



Four Degrees of Global Warming:

Effects on the New Zealand Primary Sector Appendices

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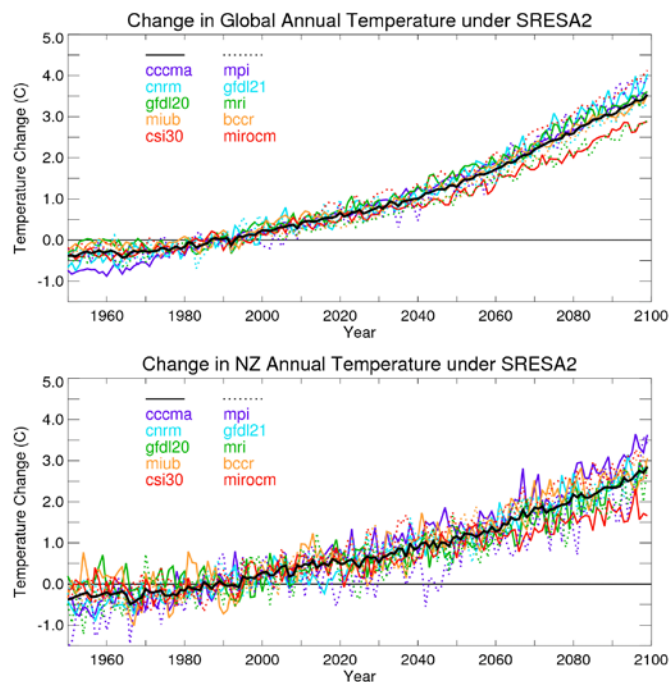
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Appendices to Section 5 of:

**Four Degrees of Global Warming:
Effects on the New Zealand Primary Sector**

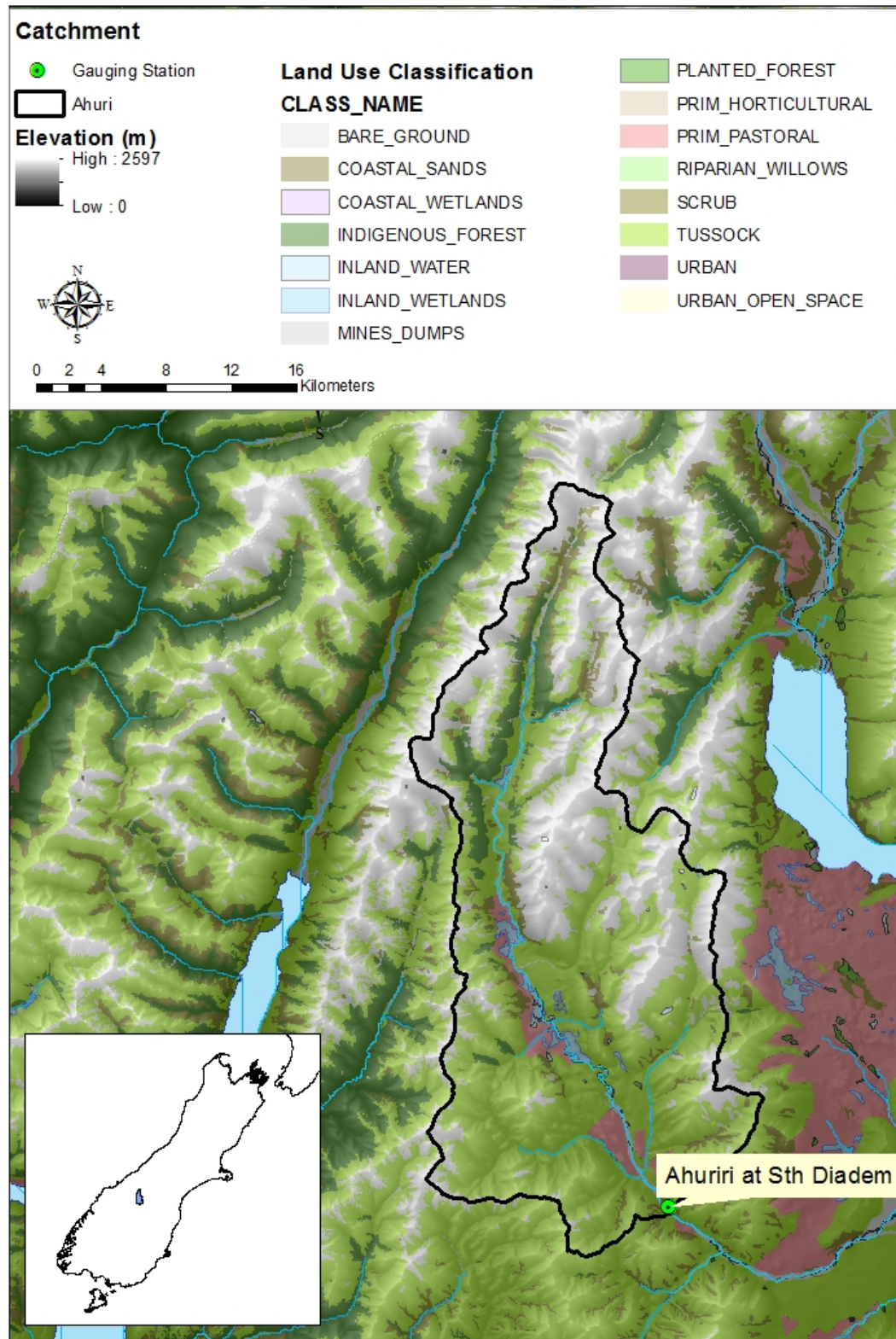
Prepared for the Ministry for Primary Industries

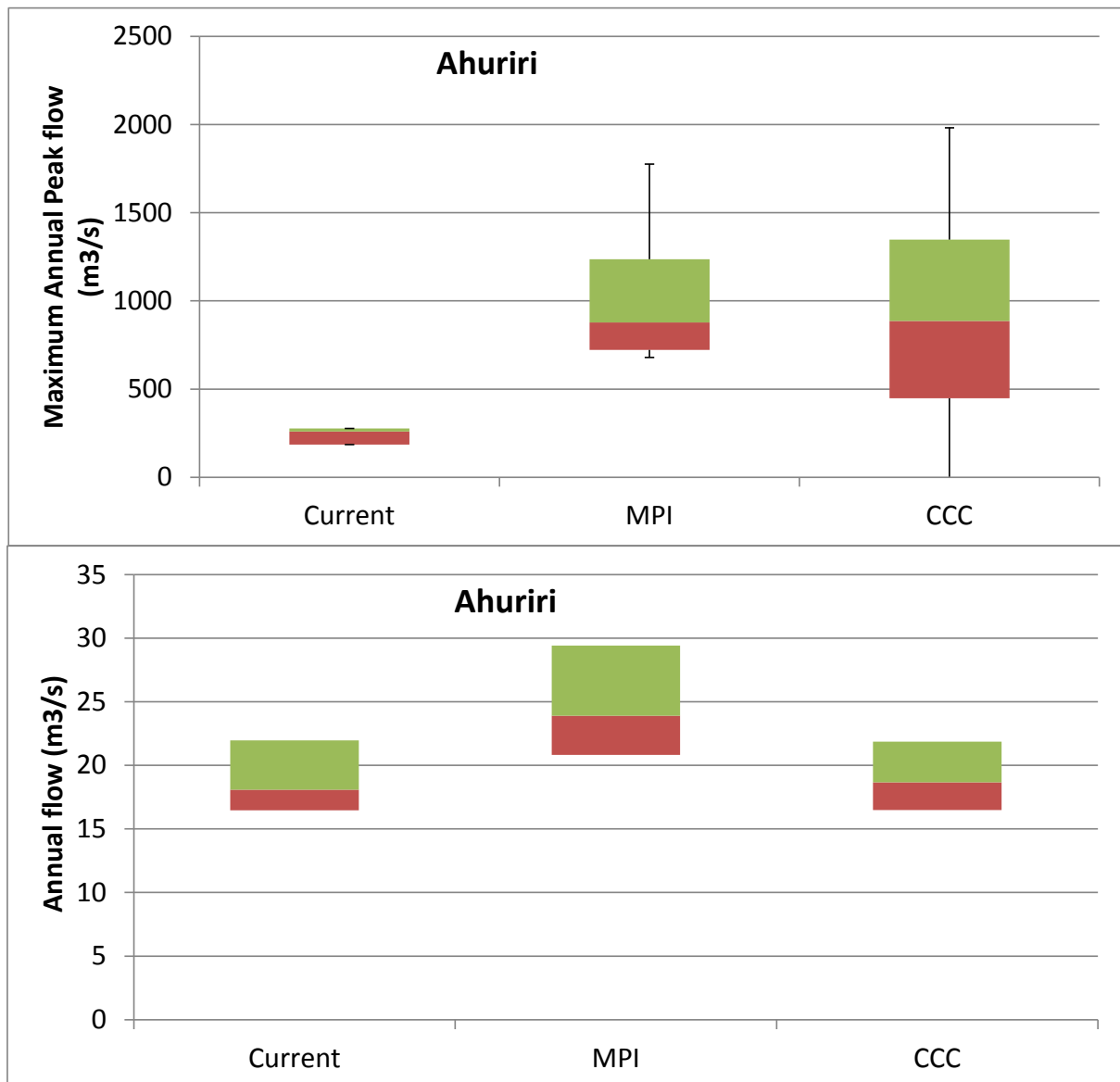
December 2012



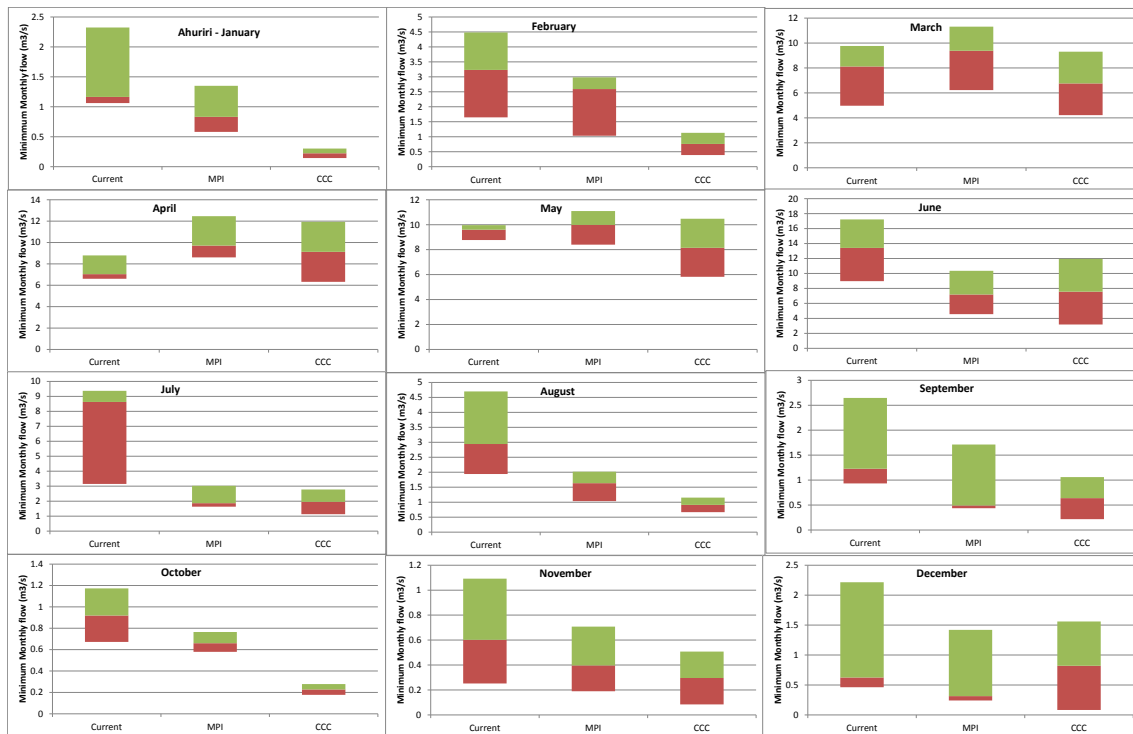
Appendix A: Ahuriri Catchment

Location:

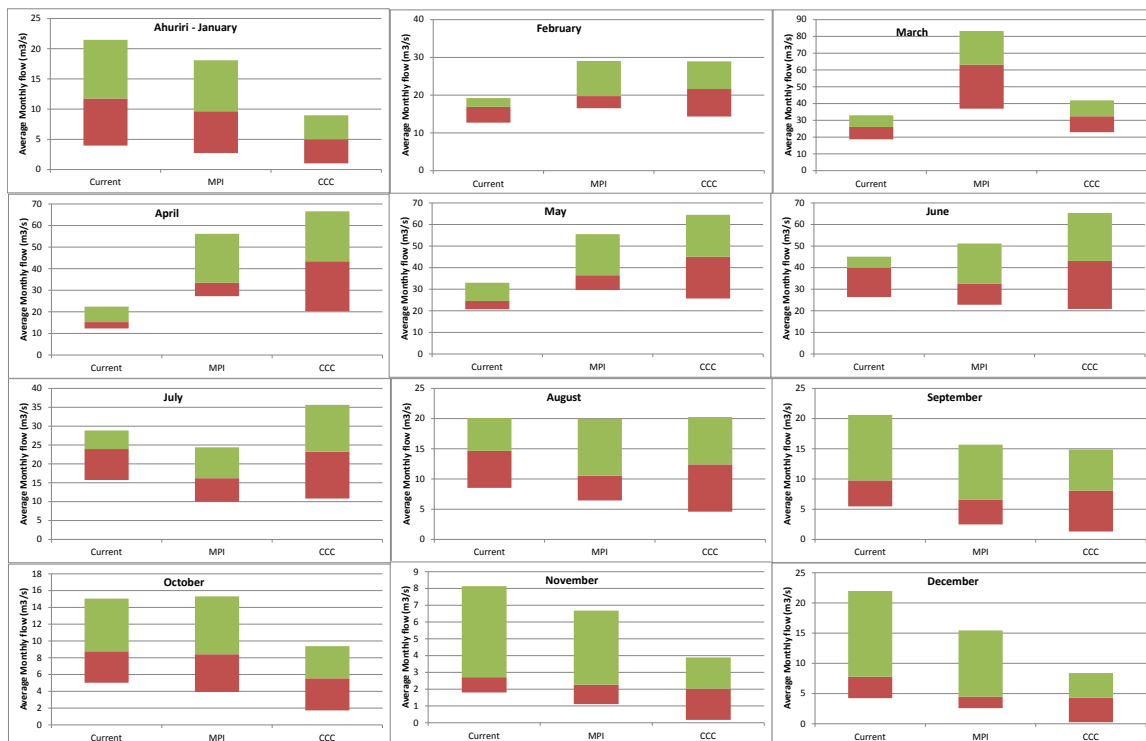




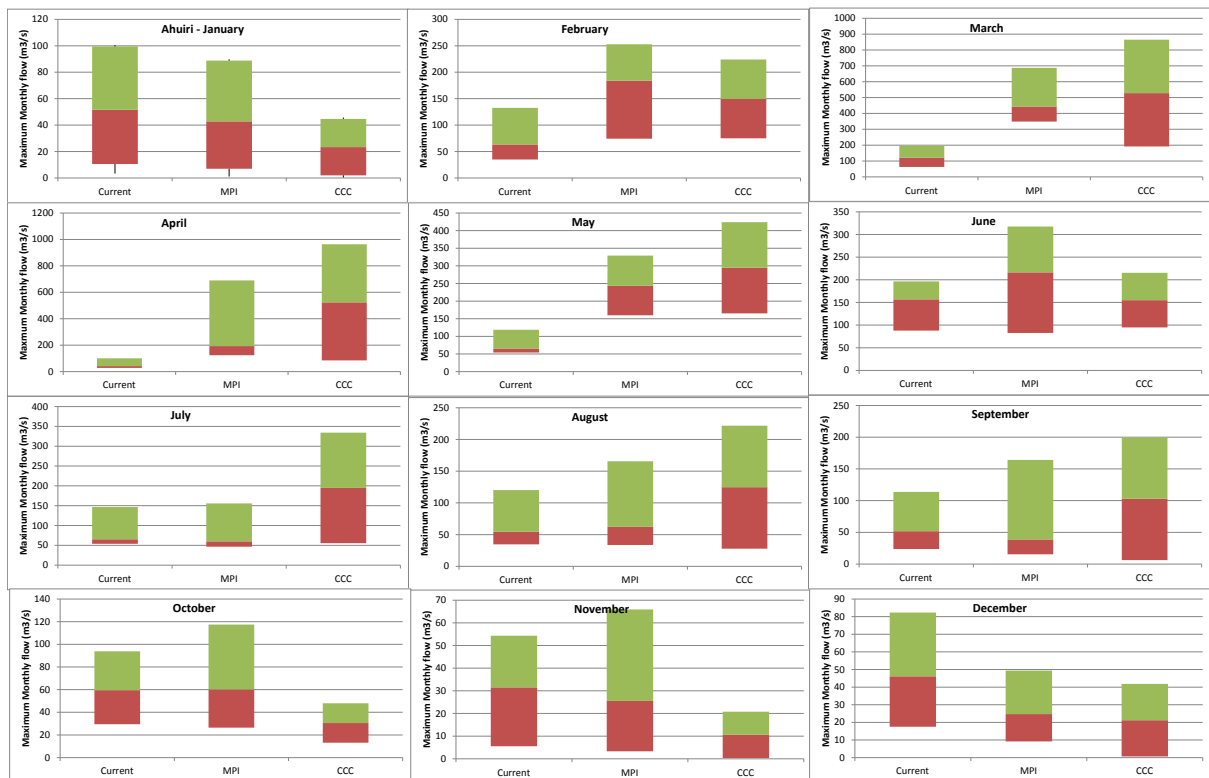
Box plot of climate change impact for the maximum annual flow and annual flow for the Ahuriri catchment at South Diadem for the current time period 1997-2011 (Current), for the nominal time period of 2085-2099 using MPI model; and for the nominal time period of 2085-2099 using CCC model. The median annual flow is at the green/brown boundary, the 75th percentile of annual flow is at the top of the green box, and the 25th percentile is at the bottom of the brown box.



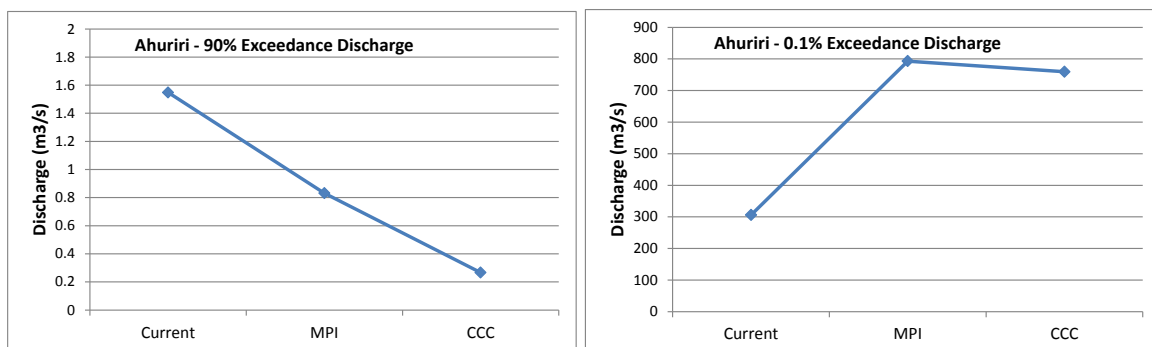
Box plot of climate change impact for the monthly minimum flow for the Ahuriri catchment for the current time period 1997-2011 (Current), for the nominal time period of 2085-2099 using MPI model; and for the nominal time period of 2085-2099 using CCC model. The median minimum annual flow is at the green/brown boundary, the 75th percentile of minimum annual flow is at the top of the green box, and the 25th percentile is at the bottom of the brown box



