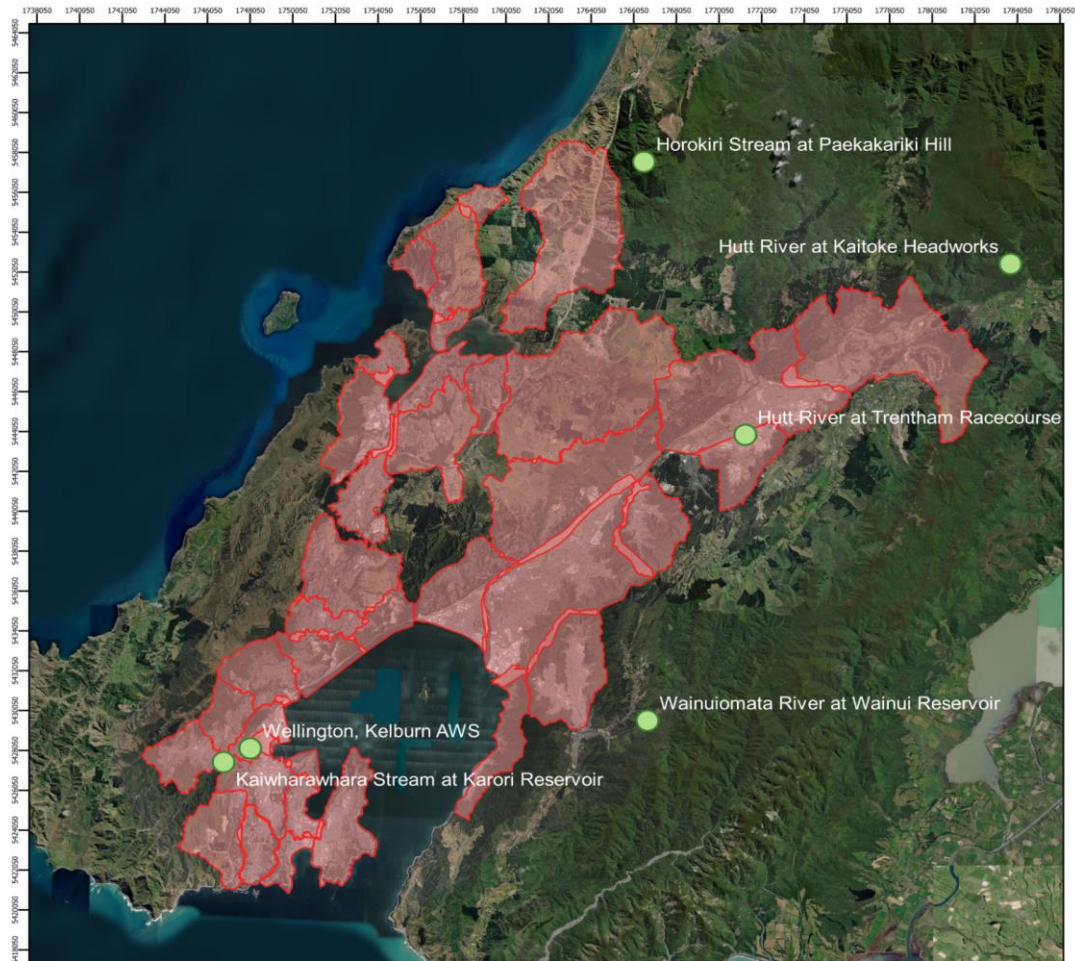




# Rainfall gauges

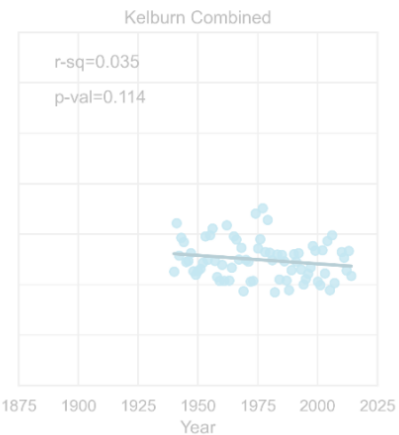
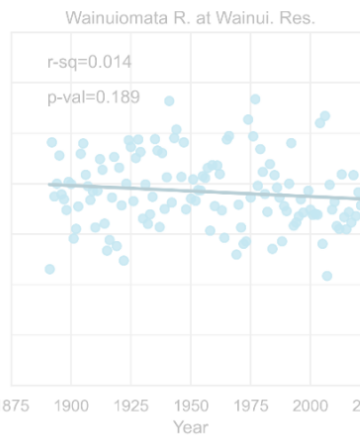
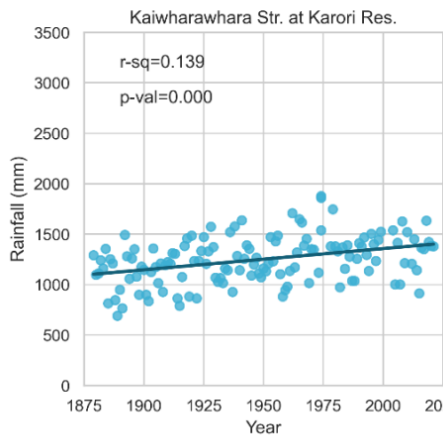
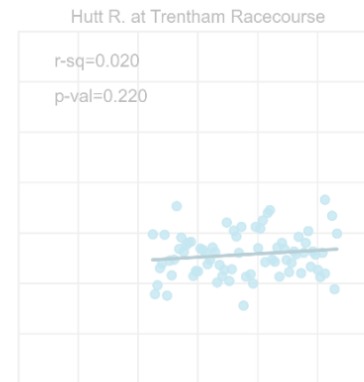
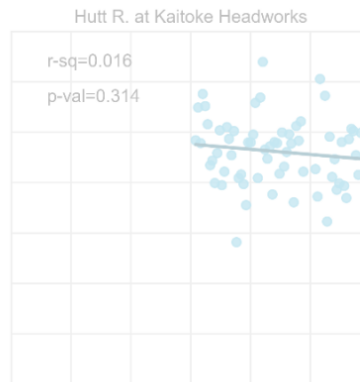
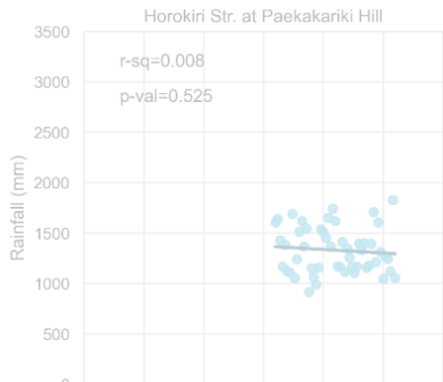


