

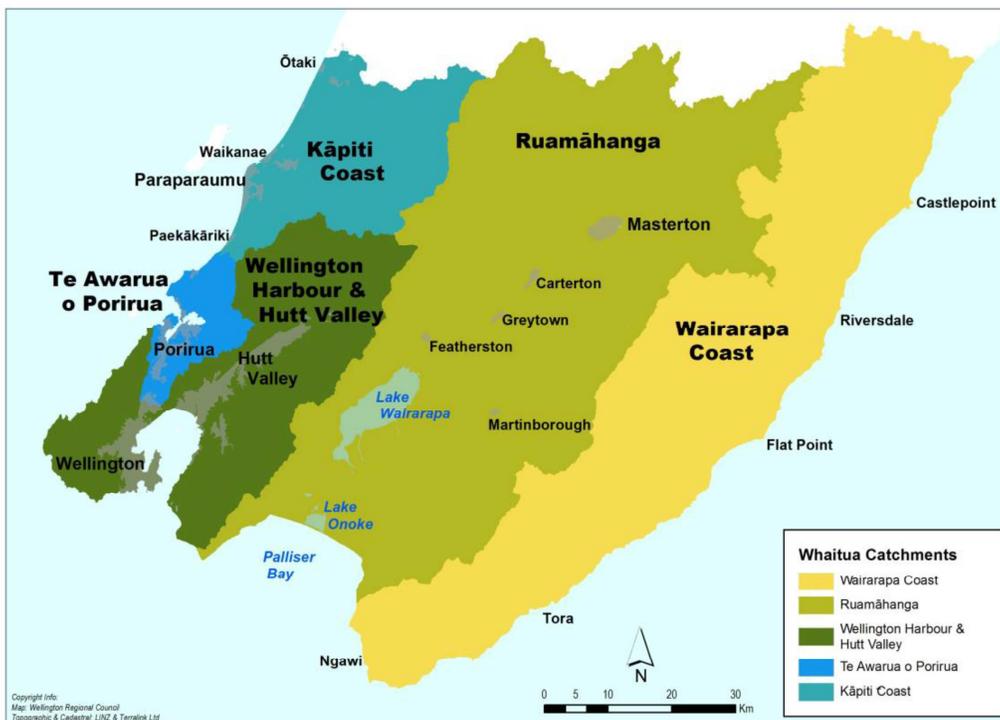
## Whaitua Catchments Climate Change parameters

All parameters were extrapolated based on the recent NIWA regional climate change report for the Wellington Region (2017) available from [www.gw.govt.nz/climate-change](http://www.gw.govt.nz/climate-change)

### Wellington Region whaitua

As pictured in the map below, the Wellington Region has been split into five whaitua (catchments) with a committee in each making decisions on the future of land and water management in that whaitua.

For more info visit: <http://www.gw.govt.nz/whaitua-committees/>



## Te Awarua o Porirua whaitua

Variable/period	2040	2090	Commentary
Average annual Temperature	+0.5C to 1C above present  (+1.2C to +1.7 C above pre-industrial)	+1C to +2.7C above present  (+1.7C to +3.4C above pre-industrial)	Maximum warming in autumn and winter, least in spring  Note reference to above present versus pre-industrial: About 0.7C of warming has already happened from pre-industrial to present (1880-1909 compared to 1986-2005 reference periods).  Uncertainty range: lower range for RCP4.5 and upper range for RCP8.5
Average annual rainfall	0% to 5% increase	0% to 10% increase	There is a large uncertainty in the range of changes due to model differences and emission scenarios. Changes against RCP are not necessarily linear. Greater likelihood of positive changes in autumn, winter and spring.
Amount of rain falling during heavy rainfall days (> 99 <sup>th</sup> percentile of daily rainfall)	0% to 15% increase	5% to 25% increase	Although the uncertainty in average rainfall range is high, extreme rainfall increases are more certain due to the increased amount of water vapour that the atmosphere can hold as it gets warmer (about 8% increase in saturation vapour per degree of warming)
Sea level rise	0.12 to 0.24 metres above present  (0.38 to 0.5 metres above pre-industrial)	0.36 to 0.98 metres above present  (0.62 to 1.24 metres above pre-industrial)	The projected sea level rise (based on IPCC AR5) may get significantly worse depending on the behavior of the Antarctic ice shelves, so the upper limit is not a fixed physical limit. There is very high confidence in sea level rise projections, probably more so than any other variable. Note the difference between present and pre-industrial, as we have already had about 26cm of sea level rise so far.  See the link below for inundation maps plotting for anywhere in