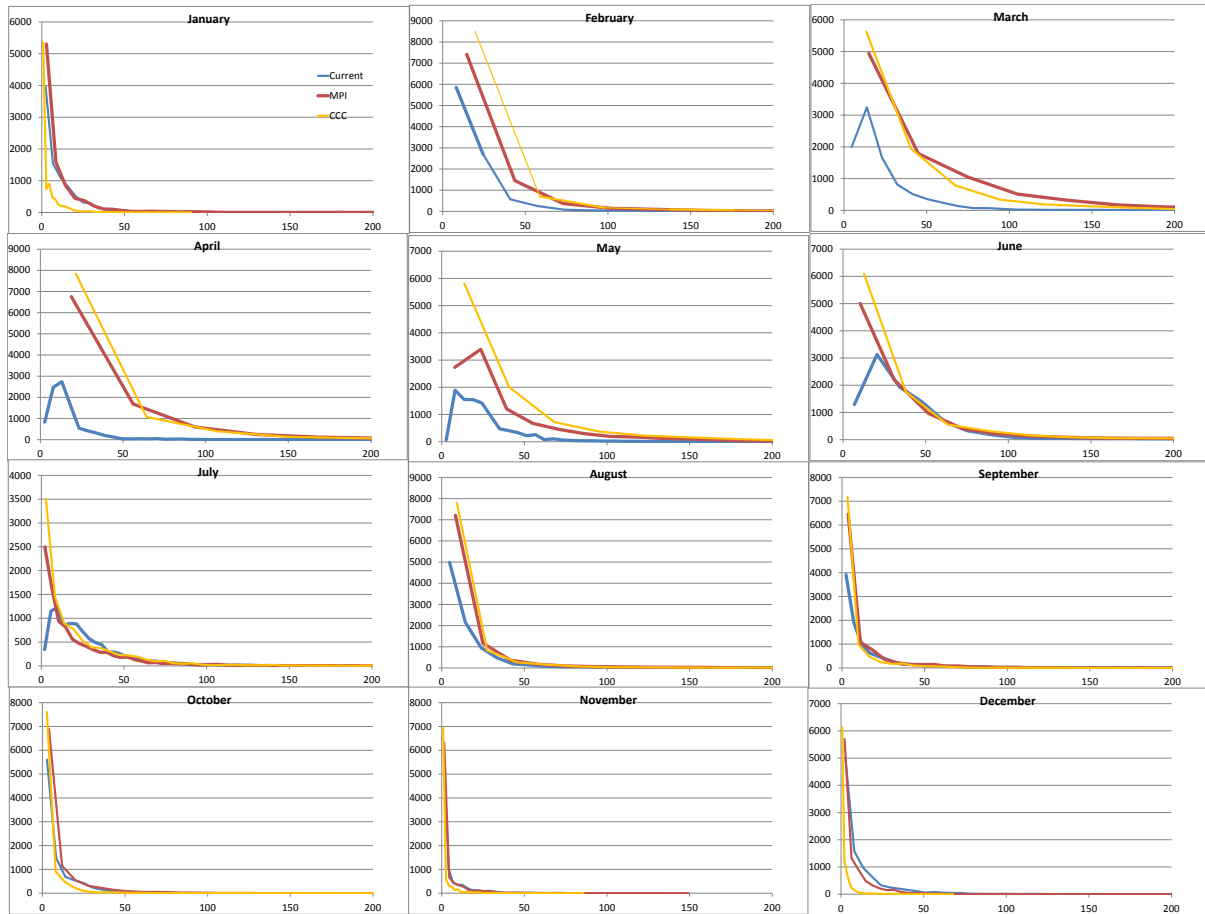
Box plot of climate change impact for the monthly average flow for the Ahuriri catchment for the current time period 1997-2011 (Current), for the nominal time period of 2085-2099 using MPI model; and for the nominal time period of 2085-2099 using CCC model. The median minimum annual flow is at the green/brown boundary, the 75th percentile of minimum annual flow is at the top of the green box, and the 25th percentile is at the bottom of the brown box



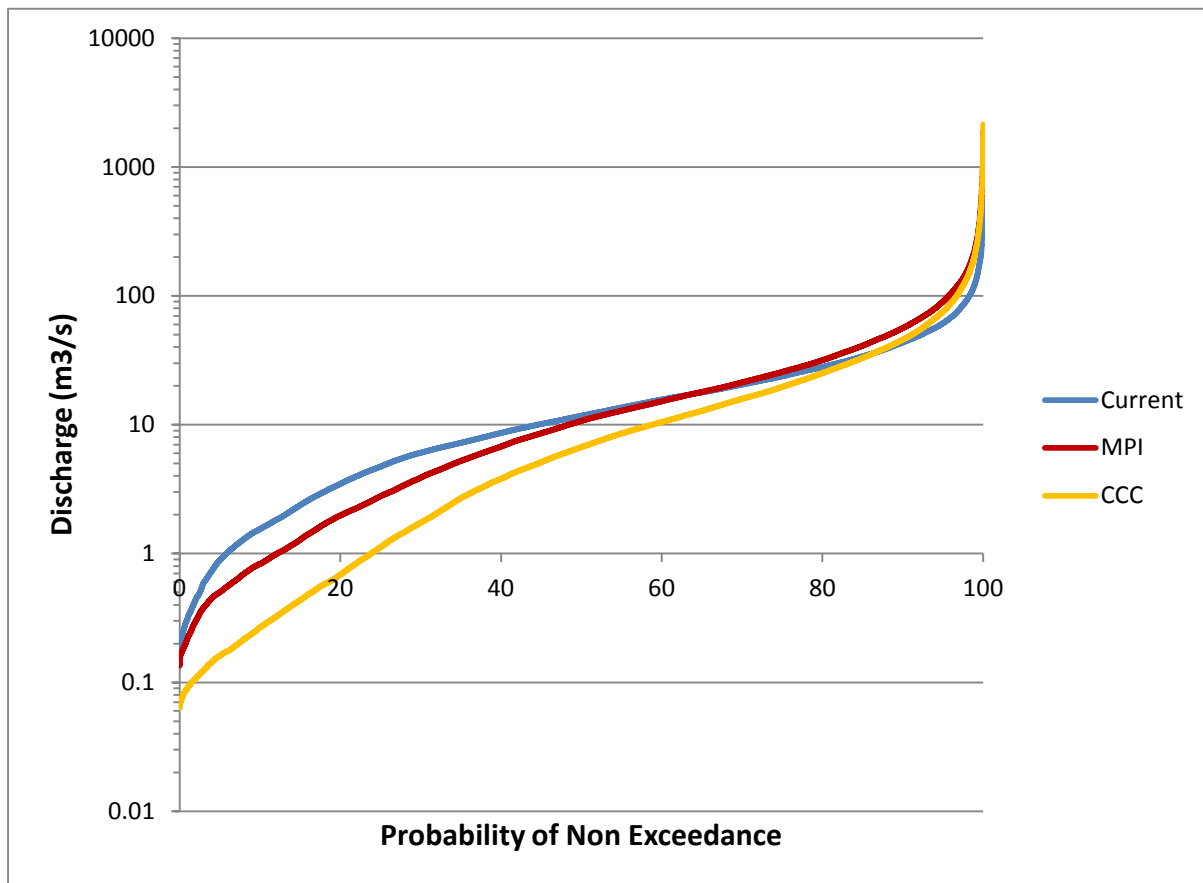
Box plot of climate change impact for the monthly maximum flow for the Ahuriri catchment for the current time period 1997-2011 (Current), for the nominal time period of 2085-2099 using MPI model; and for the nominal time period of 2085-2099 using CCC model. The median minimum annual flow is at the green/brown boundary, the 75th percentile of minimum annual flow is at the top of the green box, and the 25th percentile is at the bottom of the brown box Maximum flow



Climate change impact on low flow and high flows for the Ahuriri catchment for the current time period 1997-2011 (Current), for the nominal time period of 2085-2099 using MPI model; and for the nominal time period of 2085-2099 using CCC model.



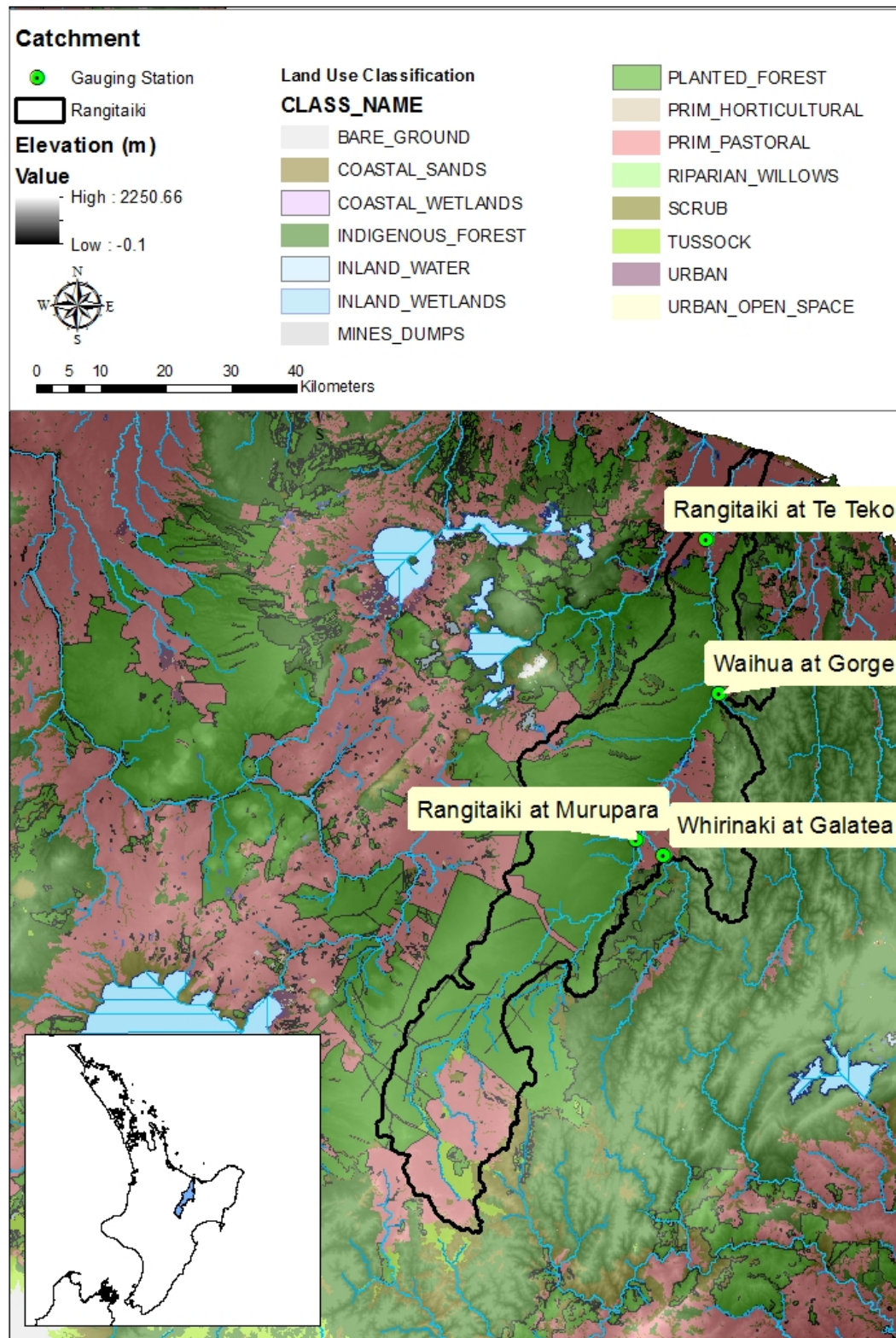
Climate change impact on monthly flow distribution for the Ahuriri catchment for the current time period 1997-2011 (Current), for the nominal time period of 2085-2099 using MPI model (MPI); and for the nominal time period of 2085-2099 using CCC model (CCC). The Y axis represents the occurrence of discharge, while the X axis represents the hourly discharge. For sake of visibility simulated hourly discharge over 200 m³/s were truncated



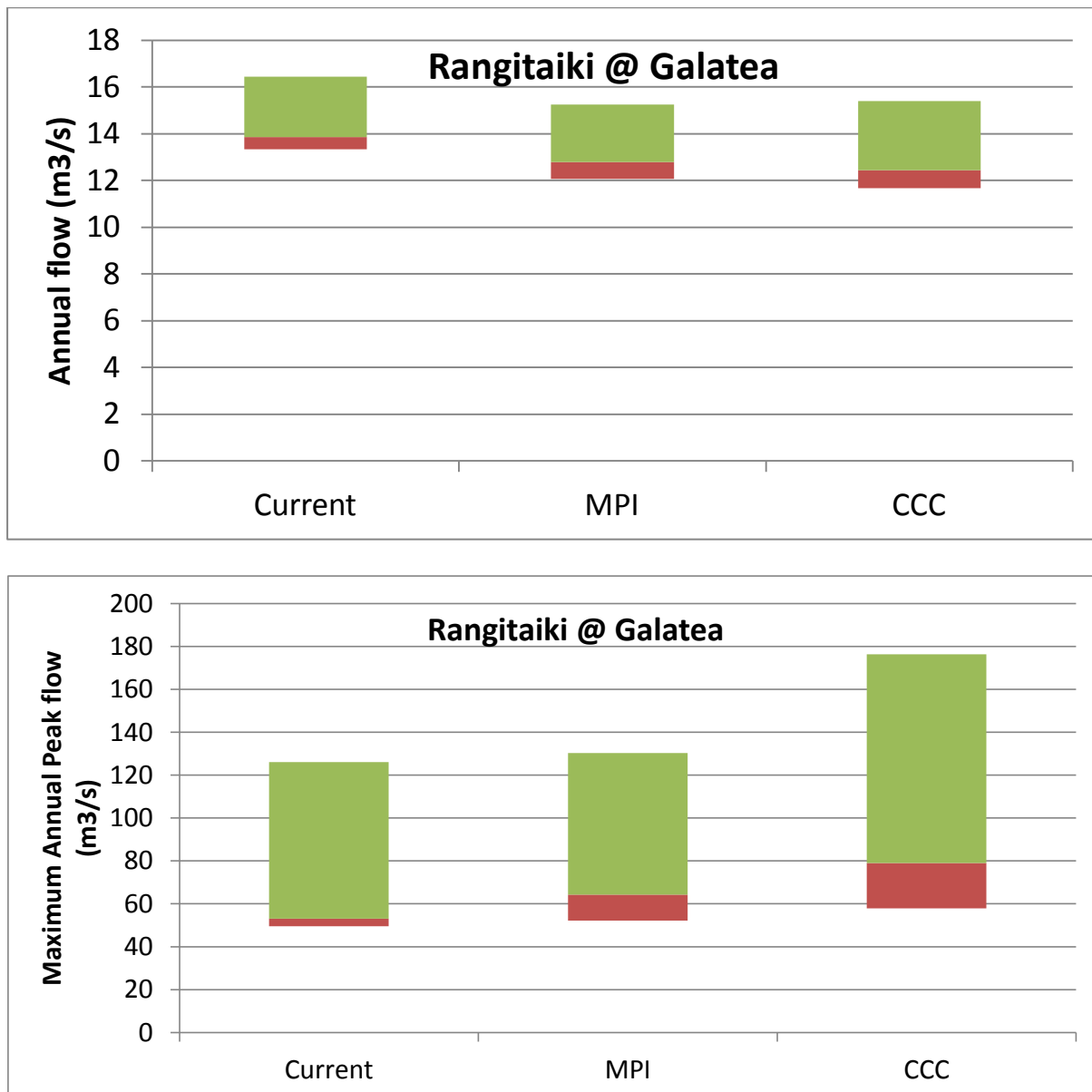
Climate change impact on hourly flow duration curve for the Ahuriri catchment for the current time period 1997-2011 (Current), for the nominal time period of 2085-2099 using MPI model (MPI); and for the nominal time period of 2085-2099 using CCC model (CCC).

Appendix B: Rangitaiki Catchment

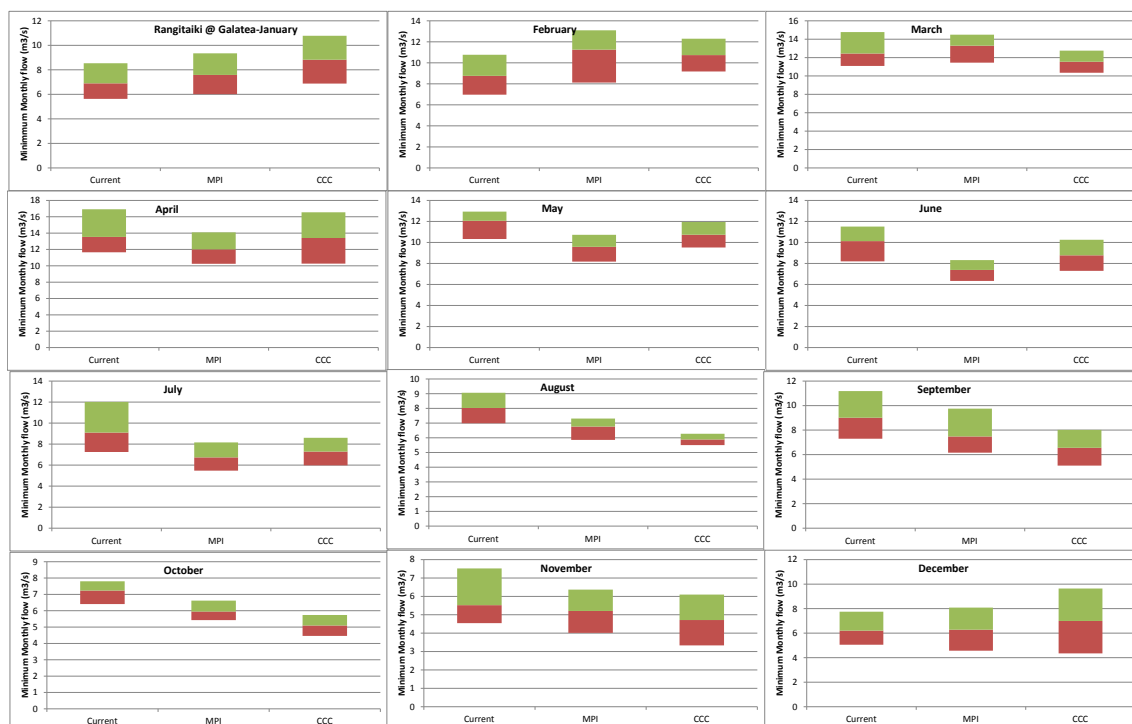
Location



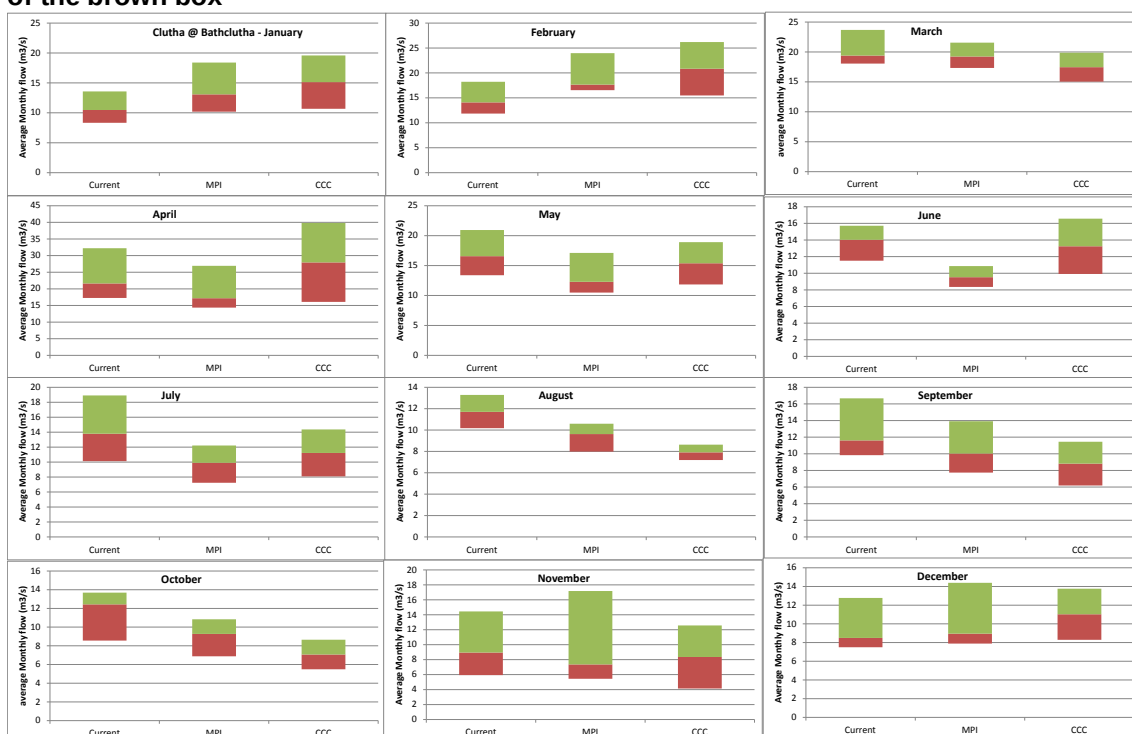
Appendix B1- Galatea



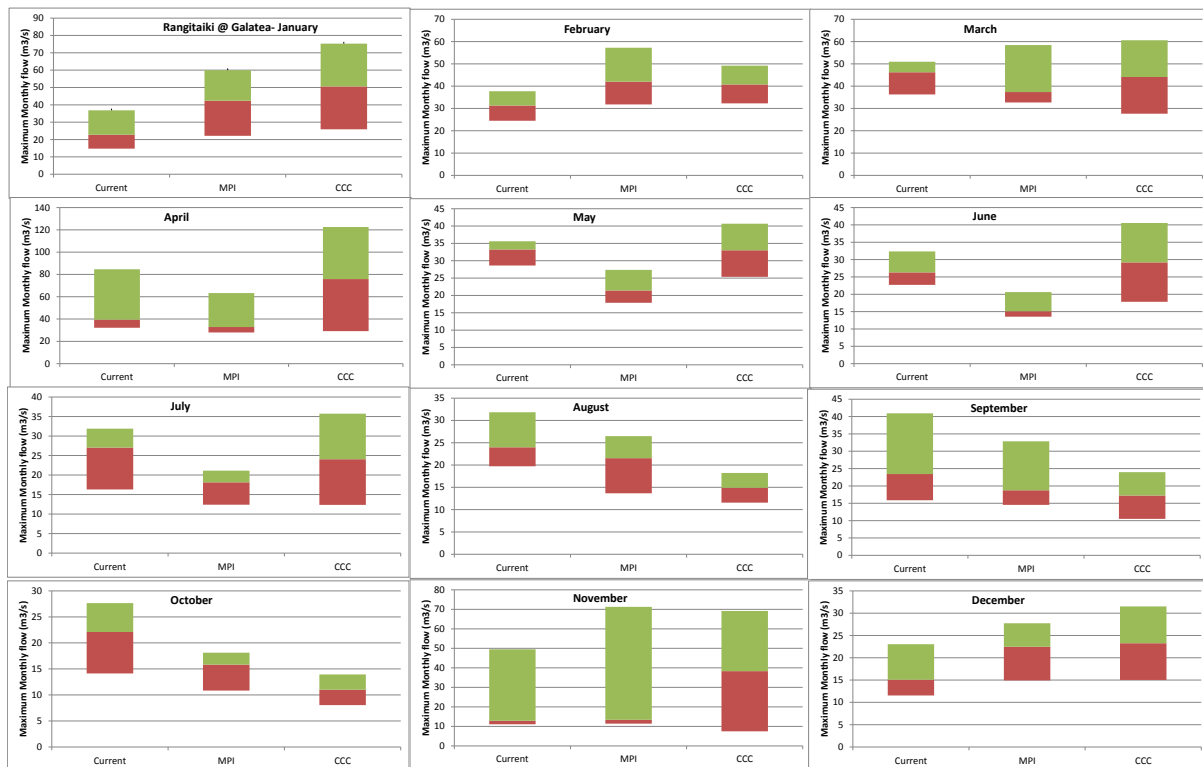
Box plot of climate change impact for the annual flow and annual maximum flow for the Rangitaiki catchment at Galatea for the current time period 1997-2011 (Current), for the nominal time period of 2085-2099 using MPI model (MPI); and for the nominal time period of 2085-2099 using CCC model (CCC). The median annual flow is at the green/brown boundary, the 75th percentile of annual flow is at the top of the green box, and the 25th percentile is at the bottom of the brown box