# Site Selection



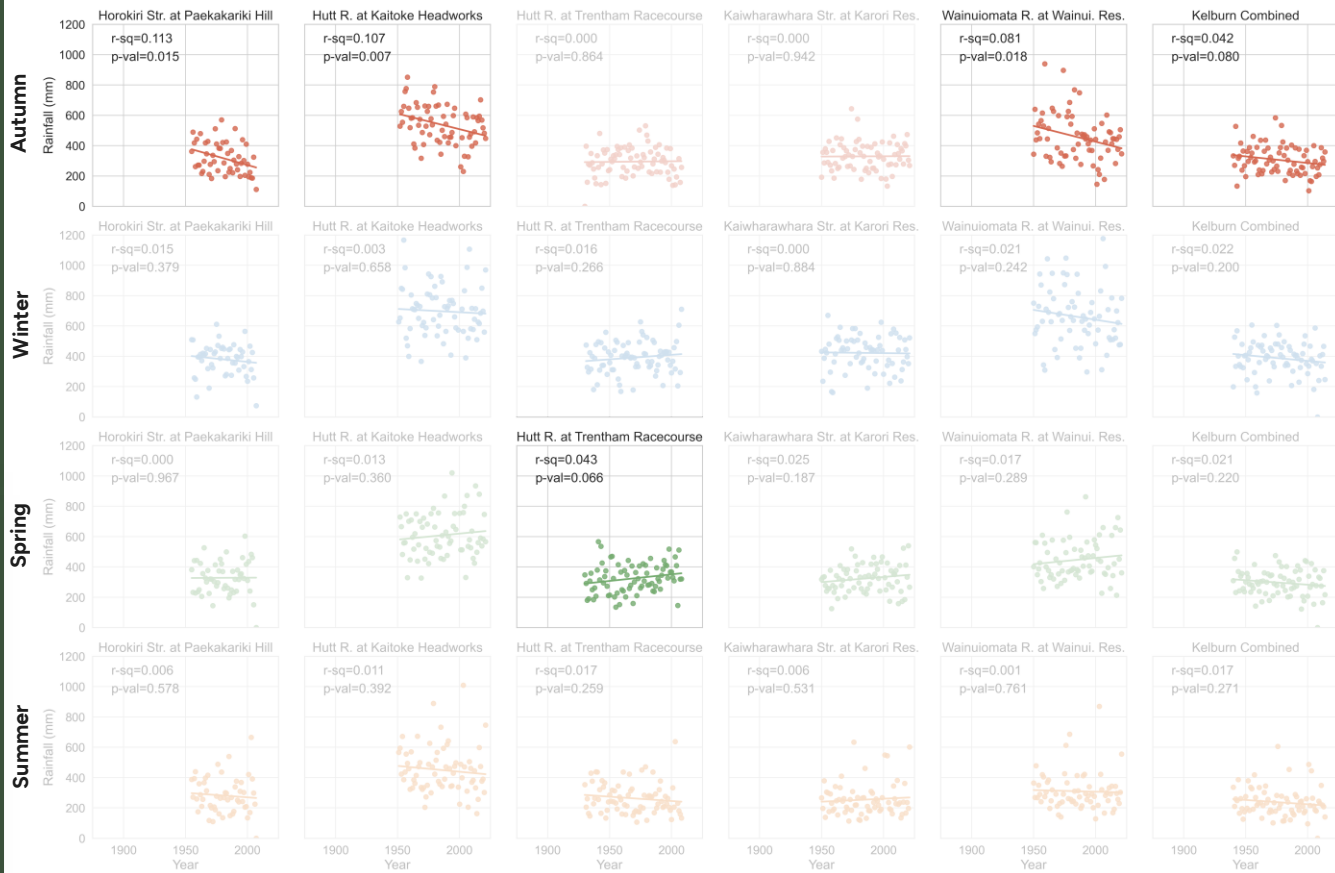


# Annual Totals





# Seasonal Totals

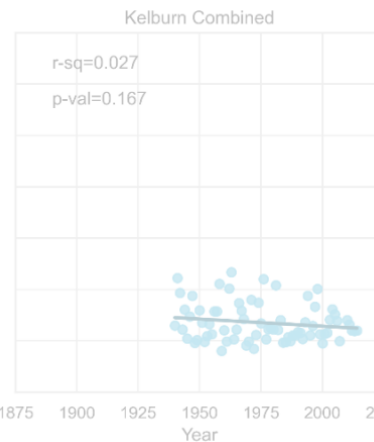
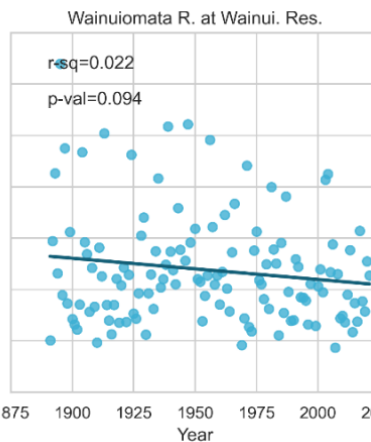
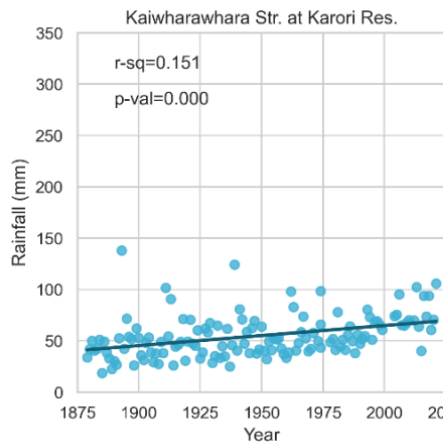
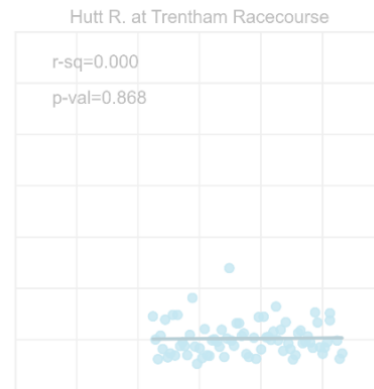
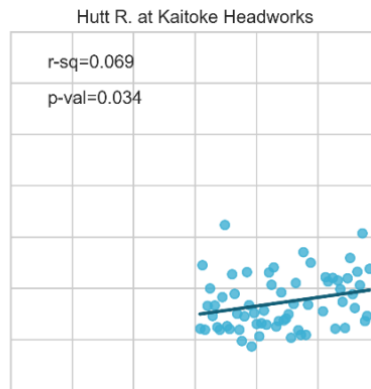
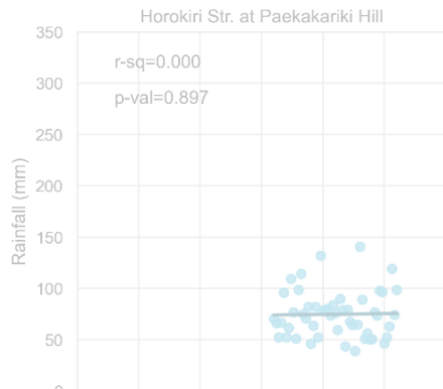