			the world: <a href="http://sealevel.climatecentral.org">http://sealevel.climatecentral.org</a>
Number of hot days (above 25C) per year	Between 0 and 10 days increase	Between 0 and 30 days increase	
Number of frost nights (below 0C) per year	Between 0 and 5 days reduction	Between 0 and 15 days reduction	
Change in the intensity of wind during windy days (>99 <sup>th</sup> percentile of daily mean)	1% to 2% increase	1% to 3% increase	
Change in annual number of windy days	2 to 4 days increase	2 to 10 days increase	
Change in annual growing degree days base 10	Increase between 200 and 300 GDD units	Increase between 300 and 900 GDD units	Measures potential for crop and pasture growth
Change in annual potential evapotranspiration deficit (mm)	Increase between 60 and 100 mm	Increase between 60 and 120 mm	Measures drought intensity
Change in rivers mean annual low flow discharge (MAL)	Decrease up to 40%	Decrease up to 40%	Measures water shortage in the catchments
Change in rivers mean annual flood discharge (MAF)	Increase up to 40%	Increase up to 80%	Measures flood potential in the catchments
Changes in number of days of very high and extreme forest fire danger	50% to 100% increase	100% to 150% increase	These figures are given by IPCC model averages. Individual models can show much higher increases of up to 700%
Key environmental impacts	Increased flood intensity Increased coastal inundation (some areas to become permanently inundated) Increased erosion Reduced soil fertility Decreased water quality Groundwater quality and availability pressures Salt water intrusion Increased pressure on water storage Biodiversity losses		

	Increased pests such as wasps and rodents Ocean acidification Decline in fish population Increased wildfire Increased allergies (e.g. pollen)
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## Wellington Harbor & Hutt Valley whaitua

Variable/period	2040	2090	Commentary
Average annual Temperature	+0.5C to 1C above present  (+1.2C to +1.7 C above pre-industrial)	+1C to +2.5C above present  (+1.7C to +3.2C above pre-industrial)	Maximum warming in summer and autumn, least in spring and winter  Note reference to above present versus pre-industrial: About 0.7C of warming has already happened from pre-industrial to present (1880-1909 compared to 1986-2005 reference periods).  Uncertainty range: lower range for RCP4.5 and upper range for RCP8.5
Average annual rainfall	5% decrease to 10% increase	5% decrease to 10% increase	There is a large uncertainty in the range of changes due to model differences and emission scenarios. Changes against RCP are not necessarily linear. Greater likelihood of positive changes in autumn and winter.
Amount of rain falling during heavy rainfall days (> 99 <sup>th</sup> percentile of daily rainfall)	5% to 15% increase	5% to 30% increase	Although the uncertainty in average rainfall range is high, extreme rainfall increases are more certain due to the increased amount of water vapour that the atmosphere can hold as it gets warmer (about 8% increase in saturation vapour per degree of warming)
Sea level rise	0.12 to 0.24 metres above present  (0.38 to 0.5 metres above pre-industrial)	0.36 to 0.98 metres above present  (0.62 to 1.24 metres above pre-industrial)	The projected sea level rise (based on IPCC AR5) may get significantly worse depending on the behavior of the Antarctic ice shelves, so the upper limit is not a fixed physical limit. There is very high confidence in sea level rise projections, probably more so than any other variable. Note the difference between present and pre-industrial, as we have already had about 26cm of sea level rise so far.  See the link below for inundation