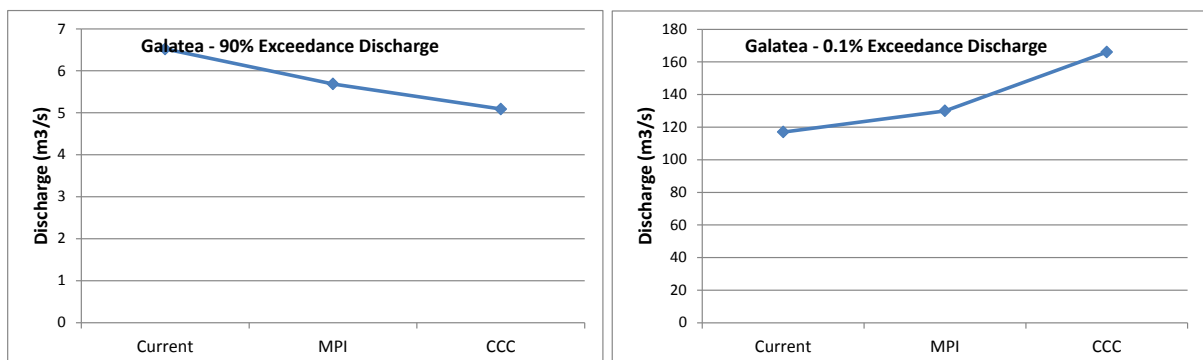
Box plot of climate change impact for the monthly minimum flow for the Rangitaiki catchment at Galatea for the current time period 1997-2011 (Current), for the nominal time period of 2085-2099 using MPI model (MPI); and for the nominal time period of 2085-2099 using CCC model (CCC). The median minimum annual flow is at the green/brown boundary, the 75th percentile of minimum annual flow is at the top of the green box, and the 25th percentile is at the bottom of the brown box



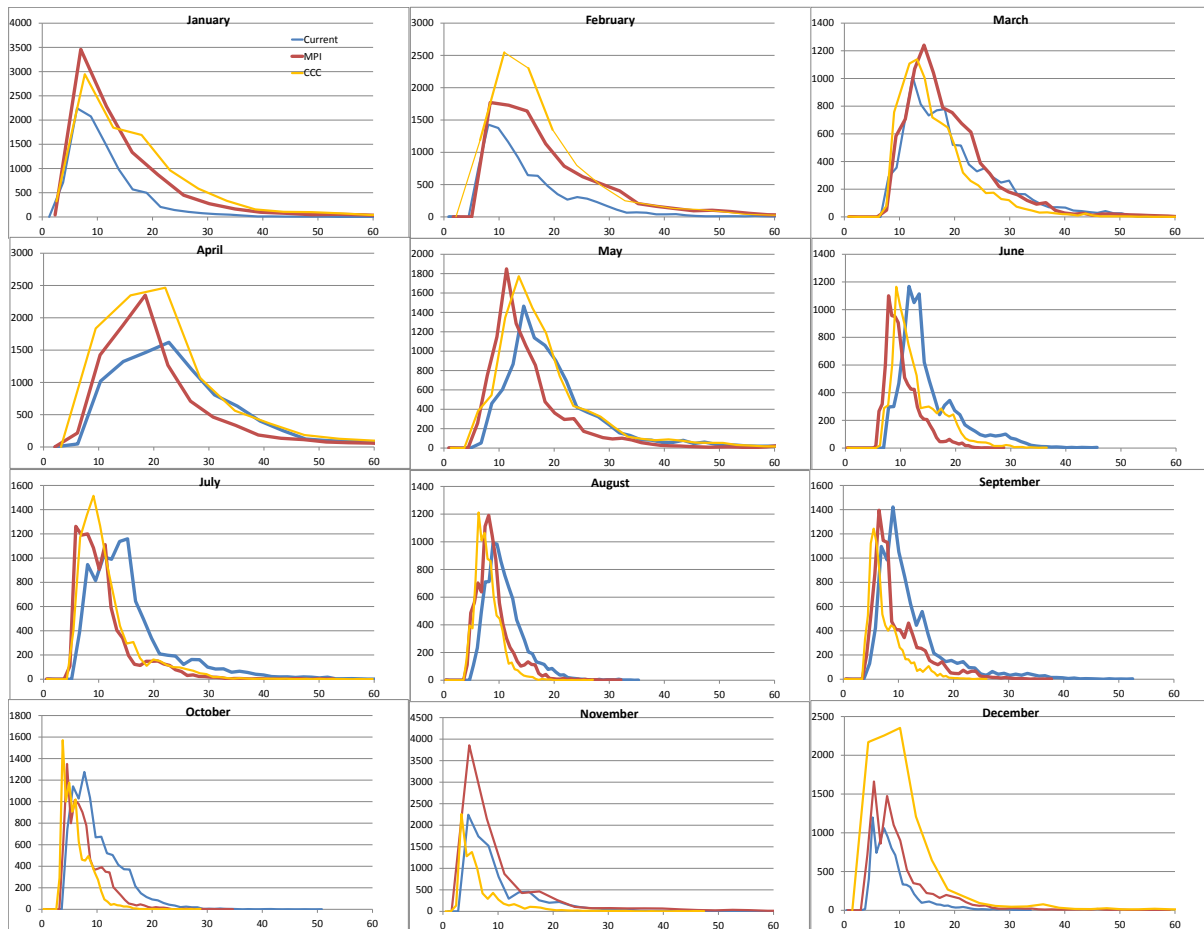
Box plot of climate change impact for the monthly average flow for the Rangitaiki catchment at Galatea for the current time period 1997-2011 (Current), for the nominal time period of 2085-2099 using MPI model (MPI); and for the nominal time period of 2085-2099 using CCC model (CCC). The median minimum annual flow is at the green/brown boundary, the 75th percentile of minimum annual flow is at the top of the green box, and the 25th percentile is at the bottom of the brown box



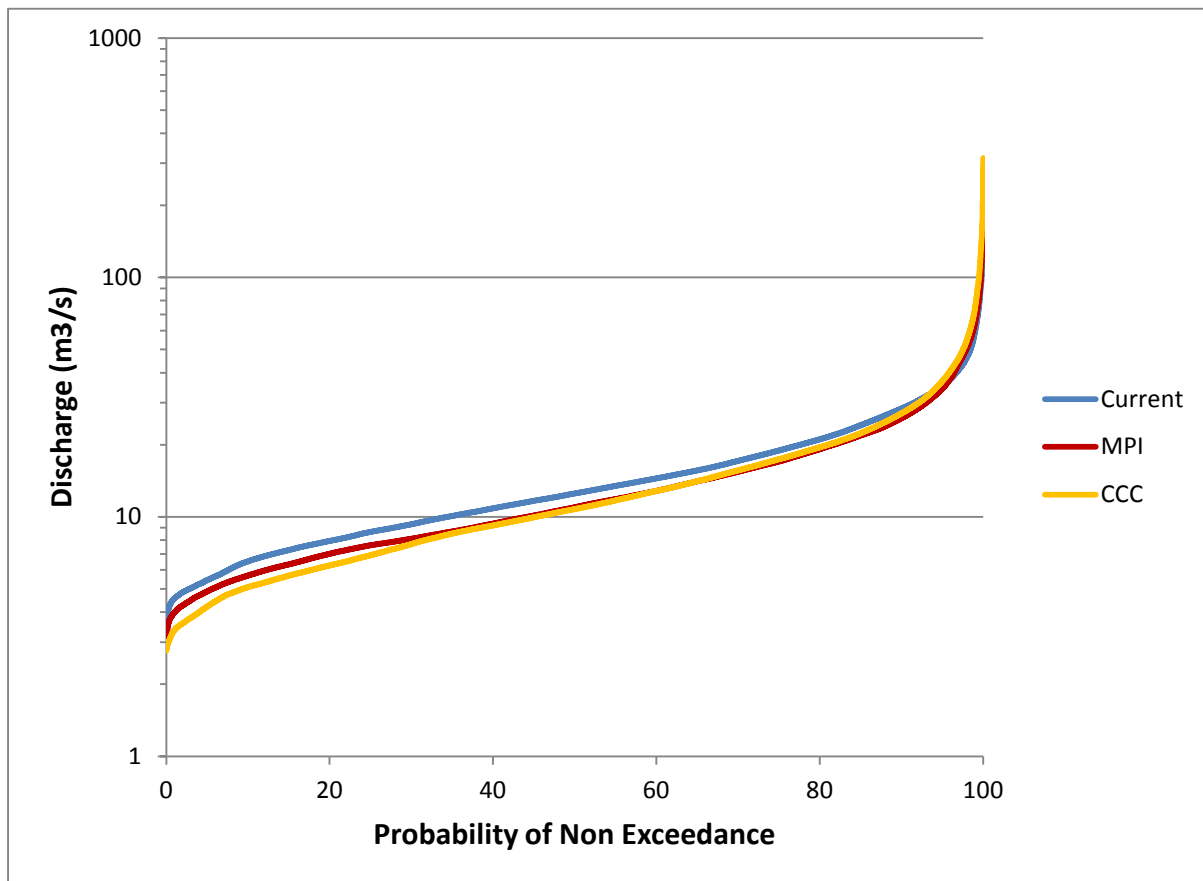
Box plot of climate change impact for the monthly maximum flow for the Rangitaiki catchment at Galatea for the current time period 1997-2011 (Current), for the nominal time period of 2085-2099 using MPI model (MPI); and for the nominal time period of 2085-2099 using CCC model (CCC). The median minimum annual flow is at the green/brown boundary, the 75th percentile of minimum annual flow is at the top of the green box, and the 25th percentile is at the bottom of the brown box



Climate change impact on low flow and high flows for the Rangitaiki catchment at Galatea for the current time period 1997-2011 (Current), for the nominal time period of 2085-2099 using MPI model (MPI); and for the nominal time period of 2085-2099 using CCC model (CCC).

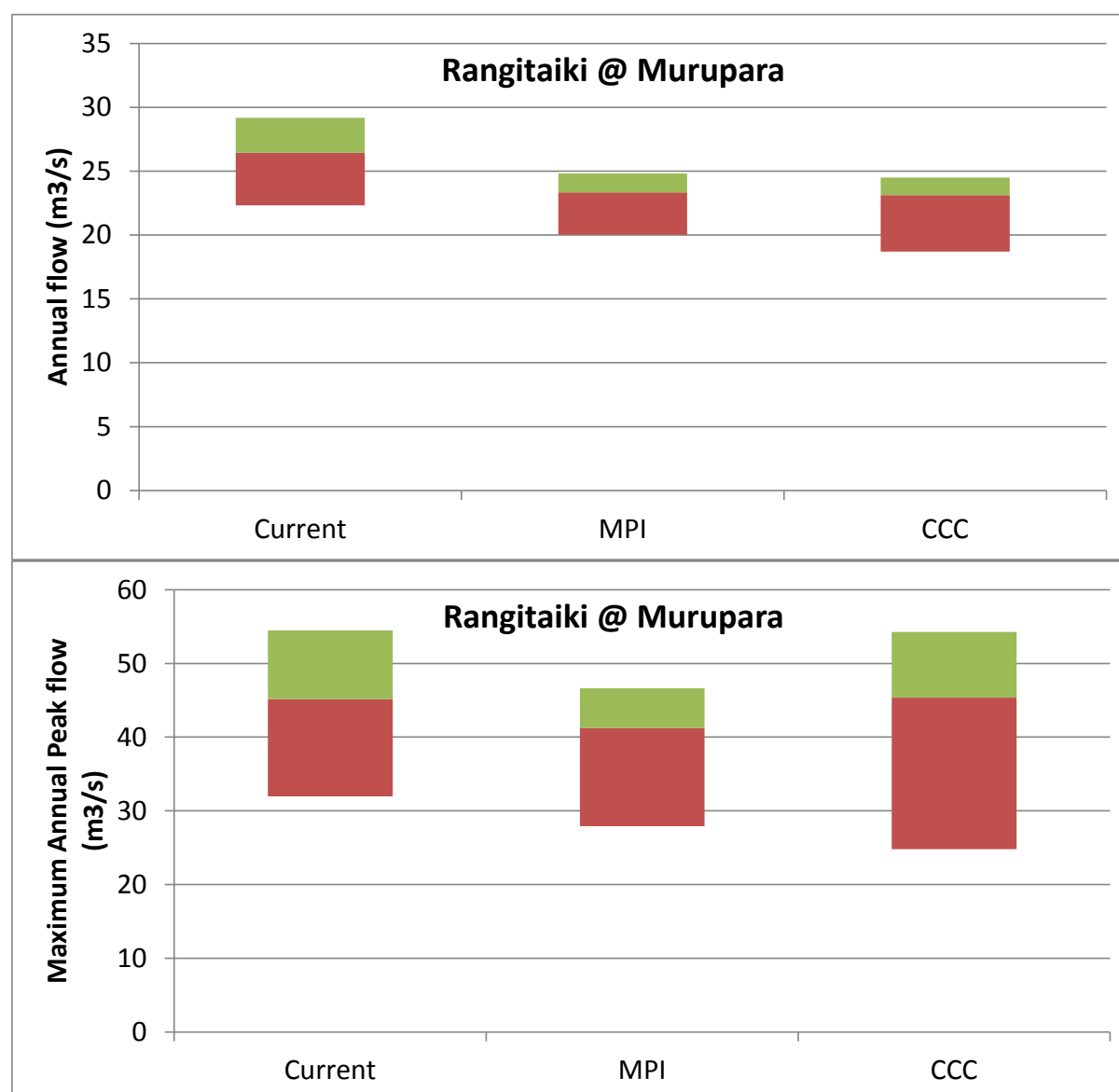


Climate change impact on monthly flow distribution for the Rangitaiki catchment at Galatea for the current time period 1997-2011 (Current), for the nominal time period of 2085-2099 using MPI model (MPI); and for the nominal time period of 2085-2099 using CCC model (CCC). The Y axis represents the occurrence of discharge, while the X axis represents the hourly discharge. For sake of visibility simulated hourly discharge over 60 m³/s were truncated

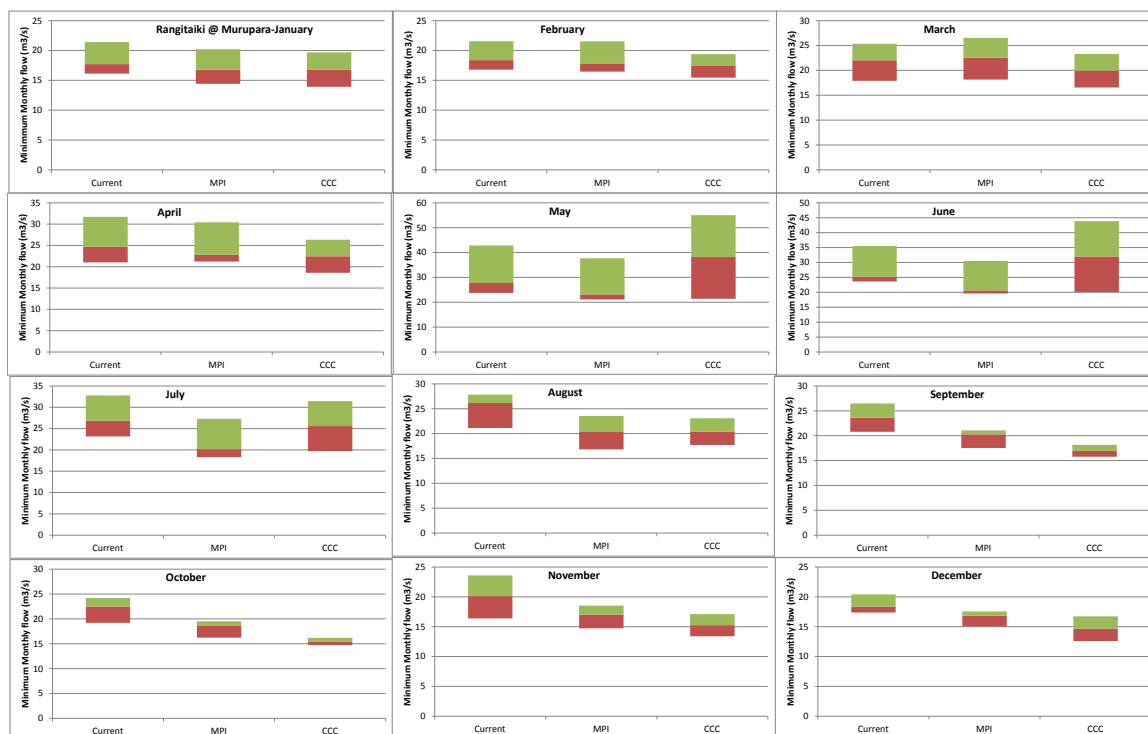


Climatic change impact on simulated hourly flow duration curve for the Rangitaiki catchment at Galatea for the current time period 1997-2011 (Current), for the nominal time period of 2085-2099 using MPI model (MPI); and for the nominal time period of 2085-2099 using CCC model (CCC).

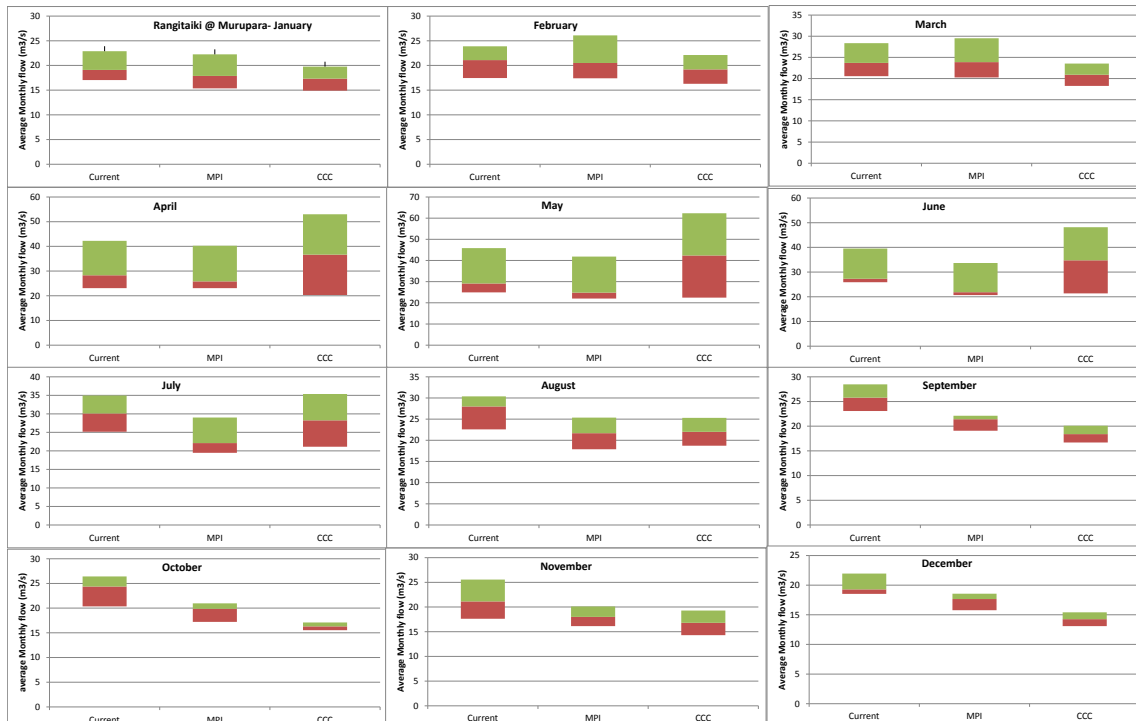
Appendix B2 - Rangitaiki at Murupara



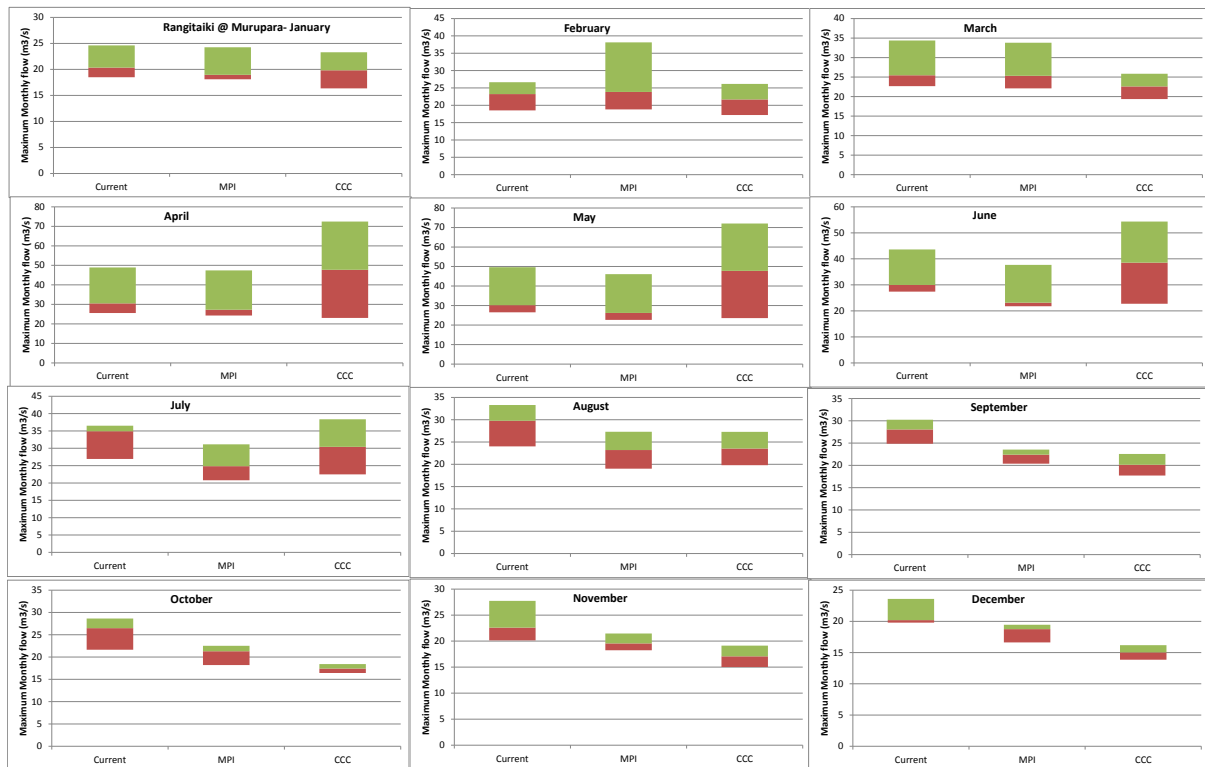
Box plot of climate change impact for the annual flow and annual maximum flow for the Rangitaiki catchment at Murupara for the current time period 1997-2011 (Current), for the nominal time period of 2085-2099 using MPI model (MPI); and for the nominal time period of 2085-2099 using CCC model (CCC). The median annual flow is at the green/brown boundary, the 75th percentile of annual flow is at the top of the green box, and the 25th percentile is at the bottom of the brown box