# Daily Rainfall

## Annual Maxima

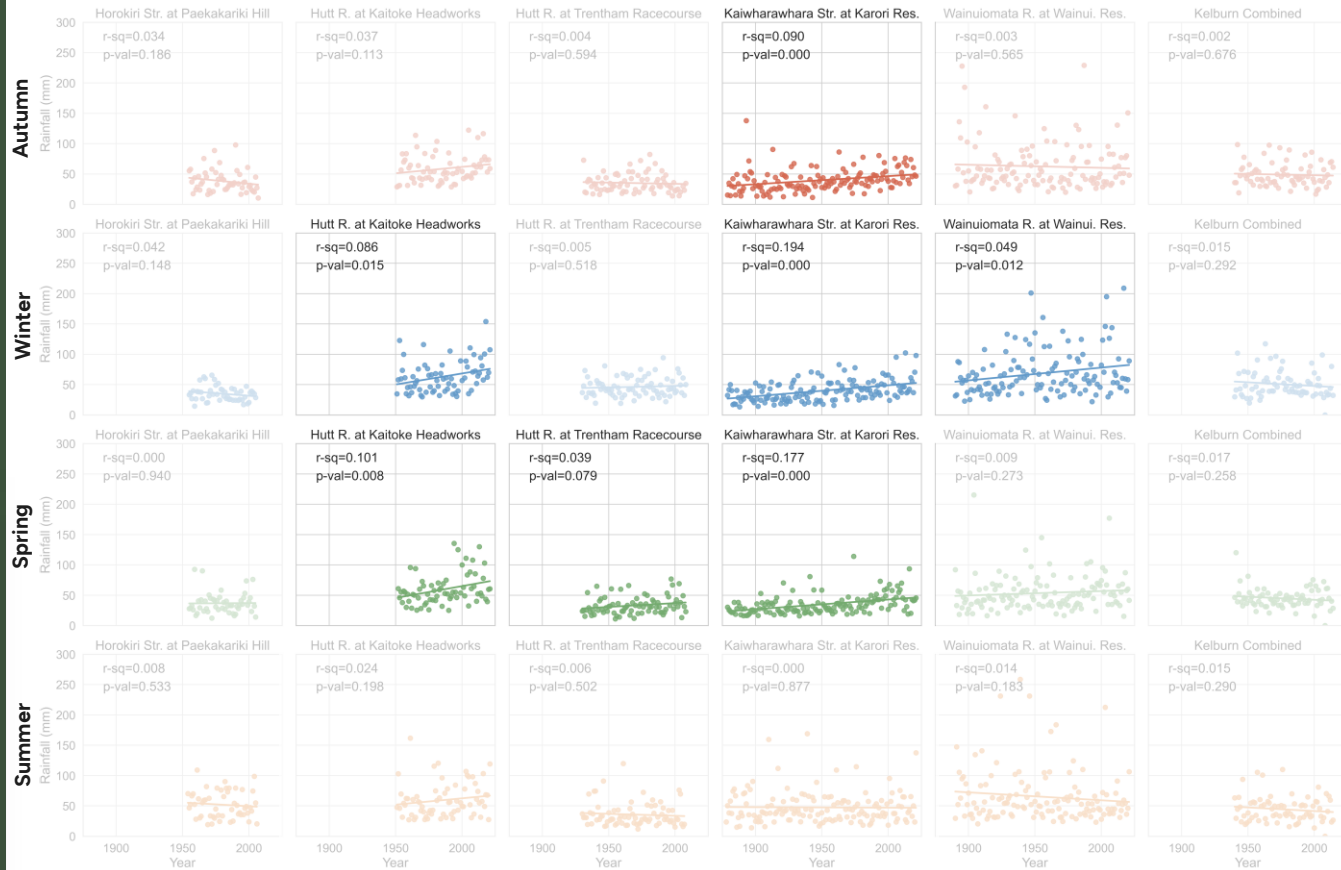






# Daily Rainfall

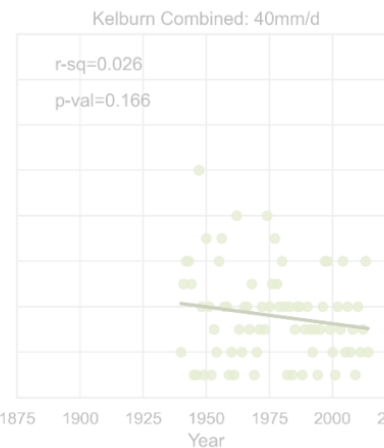
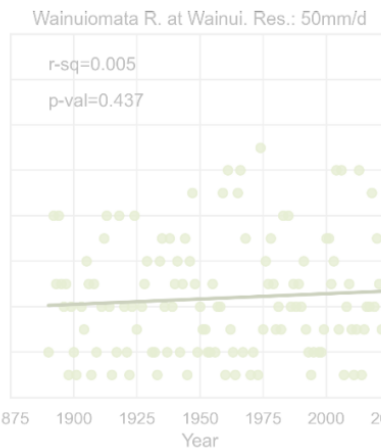
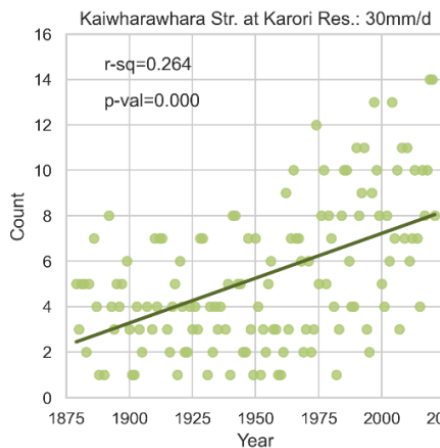
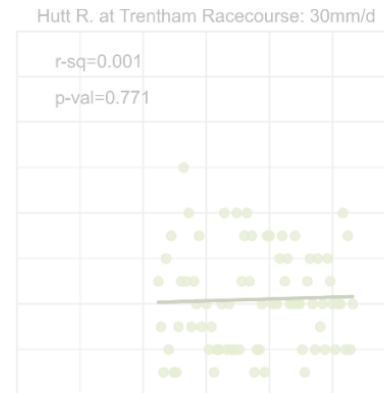
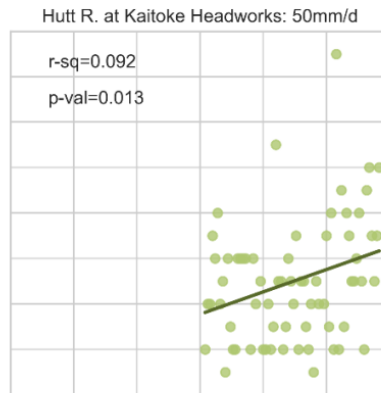
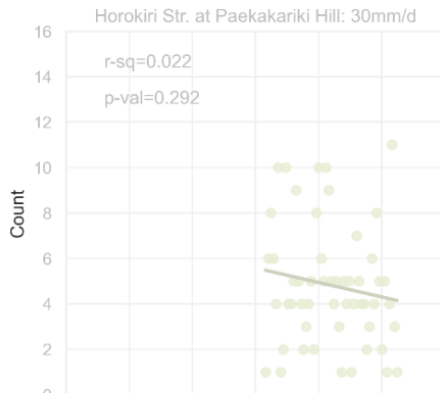
## Seasonal Maxima