			maps plotting for anywhere in the world: <a href="http://sealevel.climatecentral.org">http://sealevel.climatecentral.org</a>
Number of hot days (above 25C) per year	Between 0 and 10 days increase	Between 0 and 40 days increase	
Number of frost nights (below 0C) per year	Between 0 and 5 days reduction	Between 0 and 10 days reduction	
Change in the intensity of wind during windy days (>99 <sup>th</sup> percentile of daily mean)	1% to 2% increase	1% to 4% increase	
Change in annual number of windy days	2 to 6 days increase	2 to 12 days increase	
Change in annual growing degree days base 10	Increase between 0 and 300 GDD units	Increase between 200 and 800 GDD units	Measures potential for crop and pasture growth
Change in annual potential evapotranspiration deficit (mm)	Increase between 40 and 100 mm	Increase between 40 and 140 mm	Measures drought intensity
Change in rivers mean annual low flow discharge (MAL)	Decrease up to 40%	Decrease up to 40%	Measures water shortage in the catchments
Change in rivers mean annual flood discharge (MAF)	Increase up to 40%	Increase up to 100%	Measures flood potential in the catchments
Changes in number of days of very high and extreme forest fire danger	50% to 100% increase	100% to 150% increase	These figures are given by IPCC model averages. Individual models can show much higher increases of up to 700%
Key environmental impacts	Increased flood intensity Increased coastal inundation (some areas to become permanently inundated) Increased erosion Reduced soil fertility Decreased water quality Groundwater quality and availability pressures Saltwater intrusion Increased pressure on water storage		

	Biodiversity losses Increased pests such as wasps and rodents Ocean acidification Decline in fish population Increased wildfire Increased allergies (e.g. pollen)
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## Kapiti coast whaitua

Variable/period	2040	2090	Commentary
Average annual Temperature	+0.5C to 1C above present  (+1.2C to +1.7 C above pre-industrial)	+1C to +2.7C above present  (+1.7C to +3.4C above pre-industrial)	Maximum warming in autumn and winter, least in spring  Note reference to above present versus pre-industrial: About 0.7C of warming has already happened from pre-industrial to present (1880-1909 compared to 1986-2005 reference periods).  Uncertainty range: lower range for RCP4.5 and upper range for RCP8.5
Average annual rainfall	0% to 5% increase	0% to 10% increase	There is a large uncertainty in the range of changes due to model differences and emission scenarios. Changes against RCP are not necessarily linear. Greater likelihood of positive changes in autumn, winter and spring.
Amount of rain falling during heavy rainfall days (> 99 <sup>th</sup> percentile of daily rainfall)	0% to 10% increase	0% to 15% increase	Although the uncertainty in average rainfall range is high, extreme rainfall increases are more certain due to the increased amount of water vapour that the atmosphere can hold as it gets warmer (about 8% increase in saturation vapour per degree of warming)
Sea level rise	0.12 to 0.24 metres above present  (0.38 to 0.5 metres above pre-industrial)	0.36 to 0.98 metres above present  (0.62 to 1.24 metres above pre-industrial)	The projected sea level rise (based on IPCC AR5) may get significantly worse depending on the behavior of the Antarctic ice shelves, so the upper limit is not a fixed physical limit. There is very high confidence in sea level rise projections, probably more so than any other variable. Note the difference between present and pre-industrial, as we have already had about 26cm of sea level rise so far.  See the link below for inundation maps plotting for anywhere in