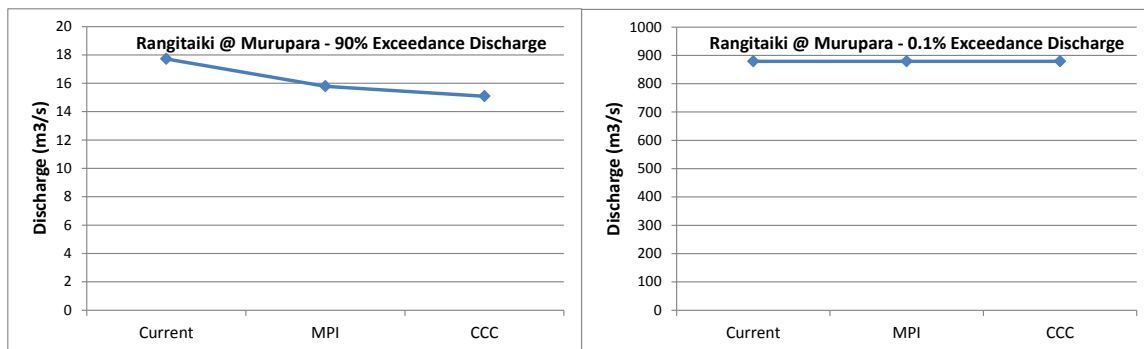
Box plot of climate change impact for the monthly minimum flow for the Rangitaiki catchment at Murupara for the current time period 1997-2011 (Current), for the nominal time period of 2085-2099 using MPI model; and for the nominal time period of 2085-2099 using CCC model. The median minimum annual flow is at the green/brown boundary, the 75th percentile of minimum annual flow is at the top of the green box, and the 25th percentile is at the bottom of the brown box



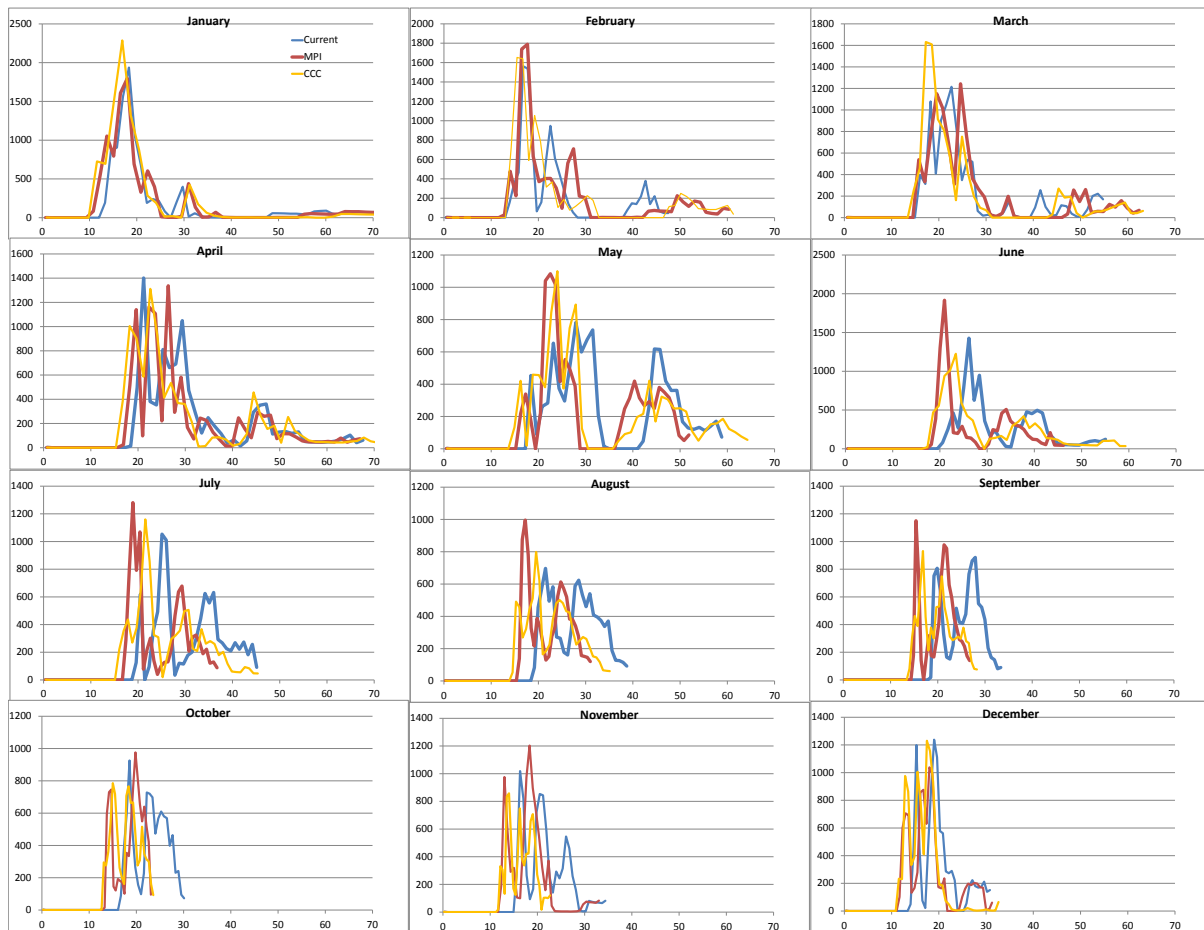
Box plot of climate change impact for the monthly average flow for the Rangitaiki catchment at Murupara for the current time period 1997-2011 (Current), for the nominal time period of 2085-2099 using MPI model; and for the nominal time period of 2085-2099 using CCC model. The median minimum annual flow is at the green/brown boundary, the 75th percentile of minimum annual flow is at the top of the green box, and the 25th percentile is at the bottom of the brown box



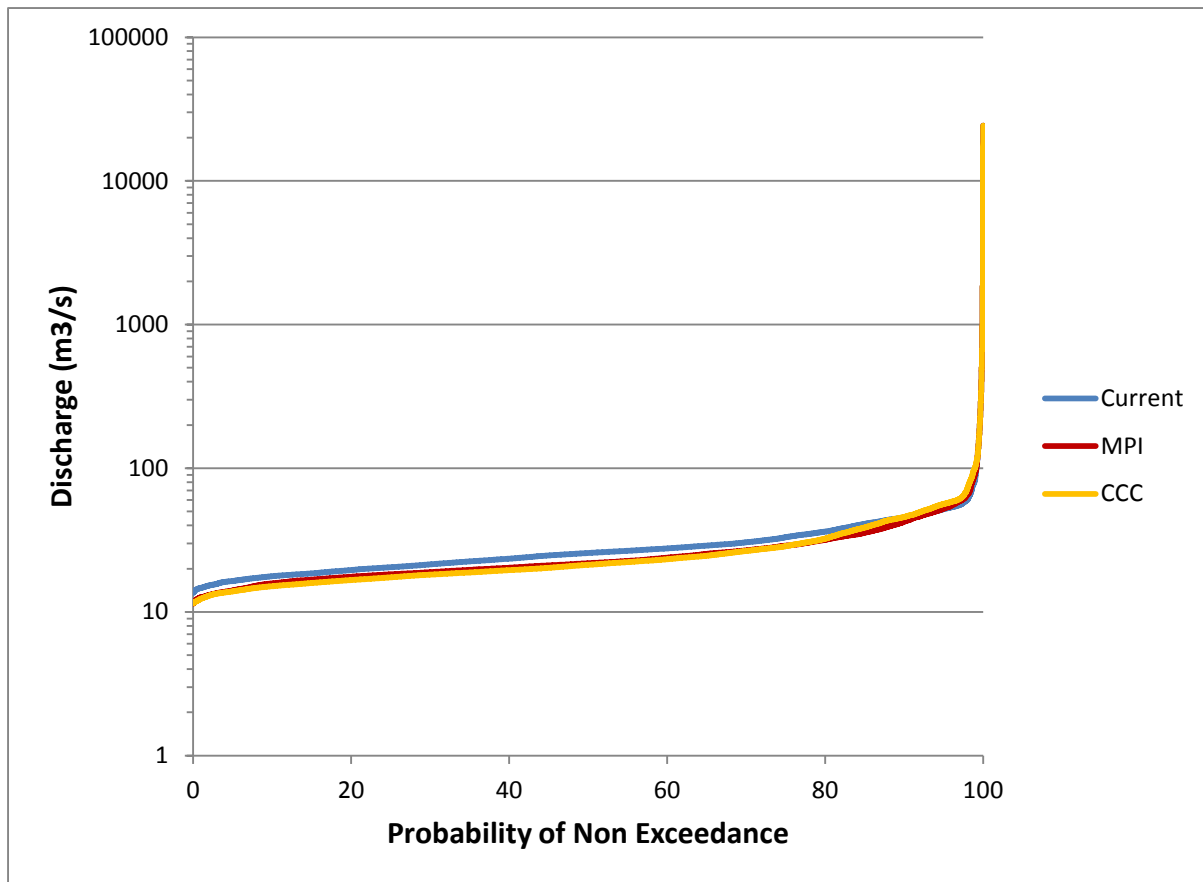
Box plot of climate change impact for the monthly maximum flow for the Rangitaiki catchment at Murupara for the current time period 1997-2011 (Current), for the nominal time period of 2085-2099 using MPI model; and for the nominal time period of 2085-2099 using CCC model. The median minimum annual flow is at the green/brown boundary, the 75th percentile of minimum annual flow is at the top of the green box, and the 25th percentile is at the bottom of the brown box



Climate change impact on low flow and high flows for the Rangitaiki catchment at Murupara for the current time period 1997-2011 (Current), for the nominal time period of 2085-2099 using MPI model; and for the nominal time period of 2085-2099 using CCC model.

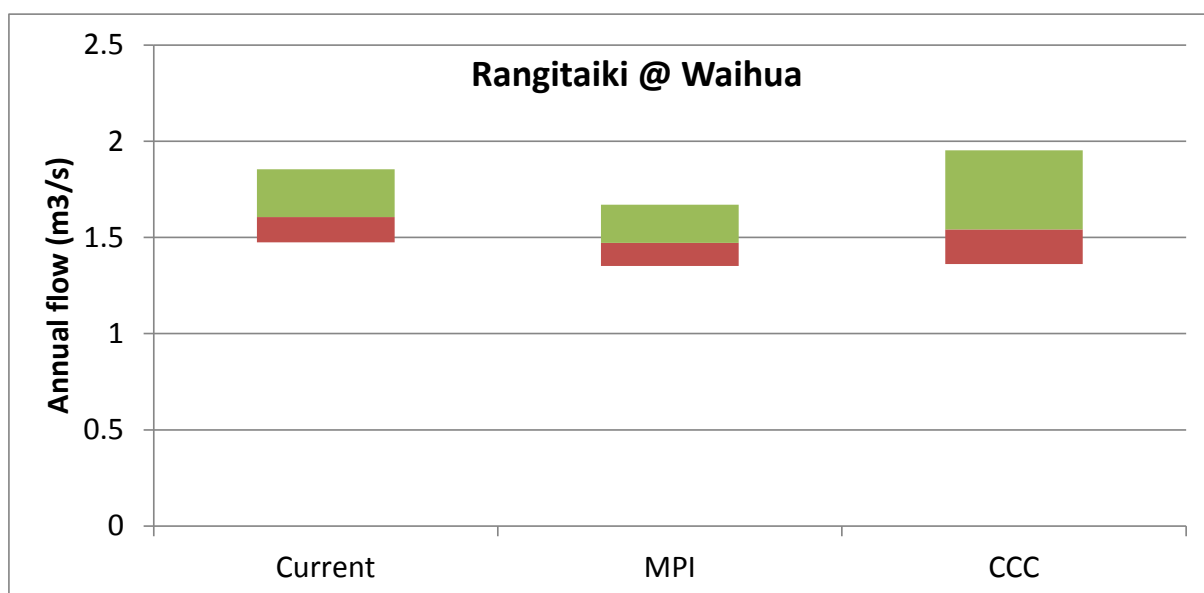
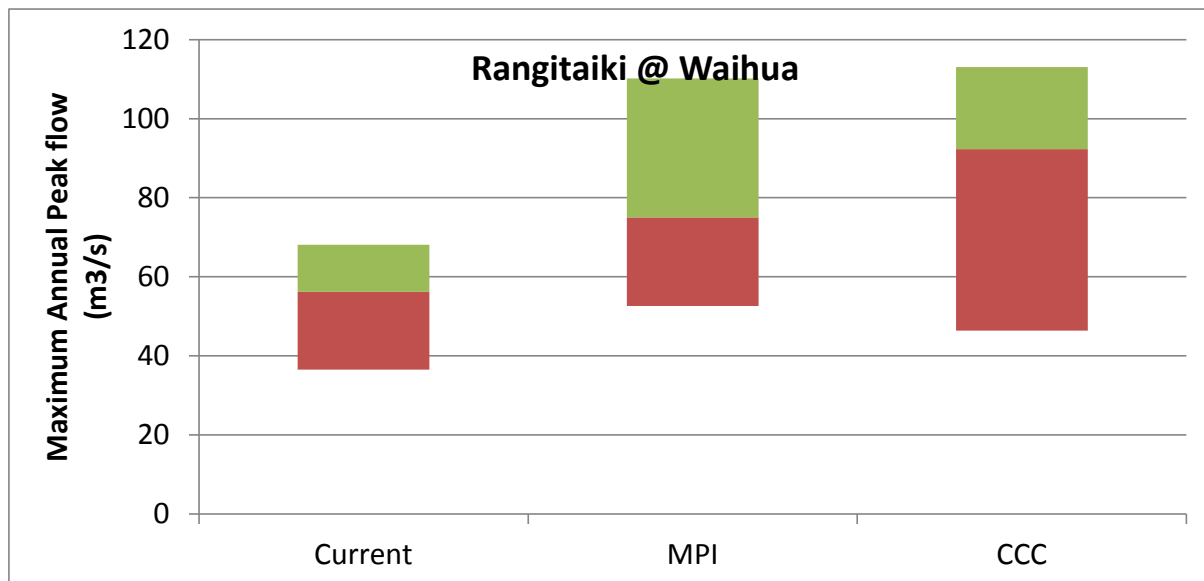


Climate change impact on monthly flow distribution for the Rangitaiki catchment at Murupara for the current time period 1997-2011 (Current), for the nominal time period of 2085-2099 using MPI model (MPI); and for the nominal time period of 2085-2099 using CCC model (CCC). The Y axis represents the occurrence of discharge, while the X axis represents the hourly discharge. For sake of visibility simulated hourly discharge over 70 m³/s were truncated

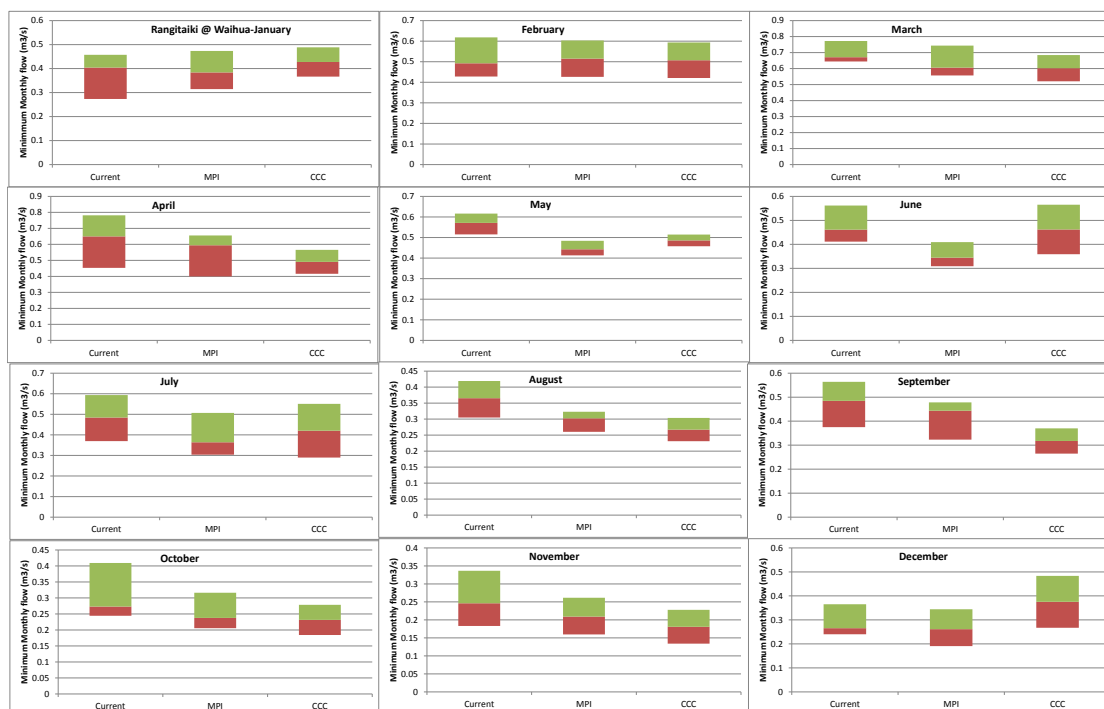


Climate change impact on simulated hourly flow duration curve for the Rangitata catchment for the current time period 1997-2011 (Current), for the nominal time period of 2085-2099 using MPI model; and for the nominal time period of 2085-2099 using CCC model.