# Daily Rainfall

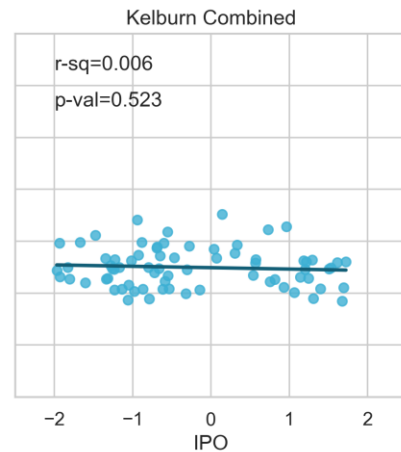
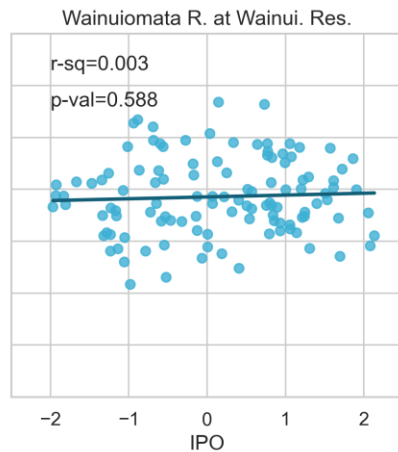
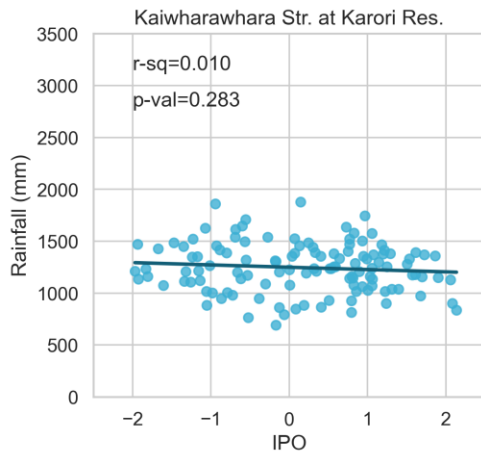
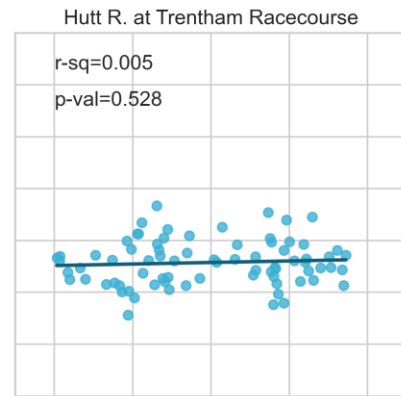
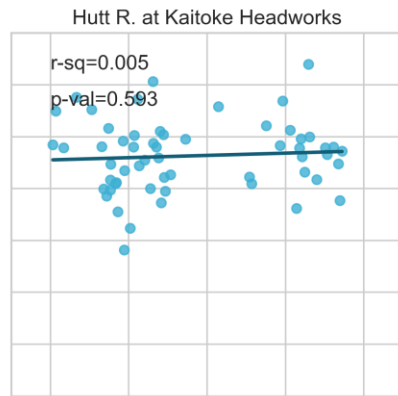
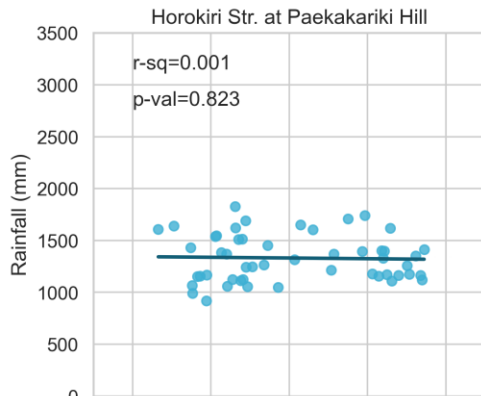