			the world: <a href="http://sealevel.climatecentral.org">http://sealevel.climatecentral.org</a>
Number of hot days (above 25C) per year	Between 5 and 10 days increase	Between 5 and 50 days increase	
Number of frost nights (below 0C) per year	Between 0 and 5 days reduction	Between 0 and 15 days reduction	
Change in the intensity of wind during windy days (>99 <sup>th</sup> percentile of daily mean)	0% to 2% increase	0% to 3% increase	
Change in annual number of windy days	0 to 4 days increase	0 to 6 days increase	
Change in annual growing degree days base 10	Increase between 0 and 300 GDD units	Increase between 200 and 900 GDD units	Measures potential for crop and pasture growth
Change in annual potential evapotranspiration deficit (mm)	Increase between 40 and 80 mm	Increase between 40 and 100 mm	Measures drought intensity
Change in rivers mean annual low flow discharge (MAL)	Decrease up to 40%	Decrease up to 40%	Measures water shortage in the catchments
Change in rivers mean annual flood discharge (MAF)	Between 20% decrease and 60% increase depending on catchment	Increase up to 60%	Measures flood potential in the catchments
Changes in number of days of very high and extreme forest fire danger	50% to 100% increase	100% to 150% increase	These figures are given by IPCC model averages. Individual models can show much higher increases of up to 700%
Key environmental impacts	Increased flood intensity Increased coastal inundation (some areas to become permanently inundated) Increased erosion Reduced soil fertility		

	Decreased water quality Groundwater quality and availability pressures Saltwater intrusion Increased pressure on water storage Biodiversity losses Increased pests such as wasps and rodents Ocean acidification Decline in fish population Increased wildfire Increased allergies (e.g. pollen)
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## Ruamahanga whaitua

Variable/period	2040	2090	Commentary
Average annual Temperature	+0.7C to 1C above present  (+1.4C to +1.7 C above pre-industrial)	+1.2C to +3C above present  (+1.9C to +3.7C above pre-industrial)	Maximum warming in autumn and summer, least in winter  Note reference to above present versus pre-industrial: About 0.7C of warming has already happened from pre-industrial to present (1880-1909 compared to 1986-2005 reference periods).  Uncertainty range: lower range for RCP4.5 and upper range for RCP8.5
Average annual rainfall	5% decrease to 5% increase	0% to 10% decrease	There is a large uncertainty in the range of changes due to model differences and emission scenarios. Changes against RCP are not necessarily linear. Variable seasonal pattern
Amount of rain falling during heavy rainfall days (> 99 <sup>th</sup> percentile of daily rainfall)	0% to 10% increase	0% to 20% increase	Although the uncertainty in average rainfall range is high, extreme rainfall increases are more certain due to the increased amount of water vapour that the atmosphere can hold as it gets warmer (about 8% increase in saturation vapour per degree of warming)
Sea level rise	0.12 to 0.24 metres above present  (0.38 to 0.5 metres above pre-industrial)	0.36 to 0.98 metres above present  (0.62 to 1.24 metres above pre-industrial)	The projected sea level rise (based on IPCC AR5) may get significantly worse depending on the behavior of the Antarctic ice shelves, so the upper limit is not a fixed physical limit. There is very high confidence in sea level rise projections, probably more so than any other variable. Note the difference between present and pre-industrial, as we have already had about 26cm of sea level rise so far.  See the link below for inundation maps plotting for anywhere in the world:

			<a href="http://sealevel.climatecentral.org">http://sealevel.climatecentral.org</a>
Number of hot days (above 25C) per year	Between 0 and 30 days increase	Between 0 and 80 days increase	
Number of frost nights (below 0C) per year	Between 0 and 15 days reduction	Between 0 and 40 days reduction	
Change in the intensity of wind during windy days (>99 <sup>th</sup> percentile of daily mean)	0% to 3% increase	1% to 4% increase	
Change in annual number of windy days	0 to 4 days increase	0 to 12 days increase	
Change in annual growing degree days base 10	Increase between 0 and 300 GDD units	Increase between 200 and 1000 GDD units	Measures potential for crop and pasture growth
Change in annual potential evapotranspiration deficit (mm)	Increase between 20 and 120 mm	Increase between 0 and 180 mm	Measures drought intensity
Change in rivers mean annual low flow discharge (MAL)	Decrease up to 60%	Decrease up to 80%	Measures water shortage in the catchments
Change in rivers mean annual flood discharge (MAF)	Between 20% decrease and 40% increase depending on catchment	Between 20% decrease and 60% increase depending on catchment	Measures flood potential in the catchments
Changes in number of days of very high and extreme forest fire danger	100% to 150% increase	100% to 150% increase	These figures are given by IPCC model averages. Individual models can show much higher increases of up to 700%
Key environmental impacts	Increased flood intensity Increased coastal inundation (some areas to become permanently inundated) Increased erosion Reduced soil fertility Decreased water quality		