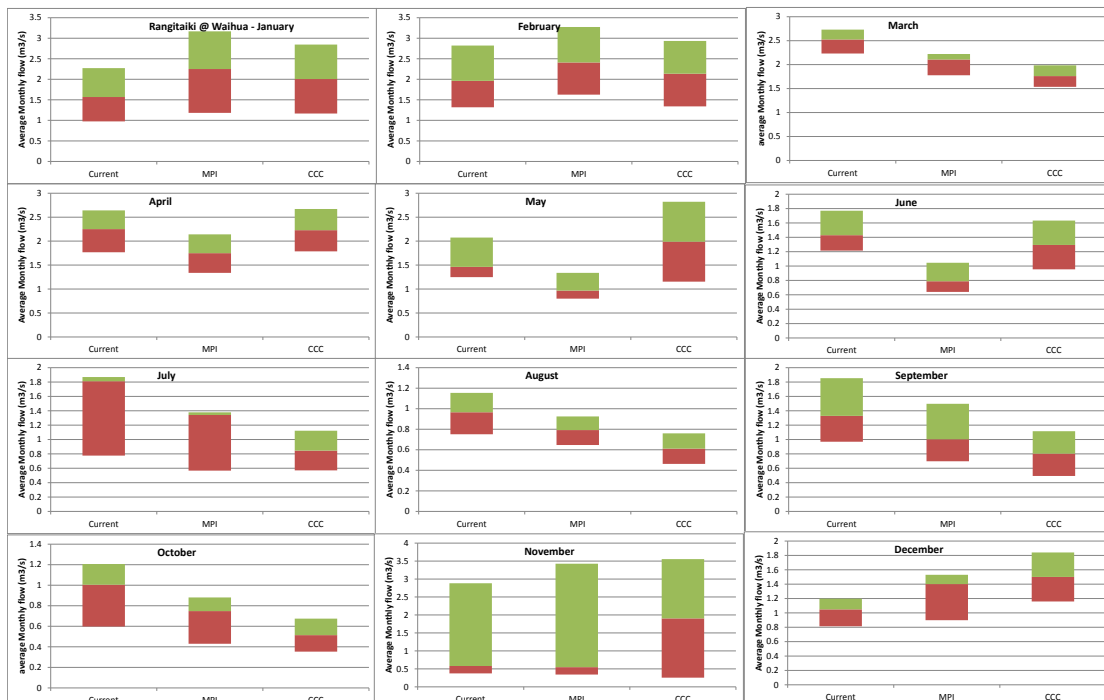
Appendix B3- Rangitaiki at Waihua



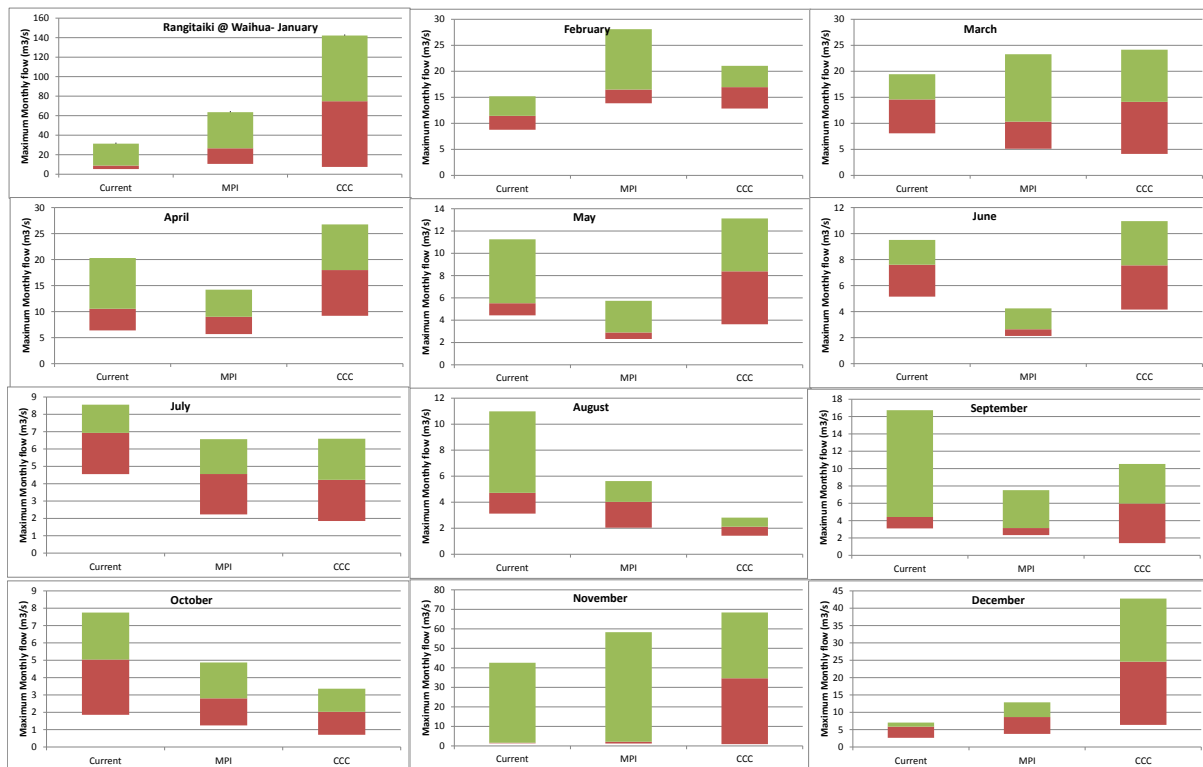
Box plot of climate change impact for the annual flow and annual maximum flow for the Rangitaiki catchment at Waihua for the current time period 1997-2011 (Current), for the nominal time period of 2085-2099 using MPI model; and for the nominal time period of 2085-2099 using CCC model. The median annual flow is at the green/brown boundary, the 75th percentile of annual flow is at the top of the green box, and the 25th percentile is at the bottom of the brown box



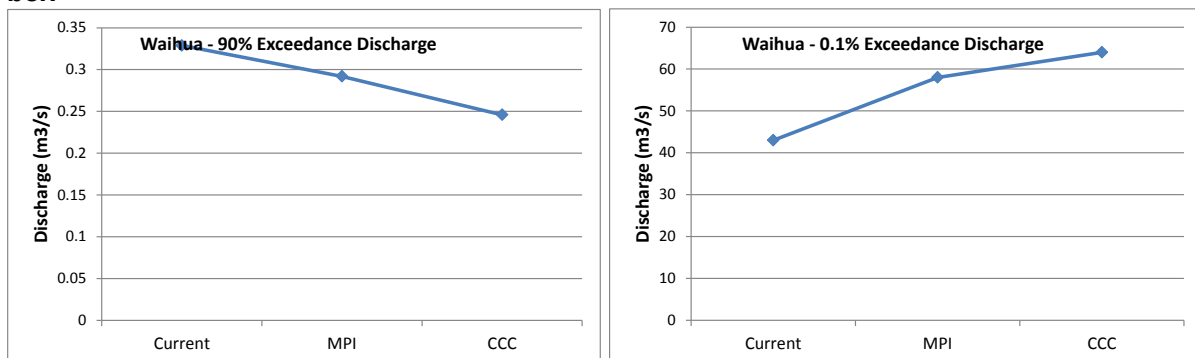
Box plot of climate change impact for the monthly minimum flow for the Rangitaiki catchment at Waihua for the current time period 1997-2011 (Current), for the nominal time period of 2085-2099 using MPI model; and for the nominal time period of 2085-2099 using CCC model. The median minimum annual flow is at the green/brown boundary, the 75th percentile of minimum annual flow is at the top of the green box, and the 25th percentile is at the bottom of the brown box



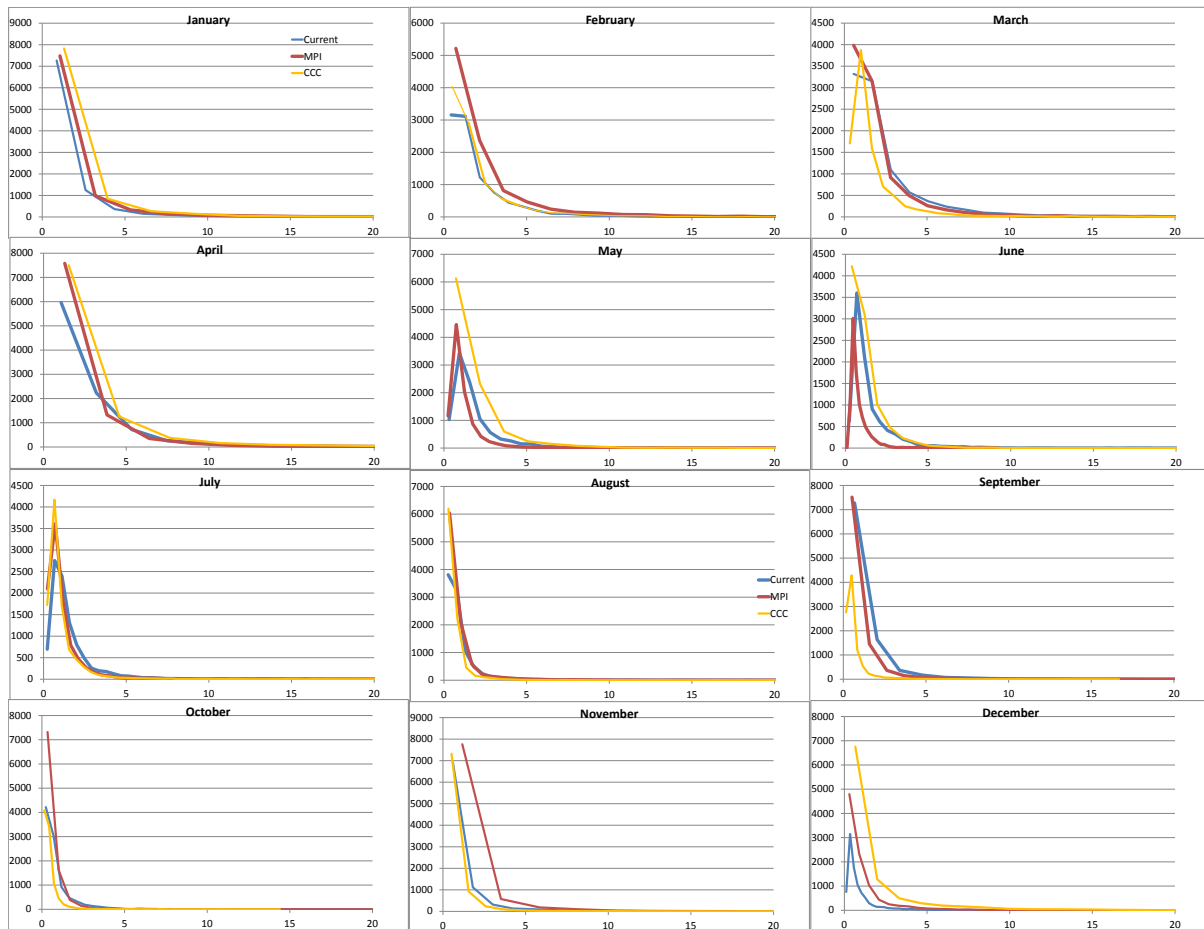
Box plot of climate change impact for the monthly average flow for the Rangitaiki catchment at Waihua for the current time period 1997-2011 (Current), for the nominal time period of 2085-2099 using MPI model; and for the nominal time period of 2085-2099 using CCC model. The median minimum annual flow is at the green/brown boundary, the 75th percentile of minimum annual flow is at the top of the green box, and the 25th percentile is at the bottom of the brown box



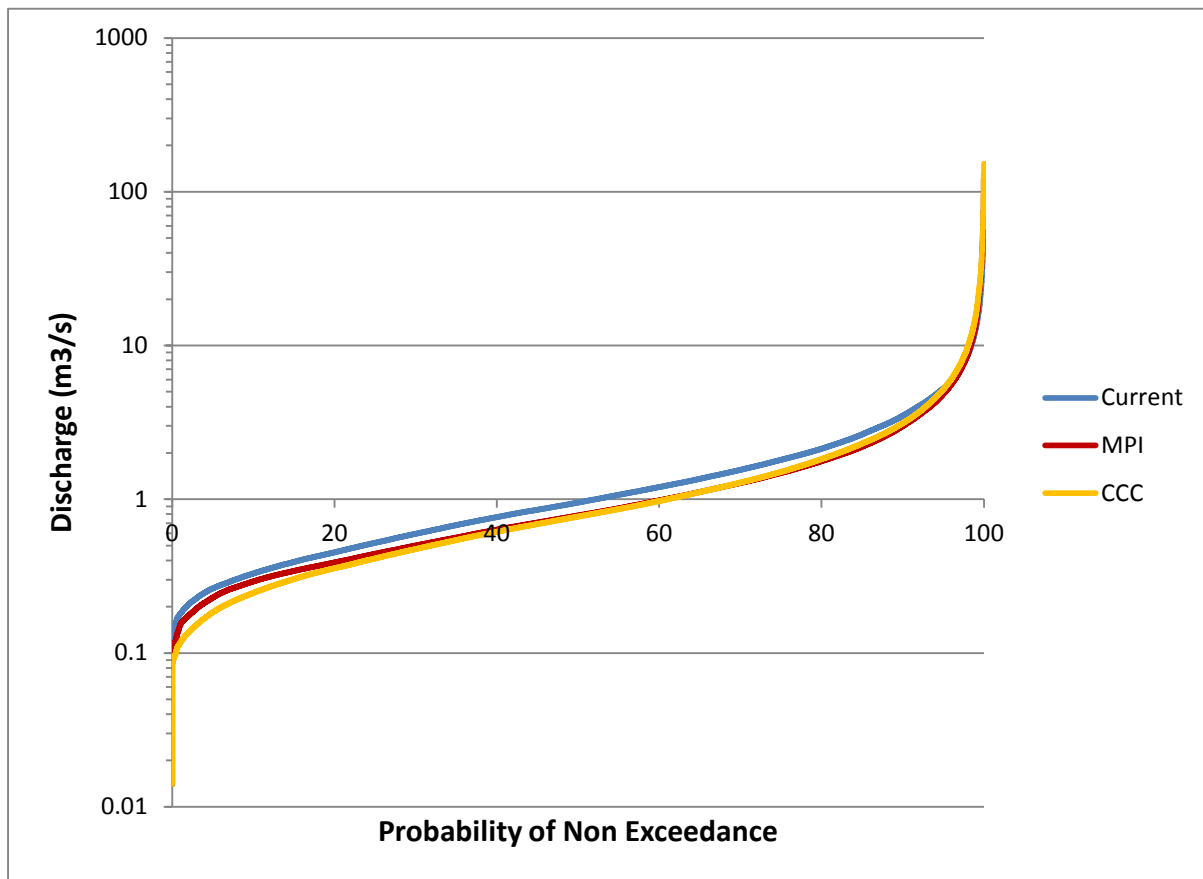
Box plot of climate change impact for the monthly maximum flow for the Rangitaiki catchment at Waihua for the current time period 1997-2011 (Current), for the nominal time period of 2085-2099 using MPI model; and for the nominal time period of 2085-2099 using CCC model. The median minimum annual flow is at the green/brown boundary, the 75th percentile of minimum annual flow is at the top of the green box, and the 25th percentile is at the bottom of the brown box



Climate change impact on low flow and high flows for the Rangitaiki catchment at Waihua for the current time period 1997-2011 (Current), for the nominal time period of 2085-2099 using MPI model; and for the nominal time period of 2085-2099 using CCC model.

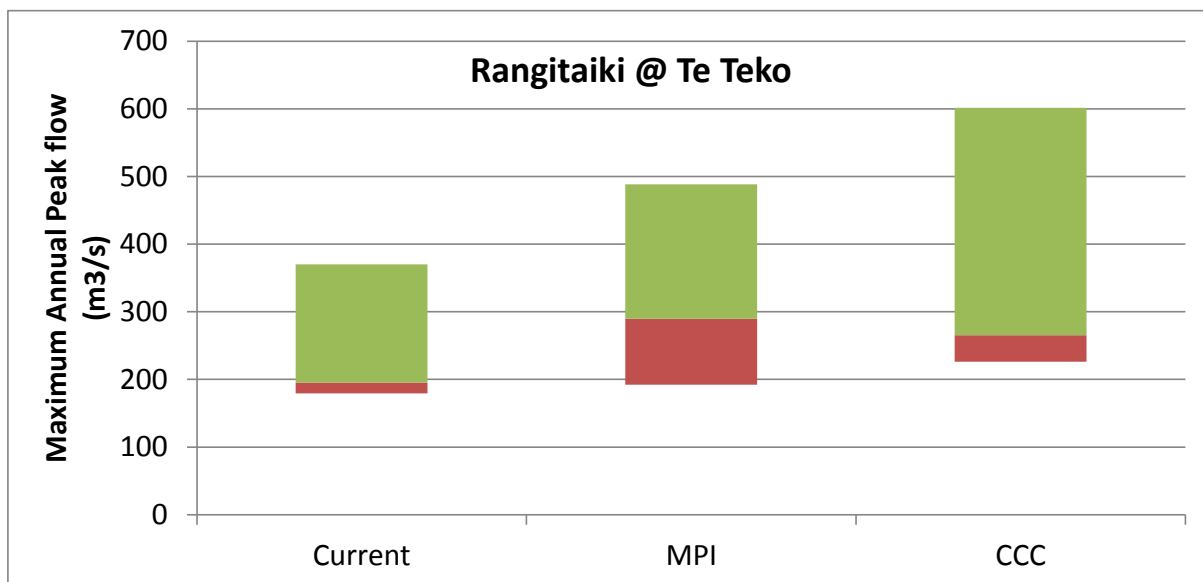
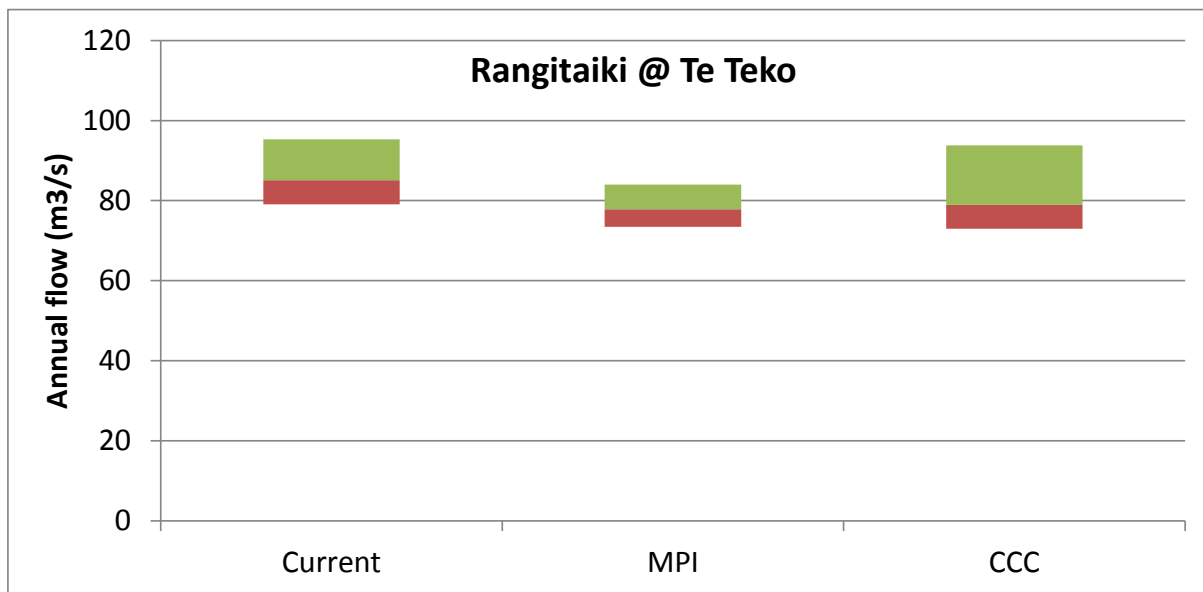


Climate change impact on monthly flow distribution for the Rangitaiki catchment at Waihua for the current time period 1997-2011 (Current), for the nominal time period of 2085-2099 using MPI model (MPI); and for the nominal time period of 2085-2099 using CCC model (CCC). The Y axis represents the occurrence of discharge, while the X axis represents the hourly discharge. For sake of visibility simulated hourly discharge over 20 m³/s were truncated

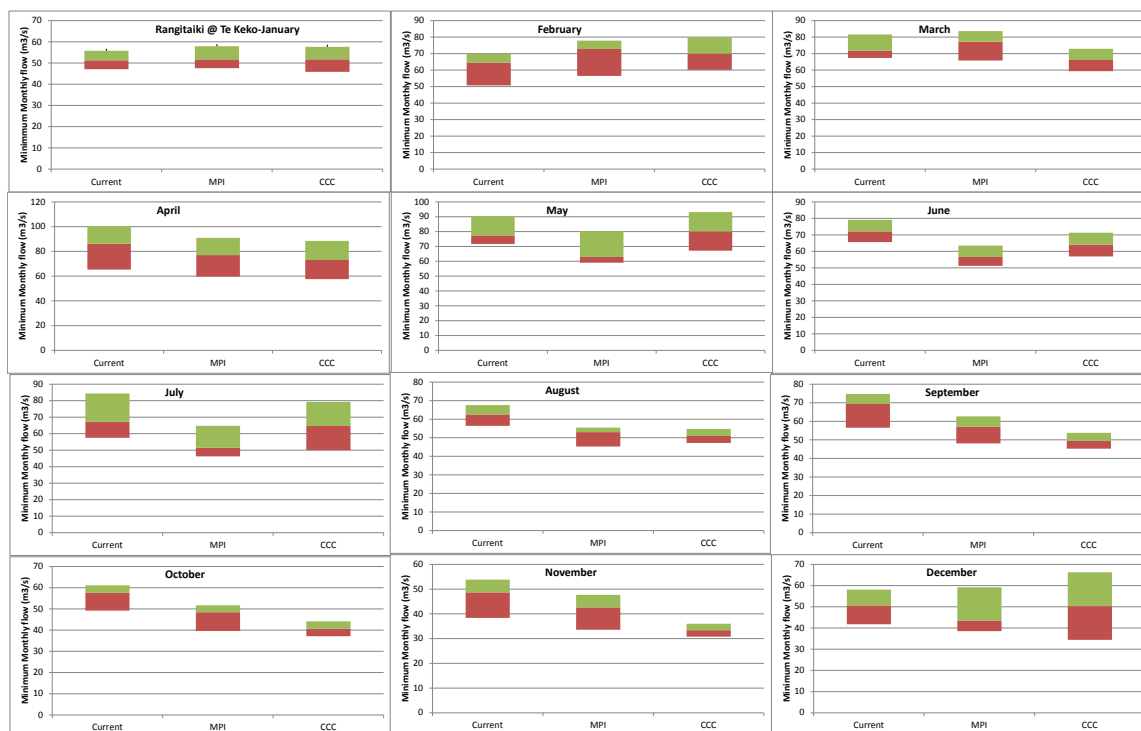


Climate change impact on simulated hourly flow duration curve for the Rangitaiki catchment at Waihua for the current time period 1997-2011 (Current), for the nominal time period of 2085-2099 using MPI model; and for the nominal time period of 2085-2099 using CCC model.