## Threshold Exceedances





# Daily Rainfall

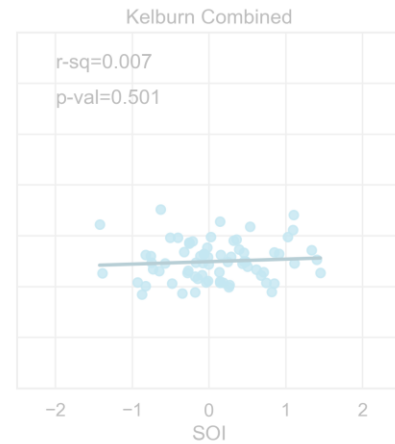
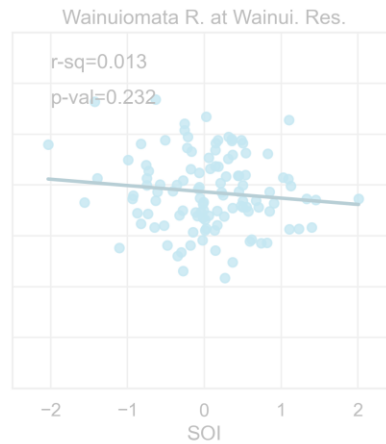
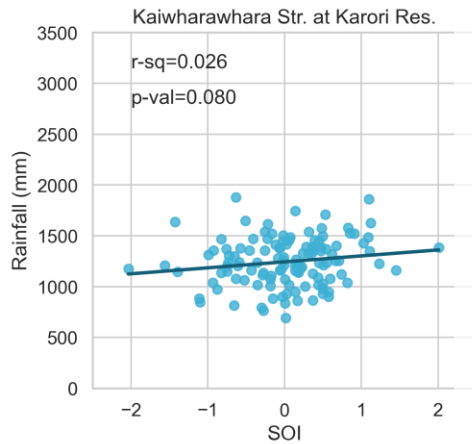
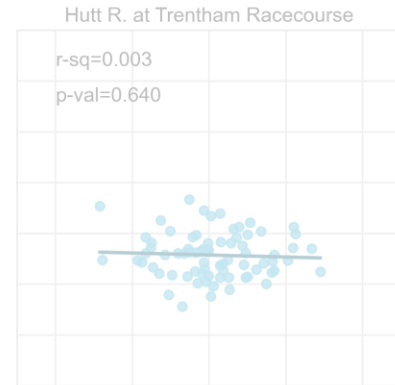
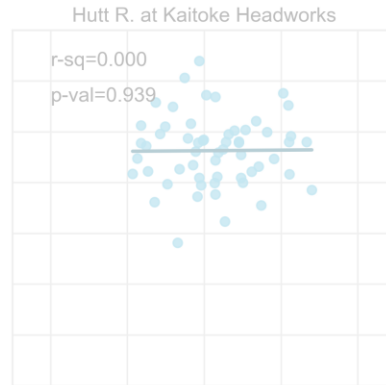
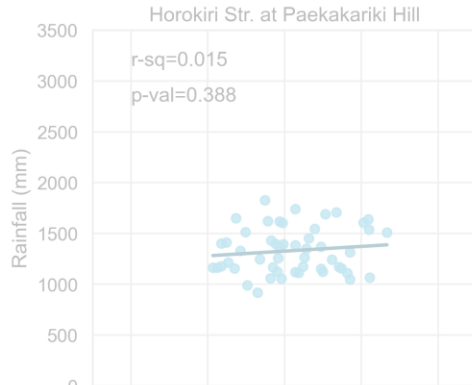
Climate indices: IPO