	Groundwater quality and availability pressures Saltwater intrusion Increased in drought frequency and intensity Increased pressure on water storage Biodiversity losses Increased pests such as wasps and rodents High potential for fruit fly establishment Ocean acidification Decline in fish population Increased wildfire Increased allergies (e.g. pollen)
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## Wairarapa coast whaitua

Variable/period	2040	2090	Commentary
Average annual Temperature	+0.5C to 1C above present  (+1.2C to +1.7 C above pre-industrial)	+1C to +3C above present  (+1.7C to +3.7C above pre-industrial)	Maximum warming in autumn and summer, least in spring  Note reference to above present versus pre-industrial: About 0.7C of warming has already happened from pre-industrial to present (1880-1909 compared to 1986-2005 reference periods).  Uncertainty range: lower range for RCP4.5 and upper range for RCP8.5
Average annual rainfall	5% decrease to 5% increase	10% decrease to 5% increase	There is a large uncertainty in the range of changes due to model differences and emission scenarios. Changes against RCP are not necessarily linear. Variable seasonal pattern
Amount of rain falling during heavy rainfall days (> 99 <sup>th</sup> percentile of daily rainfall)	0% to 15% increase	0% to 30% increase	Although the uncertainty in average rainfall range is high, extreme rainfall increases are more certain due to the increased amount of water vapour that the atmosphere can hold as it gets warmer (about 8% increase in saturation vapour per degree of warming)
Sea level rise	0.12 to 0.24 metres above present  (0.38 to 0.5 metres above pre-industrial)	0.36 to 0.98 metres above present  (0.62 to 1.24 metres above pre-industrial)	The projected sea level rise (based on IPCC AR5) may get significantly worse depending on the behavior of the Antarctic ice shelves, so the upper limit is not a fixed physical limit. There is very high confidence in sea level rise projections, probably more so than any other variable. Note the difference between present and pre-industrial, as we have already had about 26cm of sea level rise so far.  See the link below for inundation maps plotting for anywhere in the world: <a href="http://sealevel.climatecentral.org">http://sealevel.climatecentral.org</a>

Number of hot days (above 25C) per year	Between 5 and 30 days increase	Between 15 and 60 days increase	
Number of frost nights (below 0C) per year	Between 0 and 5 days reduction	Between 0 and 15 days reduction	
Change in the intensity of wind during windy days (>99 <sup>th</sup> percentile of daily mean)	0% to 3% increase	1% to 4% increase	
Change in annual number of windy days	0 to 6 days increase	0 to 10 days increase	
Change in annual growing degree days base 10	Increase between 0 and 300 GDD units	Increase between 200 and 900 GDD units	Measures potential for crop and pasture growth
Change in annual potential evapotranspiration deficit (mm)	Increase between 40 and 120 mm	Increase between 40 and 160 mm	Measures drought intensity
Change in rivers mean annual low flow discharge (MAL)	Decrease up to 60%	Decrease up to 80%	Measures water shortage in the catchments
Change in rivers mean annual flood discharge (MAF)	Between 20% decrease and 20% increase depending on catchment	Between 20% decrease and 60% increase depending on catchment	Measures flood potential in the catchments
Changes in number of days of very high and extreme forest fire danger	100% to 150% increase	100% to 150% increase	These figures are given by IPCC model averages. Individual models can show much higher increases of up to 700%
Key environmental impacts	Increased flood intensity Increased coastal inundation (some areas to become permanently inundated) Increased erosion Reduced soil fertility Decreased water quality Ground water quality and availability pressures		

	<p>Saltwater intrusion Increase in drought frequency and intensity Increased pressure on water storage Biodiversity losses Increased pests such as wasps and rodents High potential for fruit fly establishment Ocean acidification Decline in fish population Increased wildfire Increased allergies (e.g. pollen)</p>
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