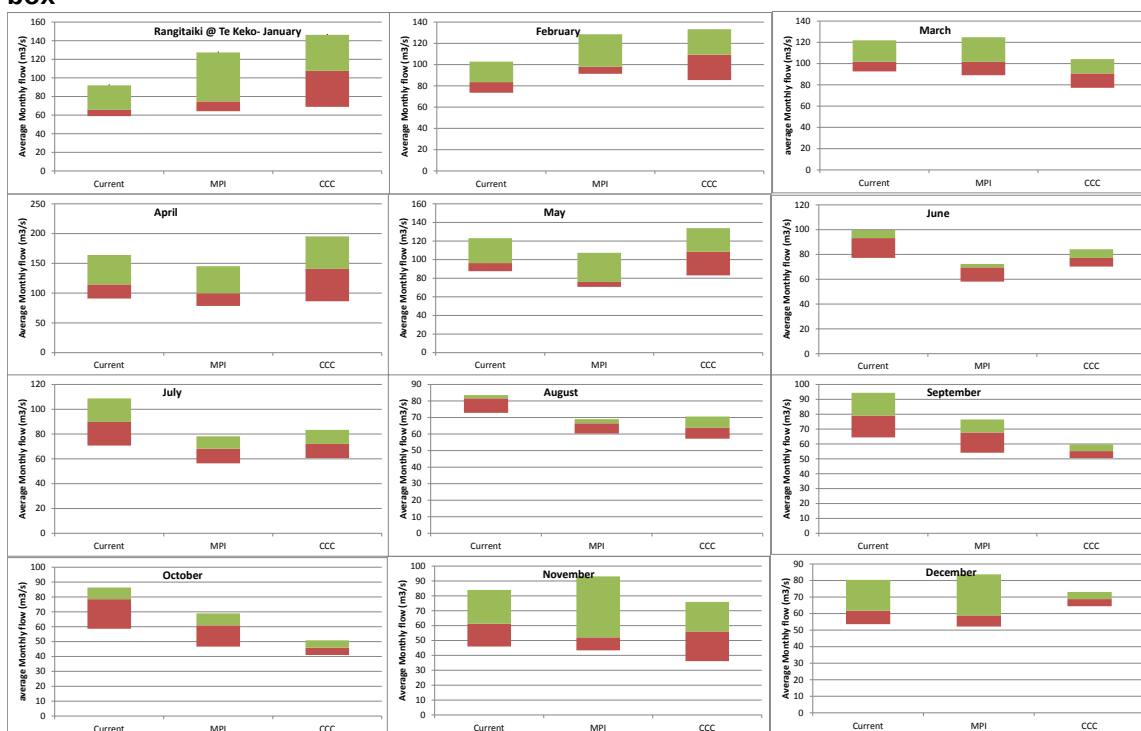
Appendix B4 : Rangitaiki at Te Teko



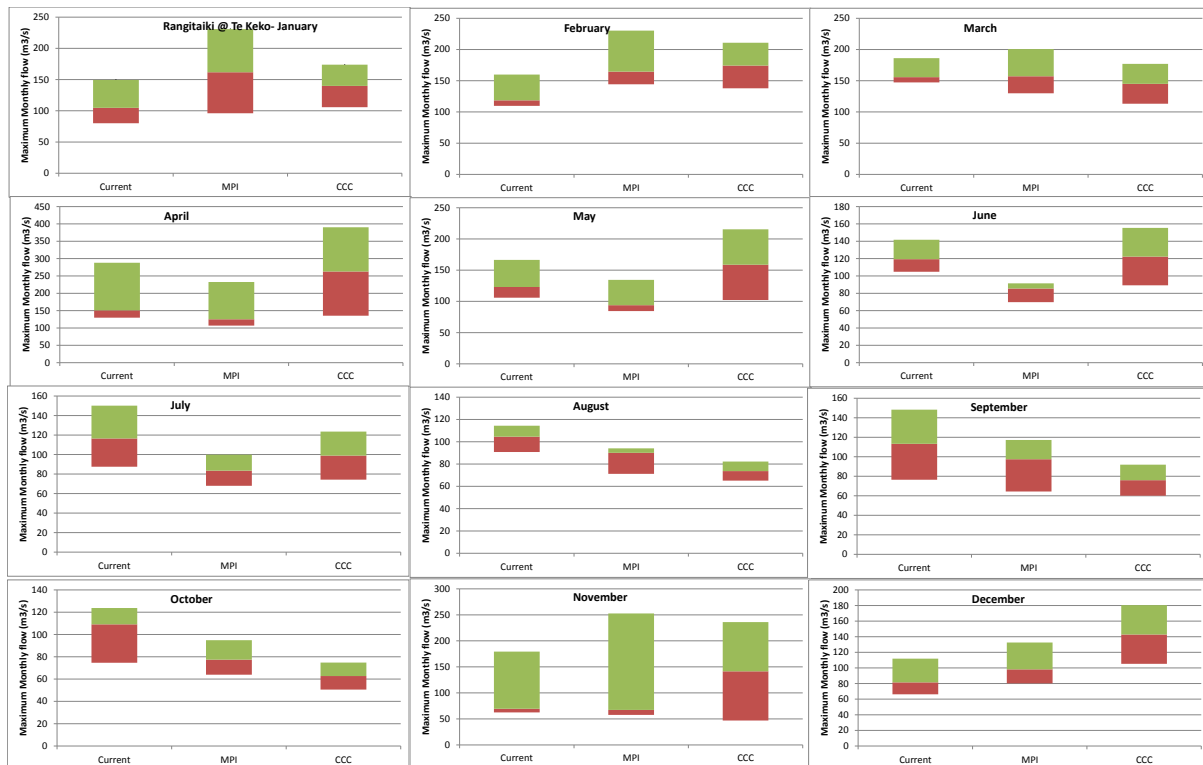
Box plot of climate change impact for the annual flow and maximum annual flow for the Rangitaiki catchment at Te Teko for the current time period 1997-2011 (Current), for the nominal time period of 2085-2099 using MPI model; and for the nominal time period of 2085-2099 using CCC model. The median annual flow is at the green/brown boundary, the 75th percentile of annual flow is at the top of the green box, and the 25th percentile is at the bottom of the brown box



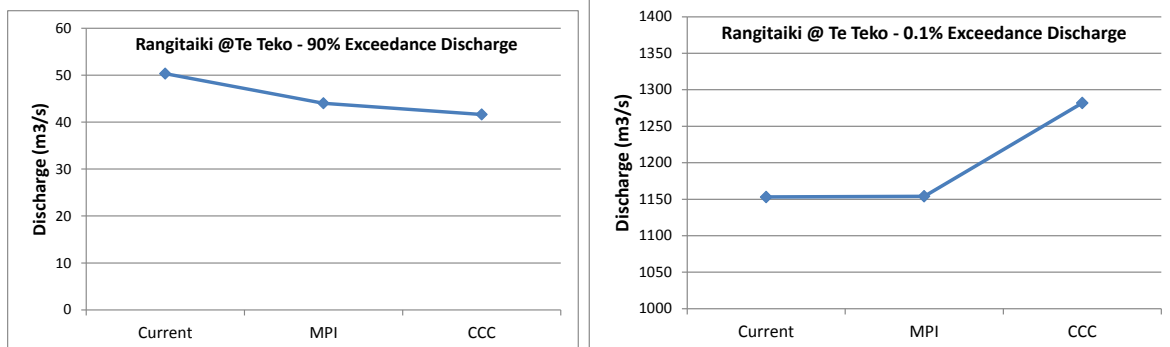
Box plot of climate change impact for the monthly minimum flow for the Rangitaiki catchment at Te Teko for the current time period 1997-2011 (Current), for the nominal time period of 2085-2099 using MPI model; and for the nominal time period of 2085-2099 using CCC model. The median minimum annual flow is at the green/brown boundary, the 75th percentile of minimum annual flow is at the top of the green box, and the 25th percentile is at the bottom of the brown box



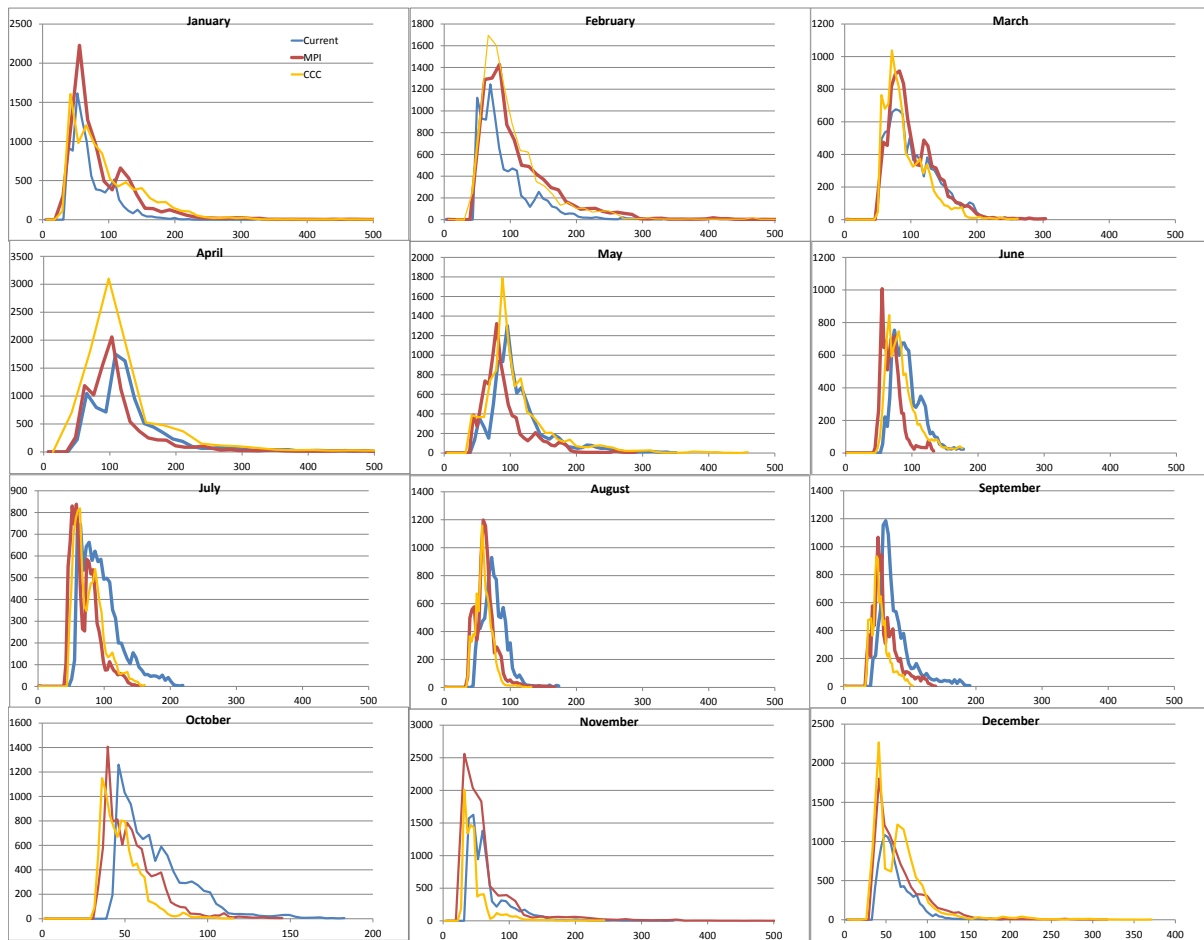
Box plot of climate change impact for the monthly average flow for the Rangitaiki catchment at Te Teko for the current time period 1997-2011 (Current), for the nominal time period of 2085-2099 using MPI model; and for the nominal time period of 2085-2099 using CCC model. The median minimum annual flow is at the green/brown boundary, the 75th percentile of minimum annual flow is at the top of the green box, and the 25th percentile is at the bottom of the brown box



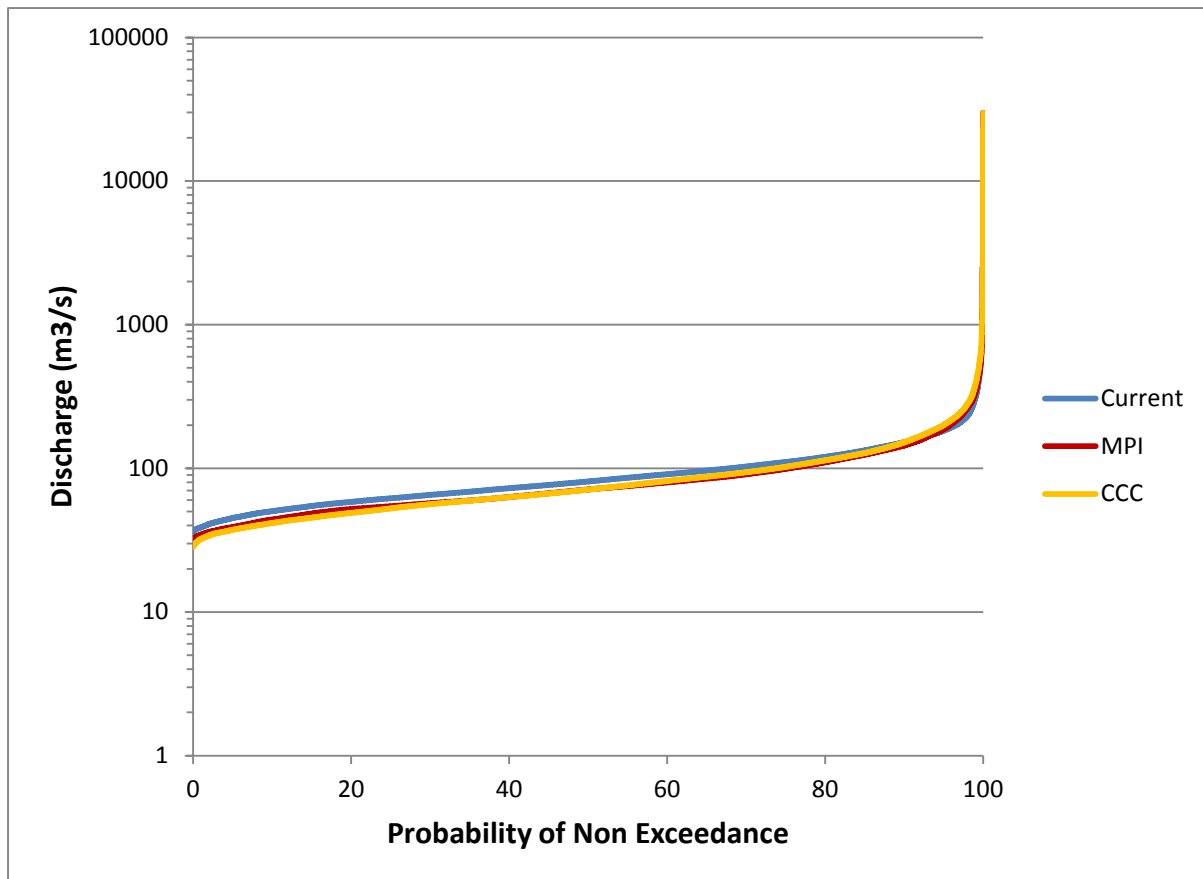
Box plot of climate change impact for the monthly maximum flow for the Rangitaiki catchment at Te Teko for the current time period 1997-2011 (Current), for the nominal time period of 2085-2099 using MPI model; and for the nominal time period of 2085-2099 using CCC model. The median minimum annual flow is at the green/brown boundary, the 75th percentile of minimum annual flow is at the top of the green box, and the 25th percentile is at the bottom of the brown box



Climate change impact on low flow and high flows for the Rangitaiki catchment at Te Teko for the current time period 1997-2011 (Current), for the nominal time period of 2085-2099 using MPI model; and for the nominal time period of 2085-2099 using CCC model.

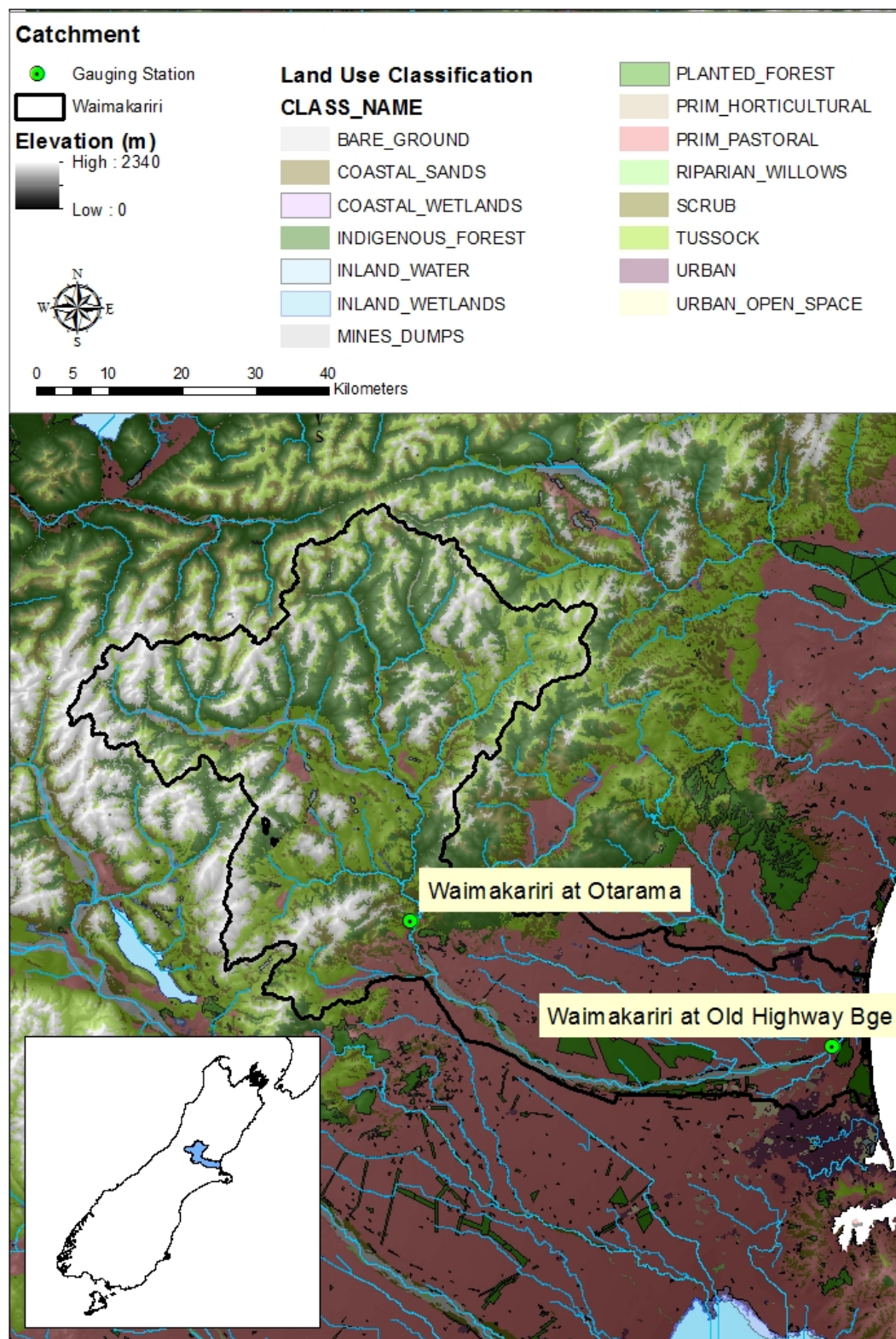


Climate change impact on monthly flow distribution for the Rangitaiki catchment at Te Teko for the current time period 1997-2011 (Current), for the nominal time period of 2085-2099 using MPI model (MPI); and for the nominal time period of 2085-2099 using CCC model (CCC). The Y axis represents the occurrence of discharge, while the X axis represents the hourly discharge. For sake of visibility simulated hourly discharge over 500 m³/s were truncated

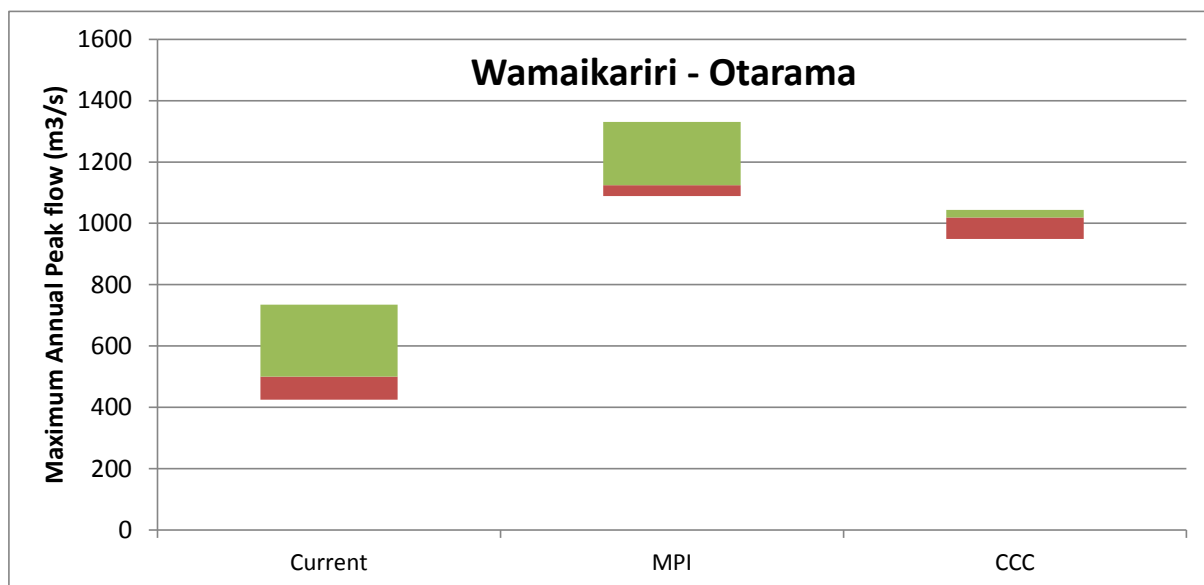
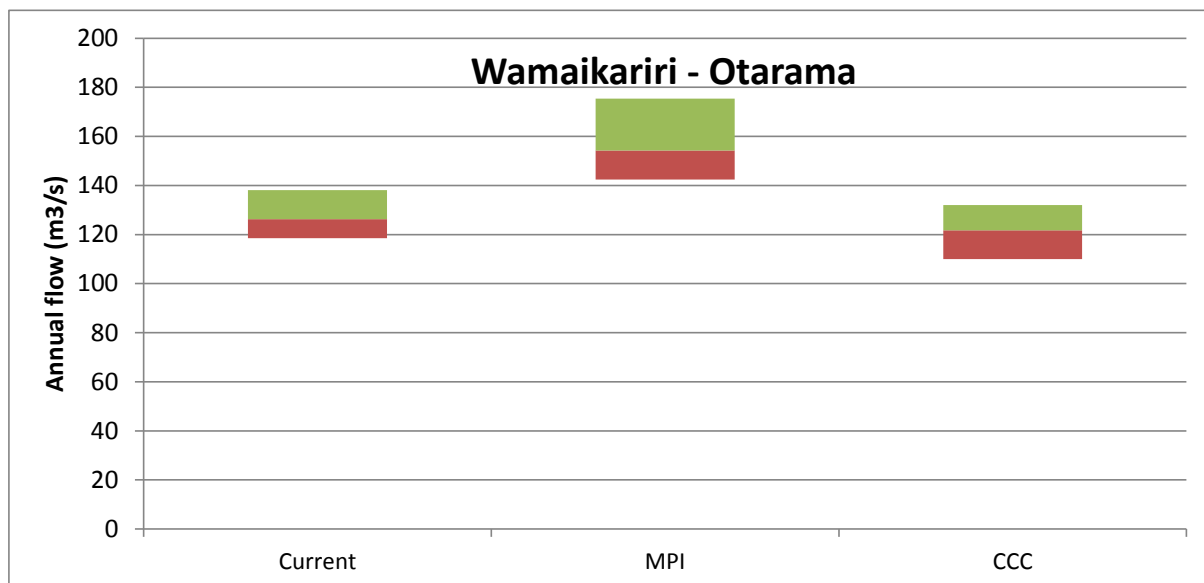


Climate change impact on simulated hourly flow duration curve for the Rangitaiki catchment at Te Teko for the current time period 1997-2011 (Current), for the nominal time period of 2085-2099 using MPI model; and for the nominal time period of 2085-2099 using CCC model.