# Daily Rainfall

Climate indices: SOI

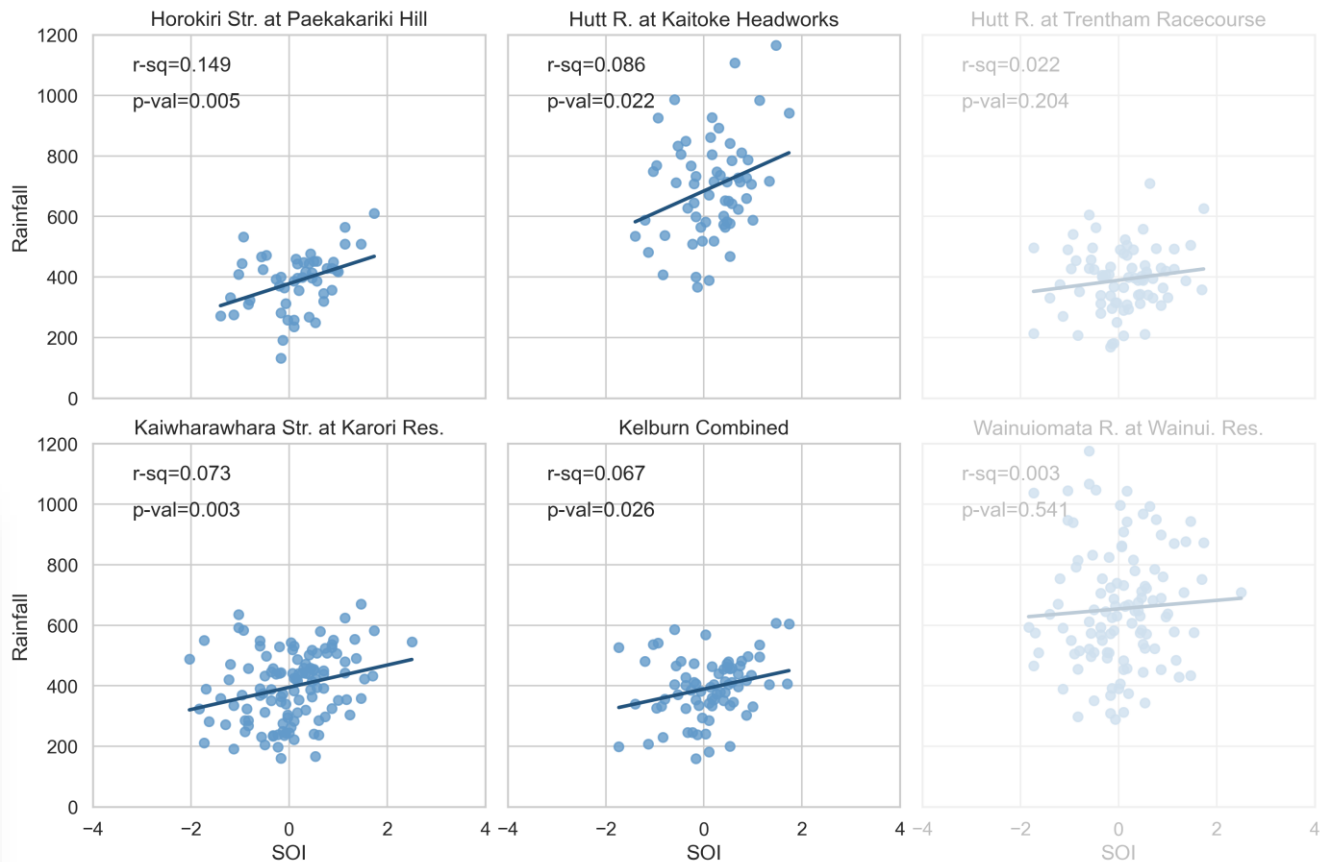






# Daily Rainfall

Climate indices: SOI





## Initial findings

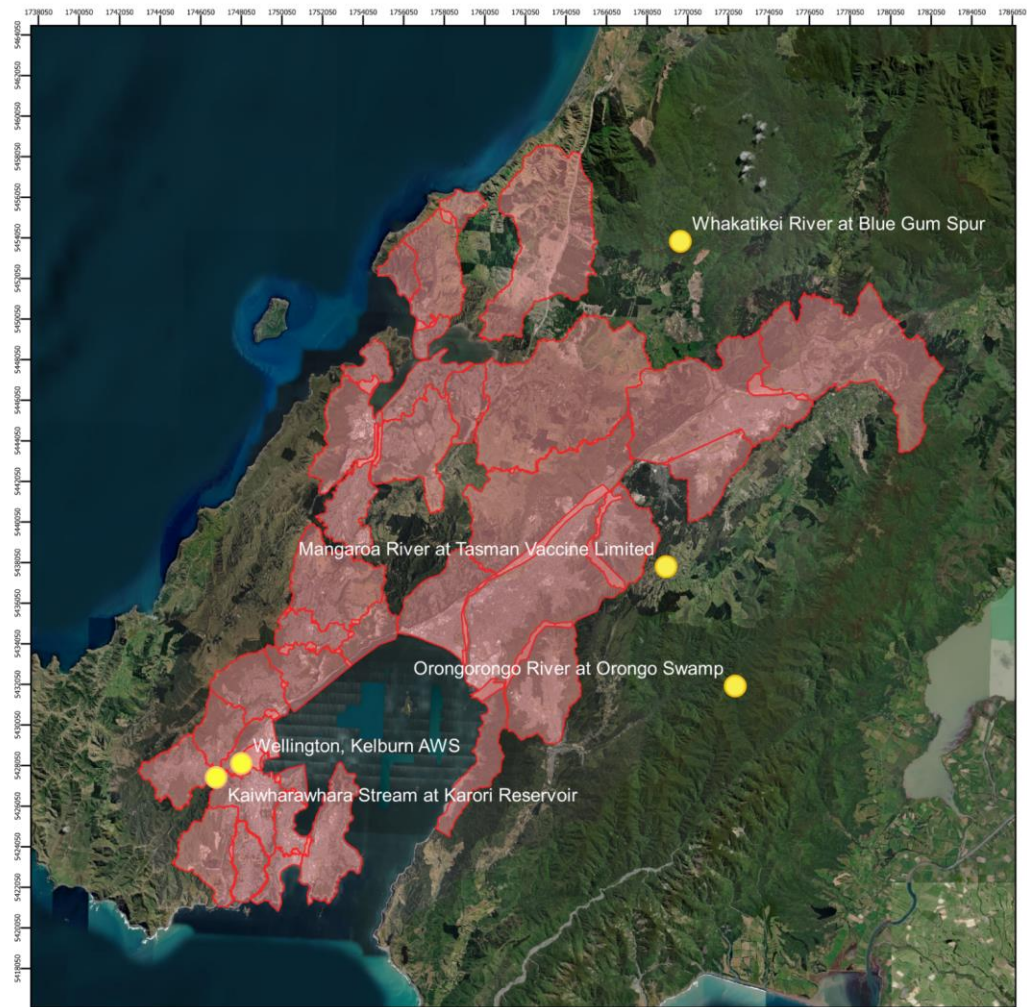
- Very little obvious or consistent trends in daily rainfall across Wellington