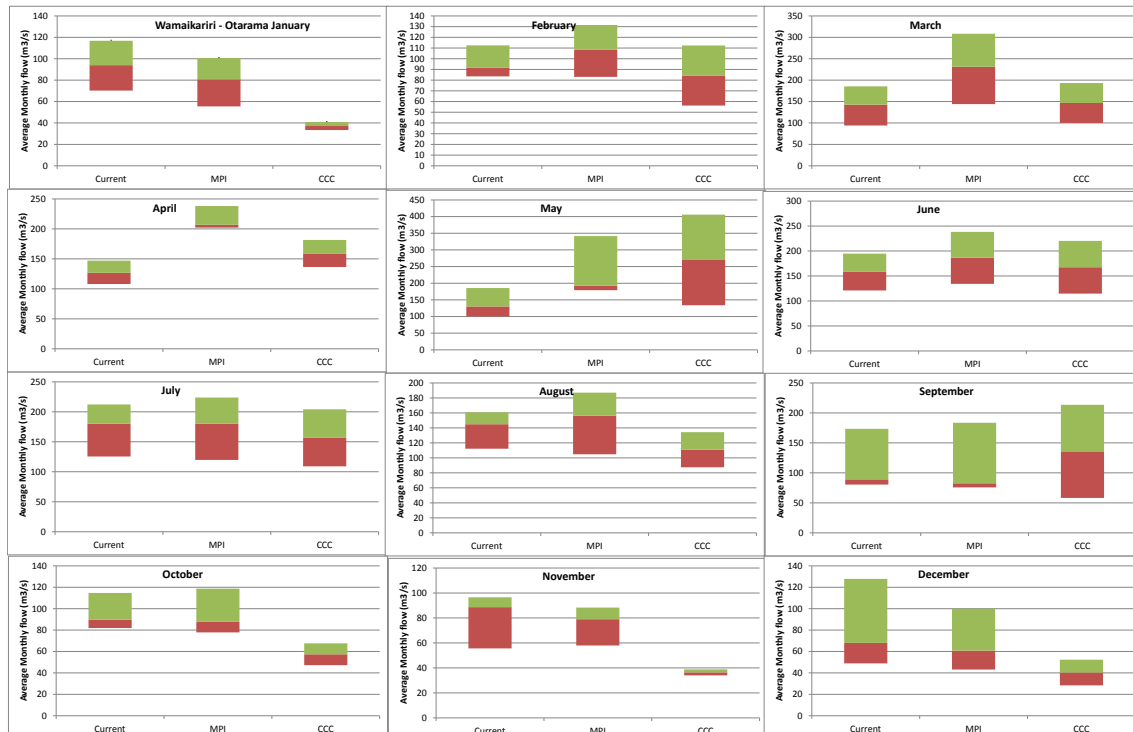
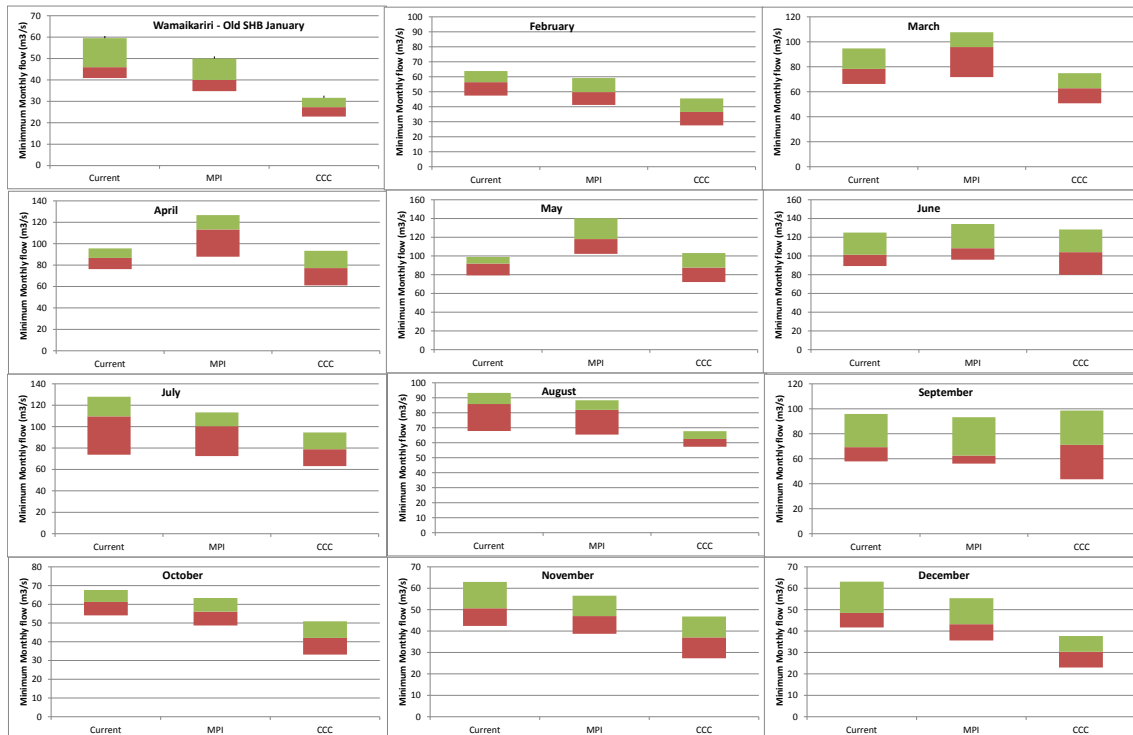
Appendix C Waimakariri Catchment

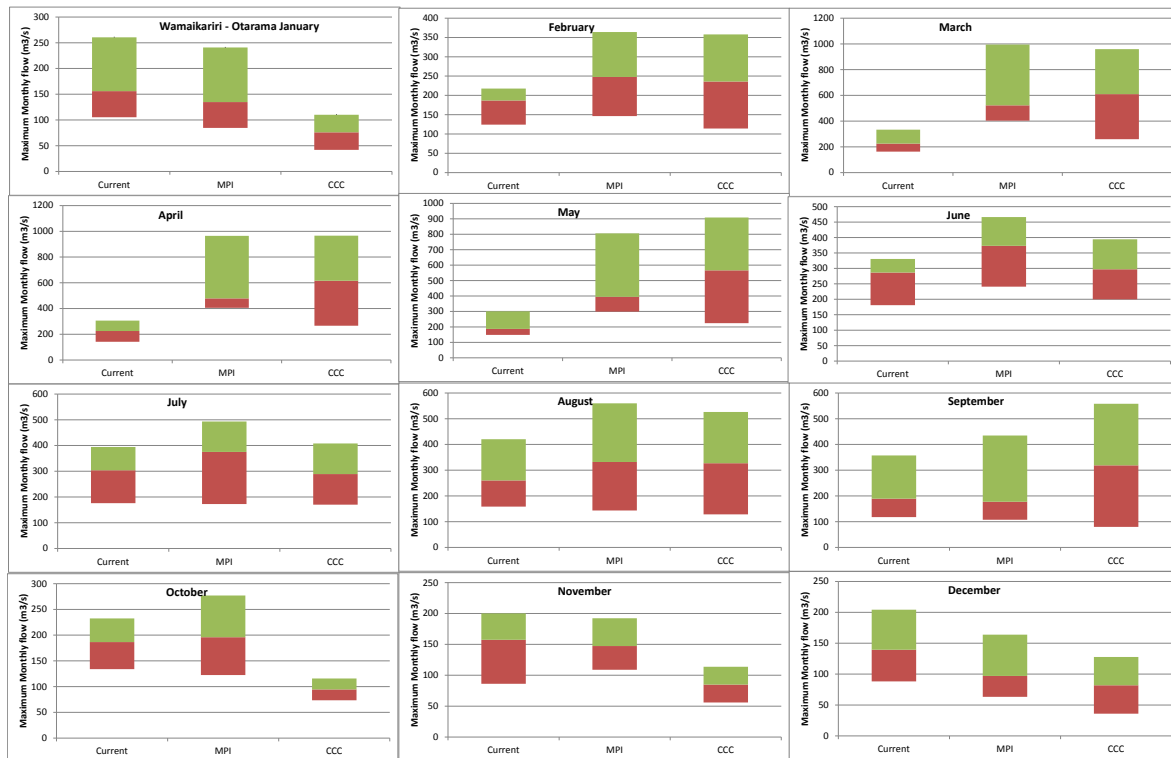


Appendix C1 - Waimakariri at Otarama

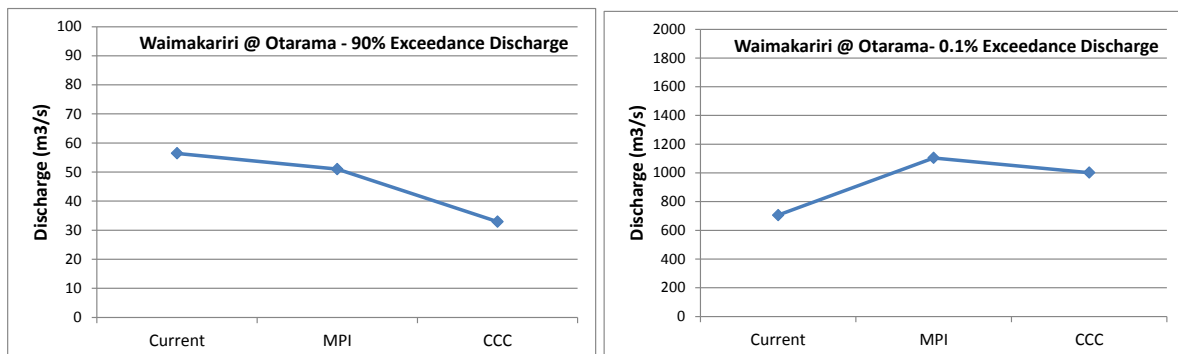


Box plot of climate change impact for maximum annual flow and annual flow for the Waimakariri catchment at Otarama for the current time period 1997-2011 (Current), for the nominal time period of 2085-2099 using MPI model; and for the nominal time period of 2085-2099 using CCC model. The median annual flow is at the green/brown boundary, the 75th percentile of annual flow is at the top of the green box, and the 25th percentile is at the bottom of the brown box

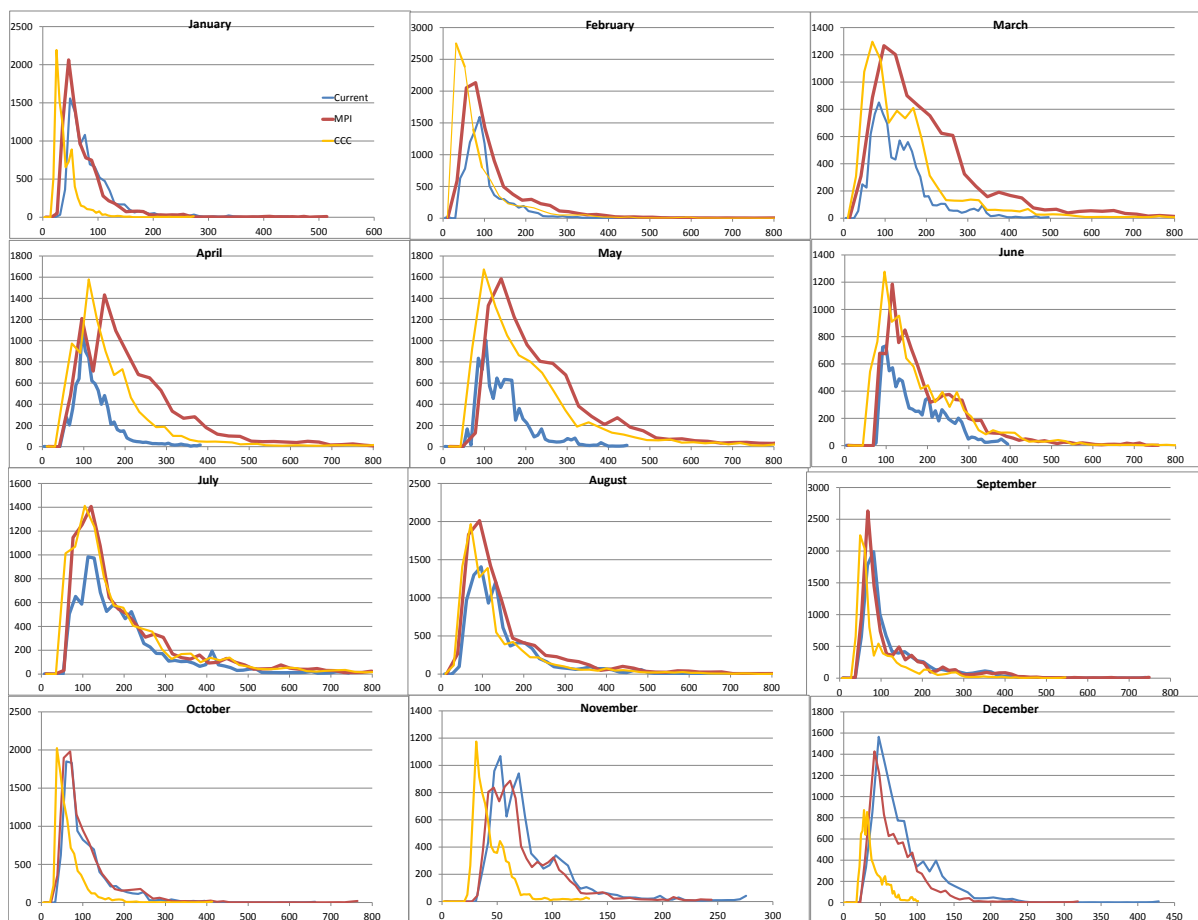




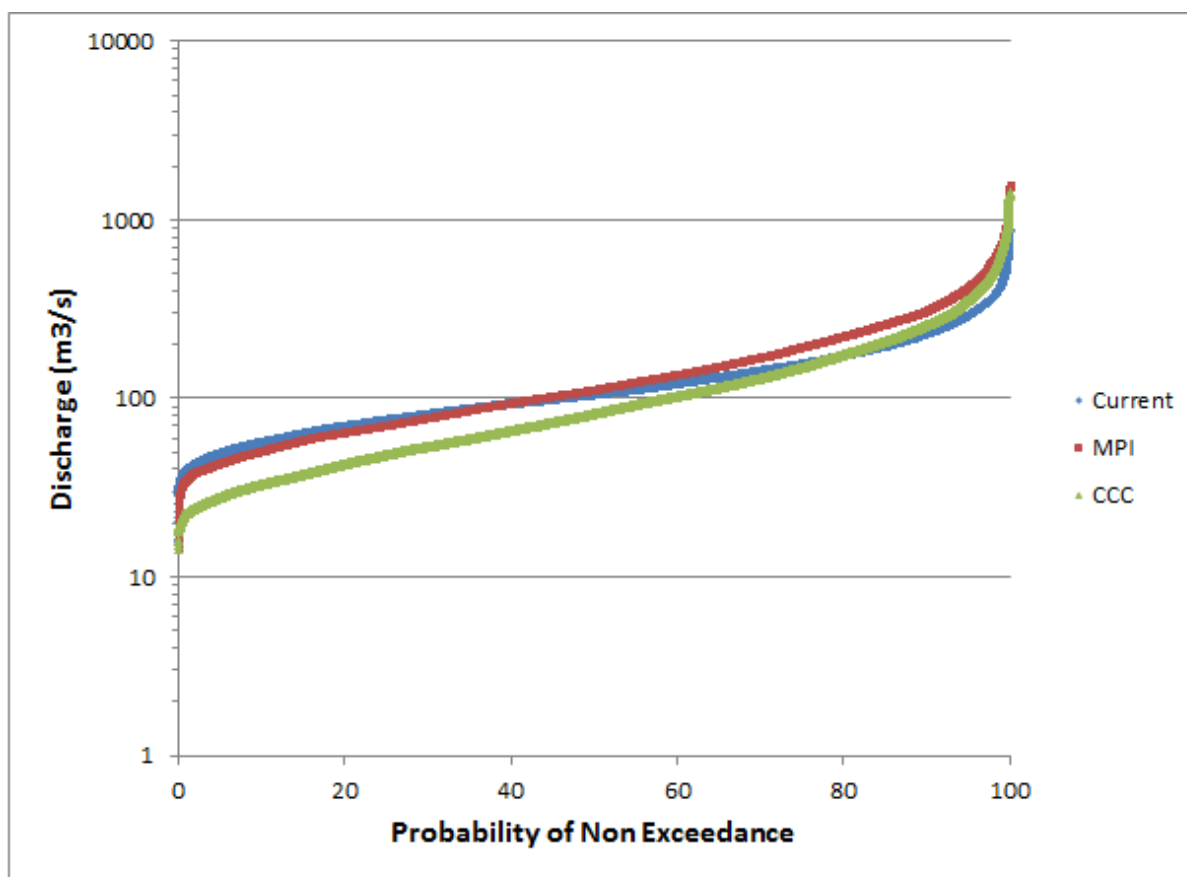
Box plot of climate change impact for the monthly maximum flow for the Waimakariri catchment at Otarama for the current time period 1997-2011 (Current), for the nominal time period of 2085-2099 using MPI model; and for the nominal time period of 2085-2099 using CCC model. The median minimum annual flow is at the green/brown boundary, the 75th percentile of minimum annual flow is at the top of the green box, and the 25th percentile is at the bottom of the brown box



Climate change impact on low flow and high flows for the Waimakariri catchment at Otarama for the current time period 1997-2011 (Current), for the nominal time period of 2085-2099 using MPI model; and for the nominal time period of 2085-2099 using CCC model.