### But...

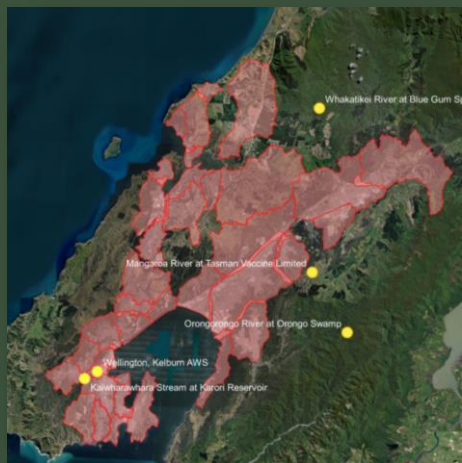
- We used daily data, so what happens when we look at shorter duration events?
- 12-hour, 6-hour, 2-hour, 1-hour, 30-min, 20-min and 10-min durations
- Needed to look at other sites that had finer resolution data



# Site Selection



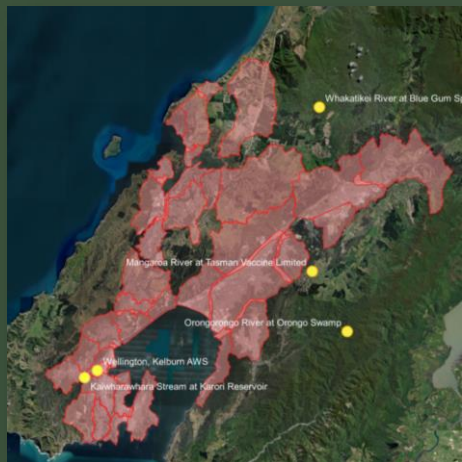
# Shorter durations Annual maxima





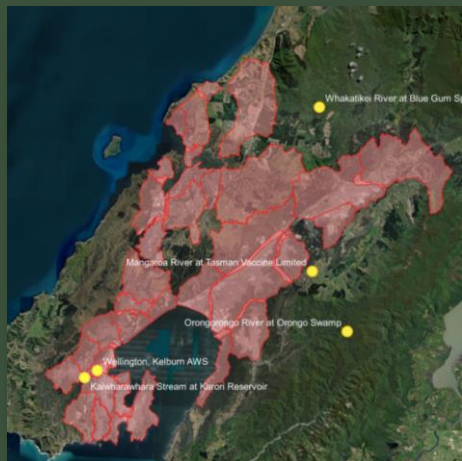
# Shorter durations

## Seasonal maxima



# Shorter durations

## Threshold exceedances



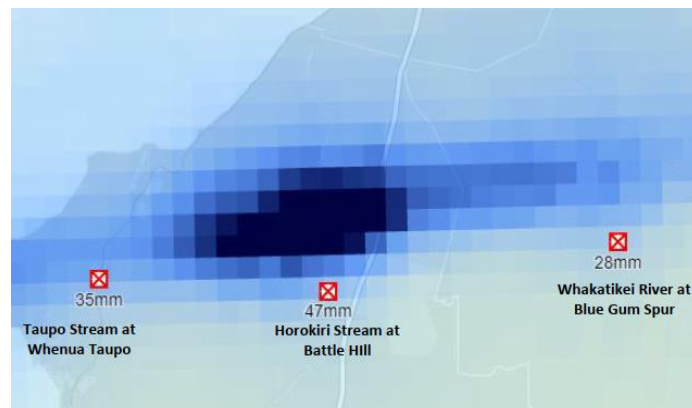


## Overall findings

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

### Why?

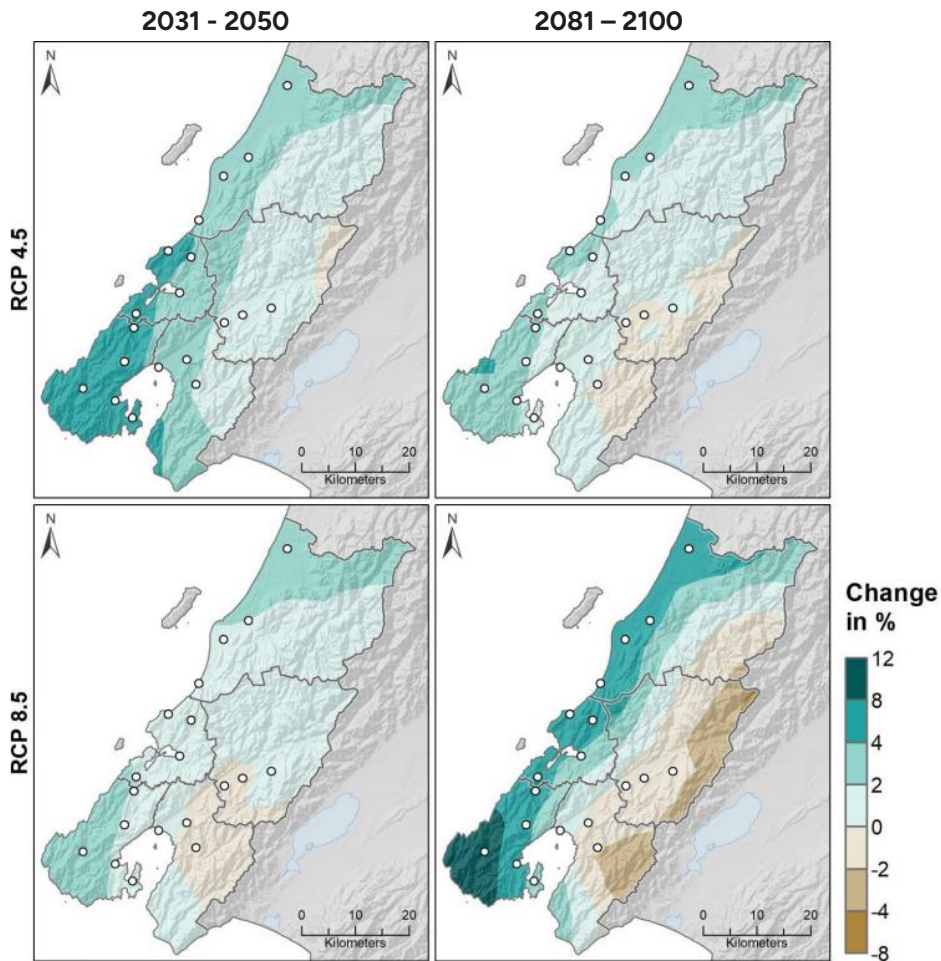
- Other atmospheric changes may influence rainfall – changes in turbulence, orographic effects, wind direction
- It may take several years of a sustained pattern for it to show up in the statistics
- Shortest duration events localised, maybe not always captured at the gauge network





# Climate change projections for Wellington

NIWA  
Annual Totals

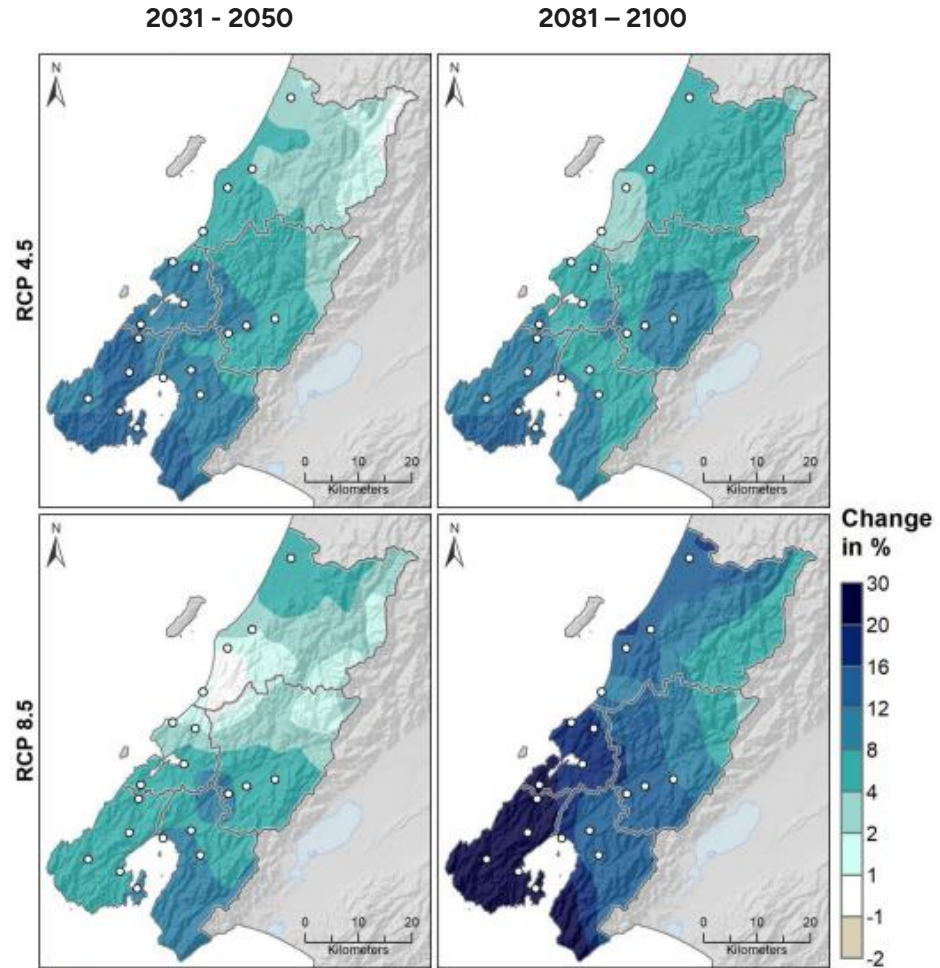




# Climate change projections for Wellington?

NIWA

99<sup>th</sup> Percentile Daily Rainfall



Annual 99<sup>th</sup> Percentile Daily Rainfall  
Projected change relative to 1986-2005 baseline



## 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 (99<sup>th</sup> 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



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Questions?

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James Renwick, VUW  
Alex Pezza, GWRC