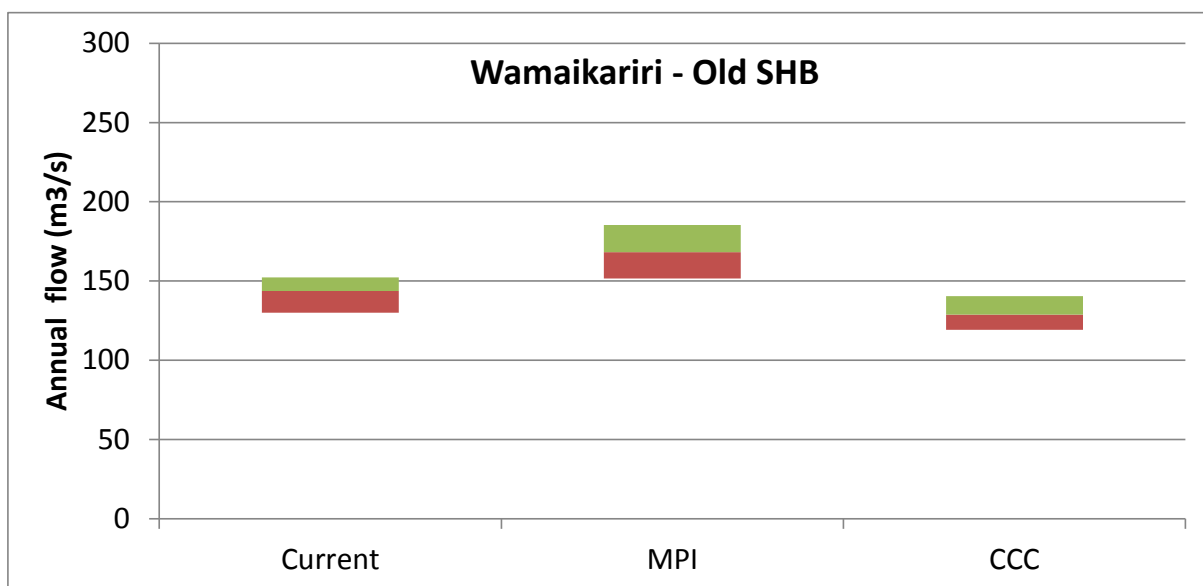
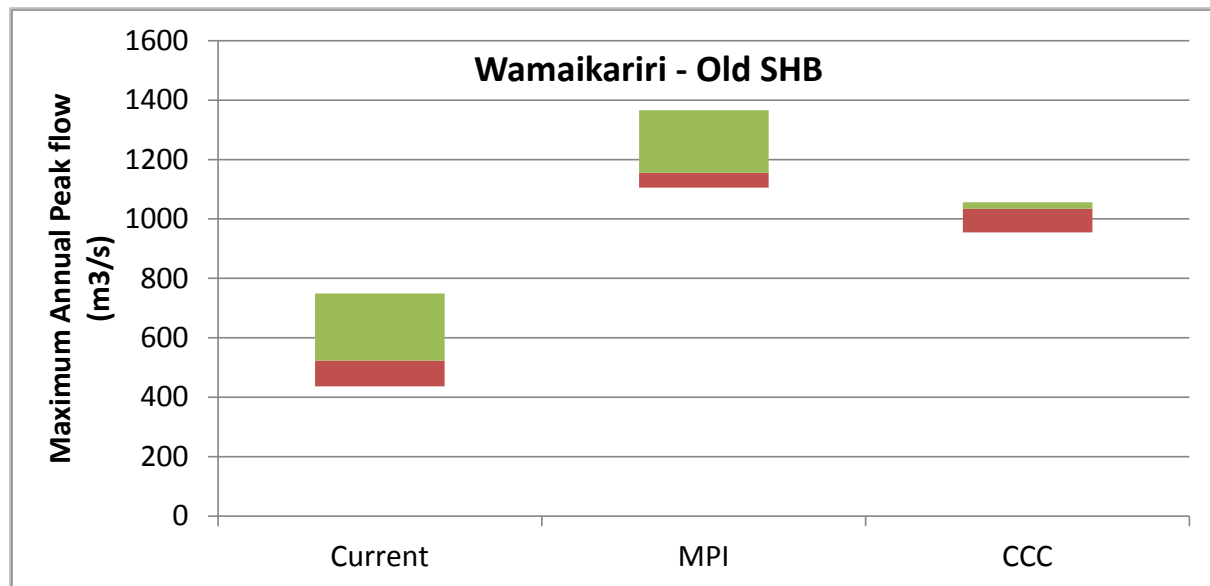


Climate change impact on monthly flow distribution for the Waimakariri catchment at Otarama for the current time period 1997-2011 (Current), for the nominal time period of 2085-2099 using MPI model (MPI); and for the nominal time period of 2085-2099 using CCC model (CCC). The Y axis represents the occurrence of discharge, while the X axis represents the hourly discharge. For sake of visibility simulated hourly discharge over 800 m³/s were truncated

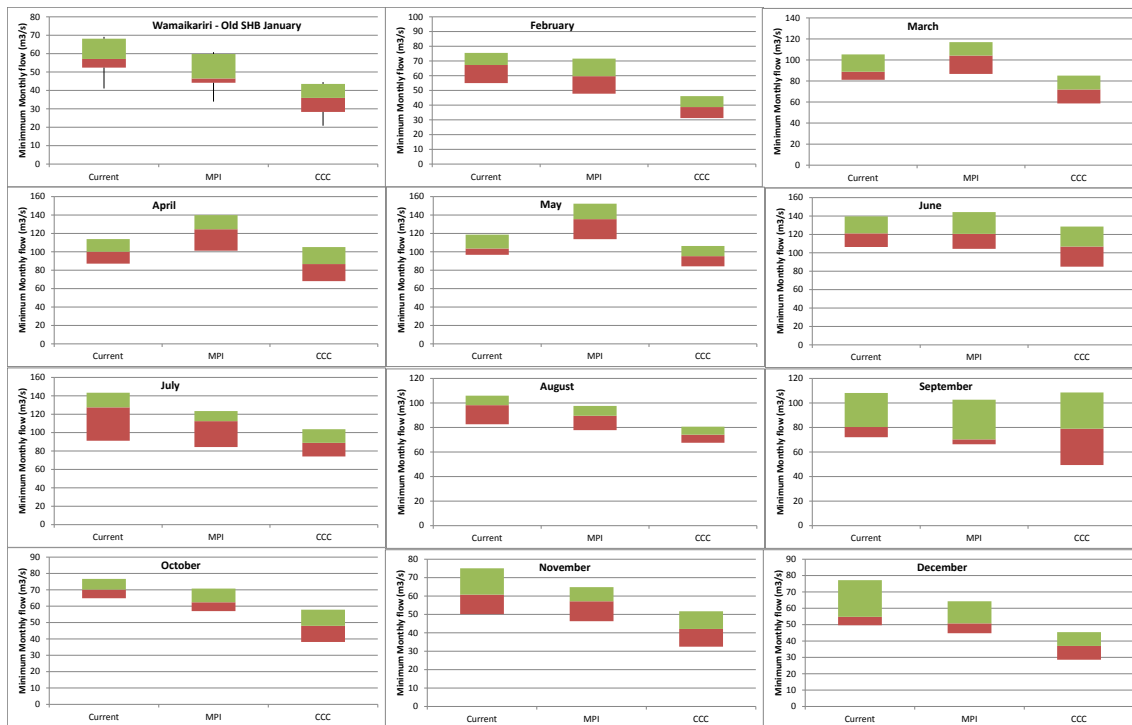


Climate change impact on simulated hourly flow duration curve for the Waimakariri catchment at Otarama for the current time period 1997-2011 (Current), for the nominal time period of 2085-2099 using MPI model; and for the nominal time period of 2085-2099 using CCC model.

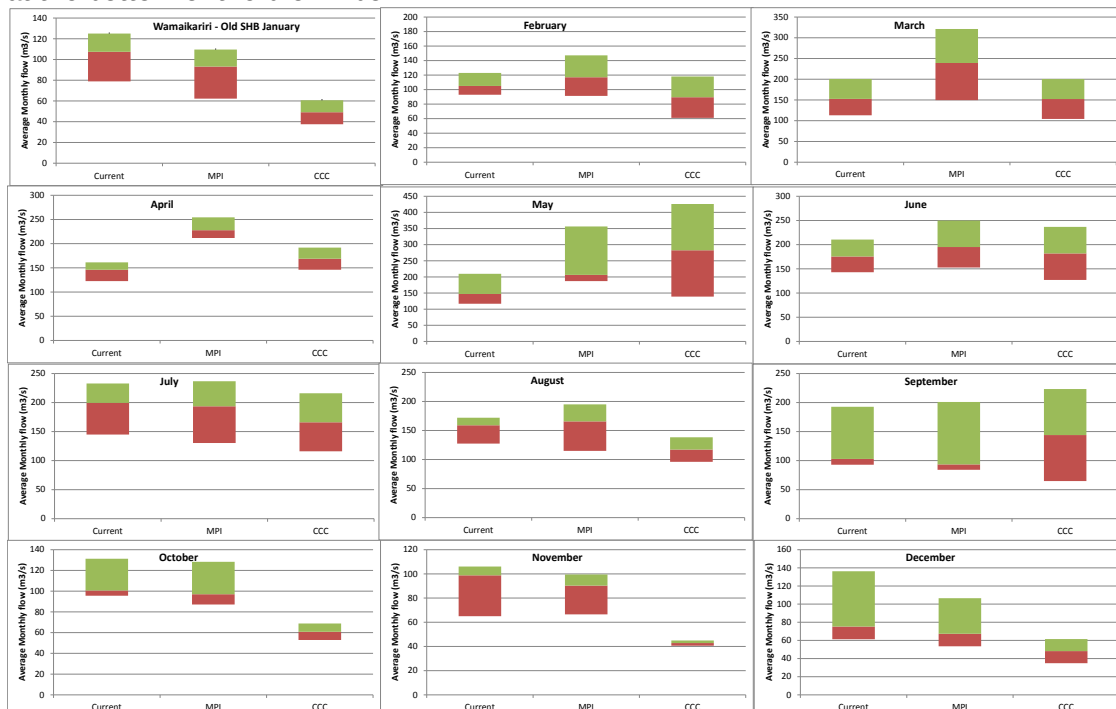
Appendix C2 – Waimakariri at State Highway Bridge



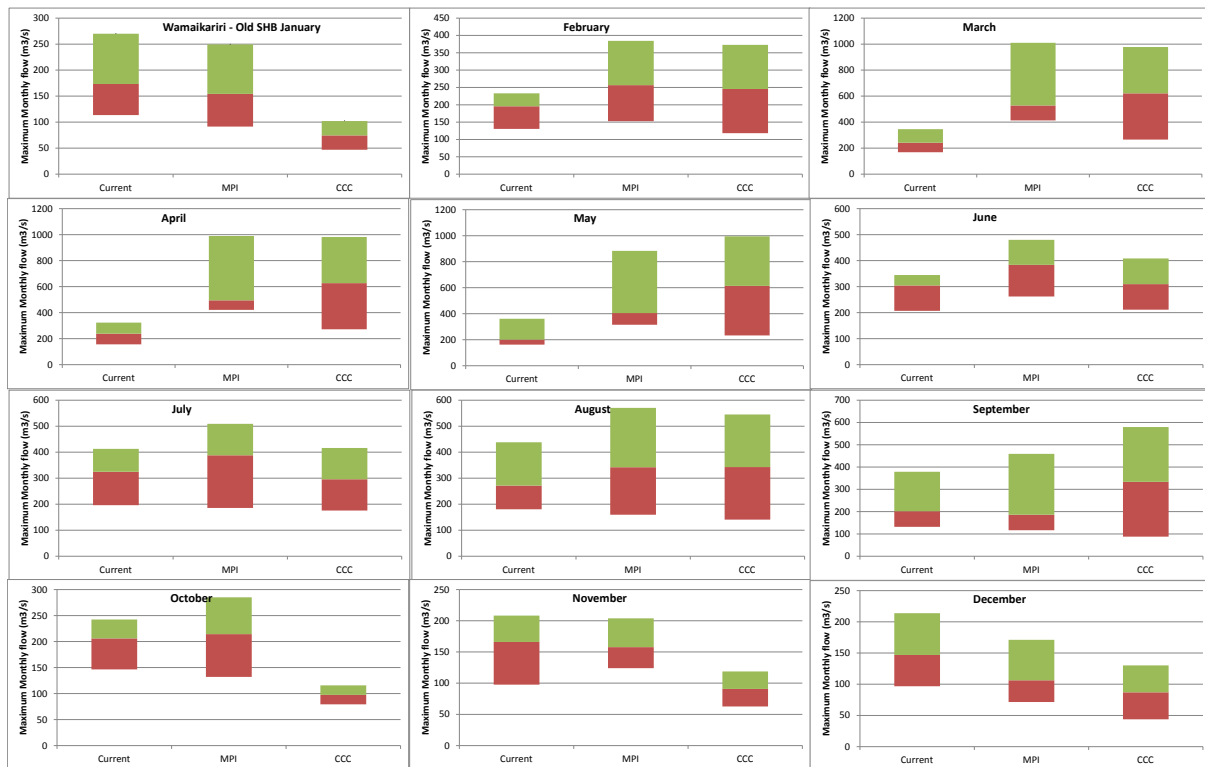
Box plot of climate change impact for the maximum annual flow and annual flow for the Waimakariri catchment at Old State Highway Bridge for the current time period 1997-2011 (Current), for the nominal time period of 2085-2099 using MPI model; and for the nominal time period of 2085-2099 using CCC model. The median annual flow is at the green/brown boundary, the 75th percentile of annual flow is at the top of the green box, and the 25th percentile is at the bottom of the brown box



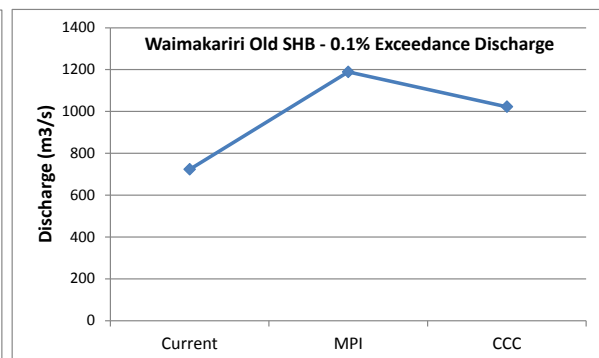
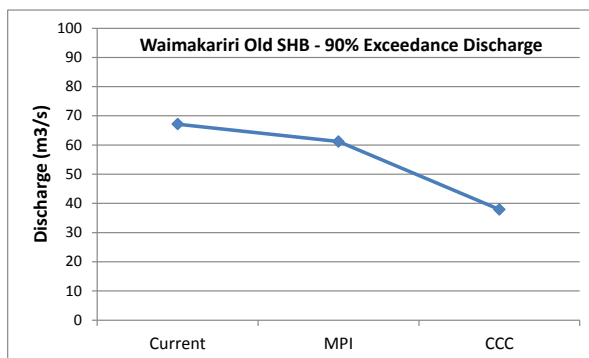
Box plot of climate change impact for the monthly minimum flow for the Waimakariri catchment at Old State Highway Bridge for the current time period 1997-2011 (Current), for the nominal time period of 2085-2099 using MPI model; and for the nominal time period of 2085-2099 using CCC model. The median minimum annual flow is at the green/brown boundary, the 75th percentile of minimum annual flow is at the top of the green box, and the 25th percentile is at the bottom of the brown box



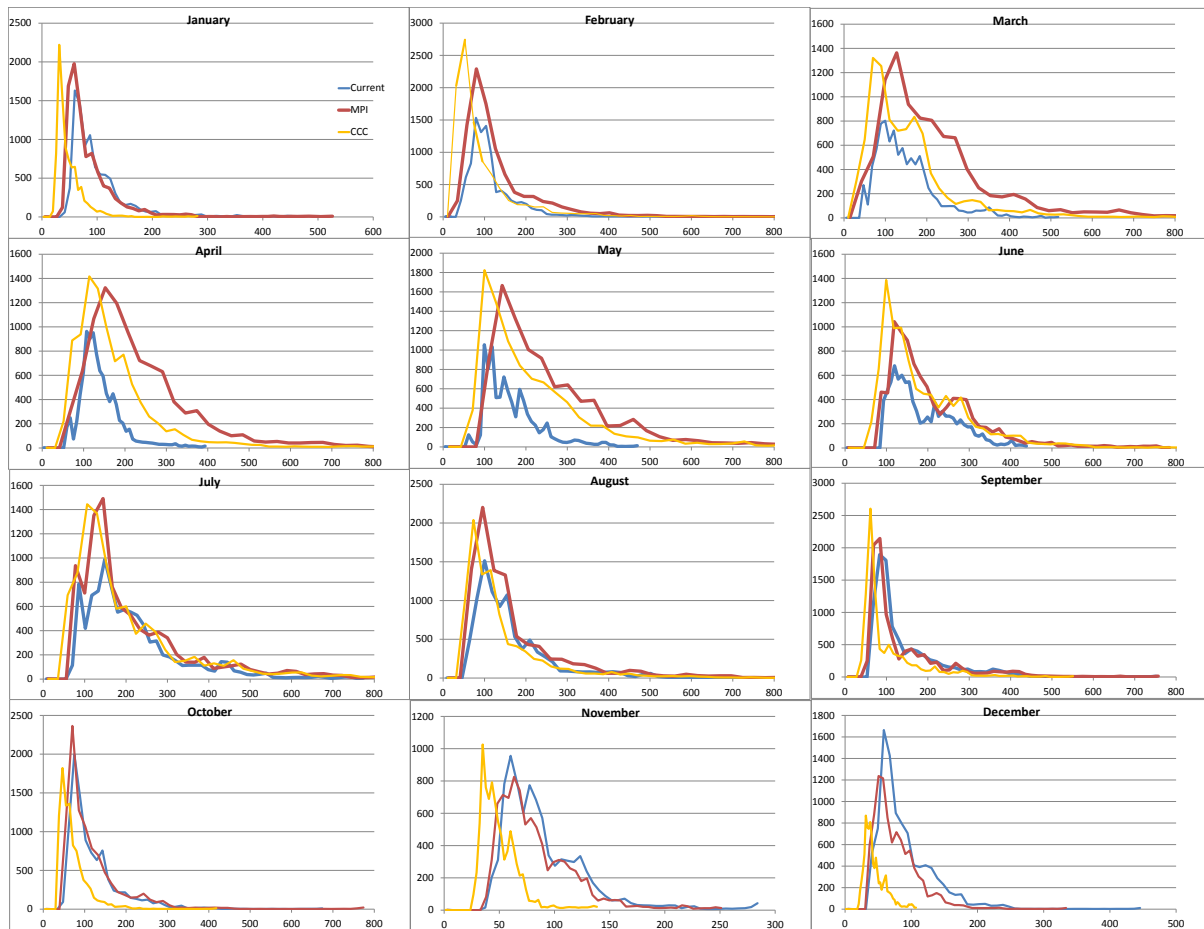
Box plot of climate change impact for the average monthly flow for the Waimakariri catchment at Old State Highway Bridge for the current time period 1997-2011 (Current), for the nominal time period of 2085-2099 using MPI model; and for the nominal time period of 2085-2099 using CCC model. The median minimum annual flow is at the green/brown boundary, the 75th percentile of minimum annual flow is at the top of the green box, and the 25th percentile is at the bottom of the brown box



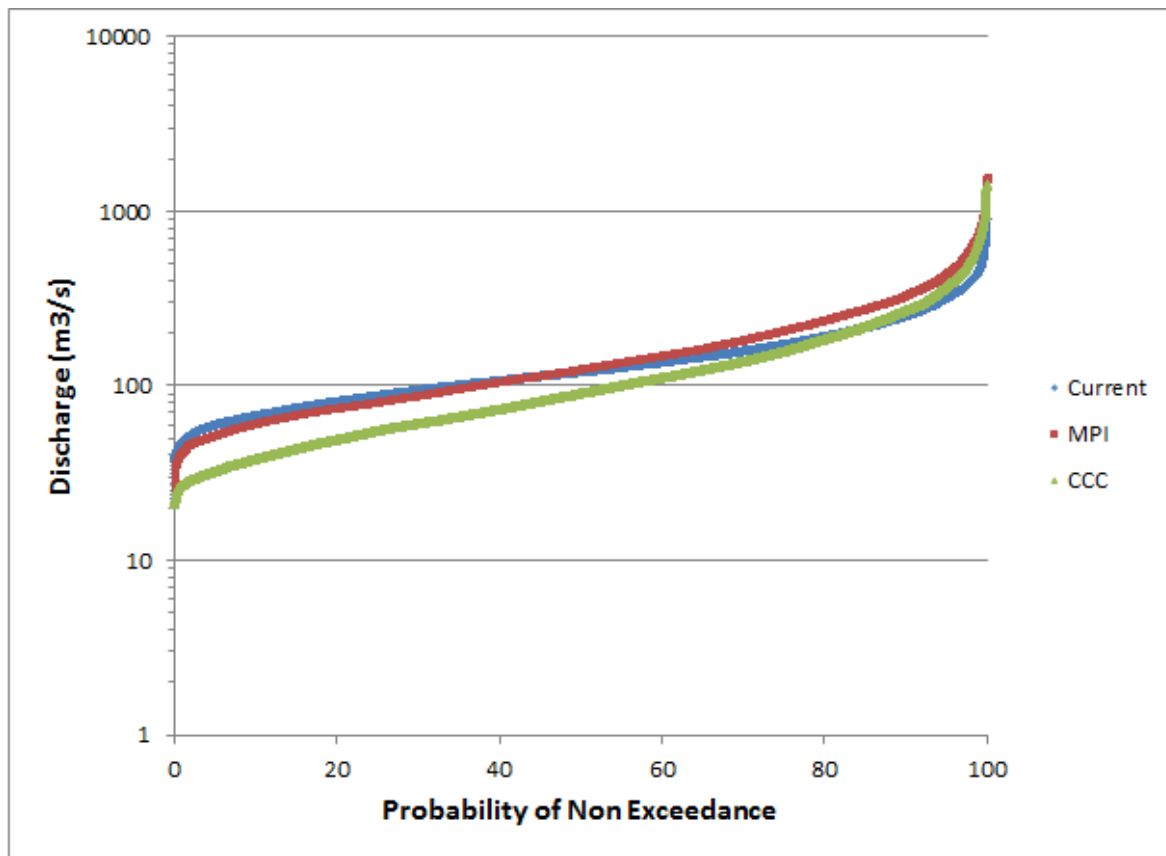
Box plot of climate change impact for the monthly maximum flow for the Waimakariri catchment at Old State Highway Bridge for the current time period 1997-2011 (Current), for the nominal time period of 2085-2099 using MPI model; and for the nominal time period of 2085-2099 using CCC model. The median minimum annual flow is at the green/brown boundary, the 75th percentile of minimum annual flow is at the top of the green box, and the 25th percentile is at the bottom of the brown box



Climate change impact on low flow and high flows for the Waimakariri catchment at Old State Highway Bridge for the current time period 1997-2011 (Current), for the nominal time period of 2085-2099 using MPI model; and for the nominal time period of 2085-2099 using CCC model.

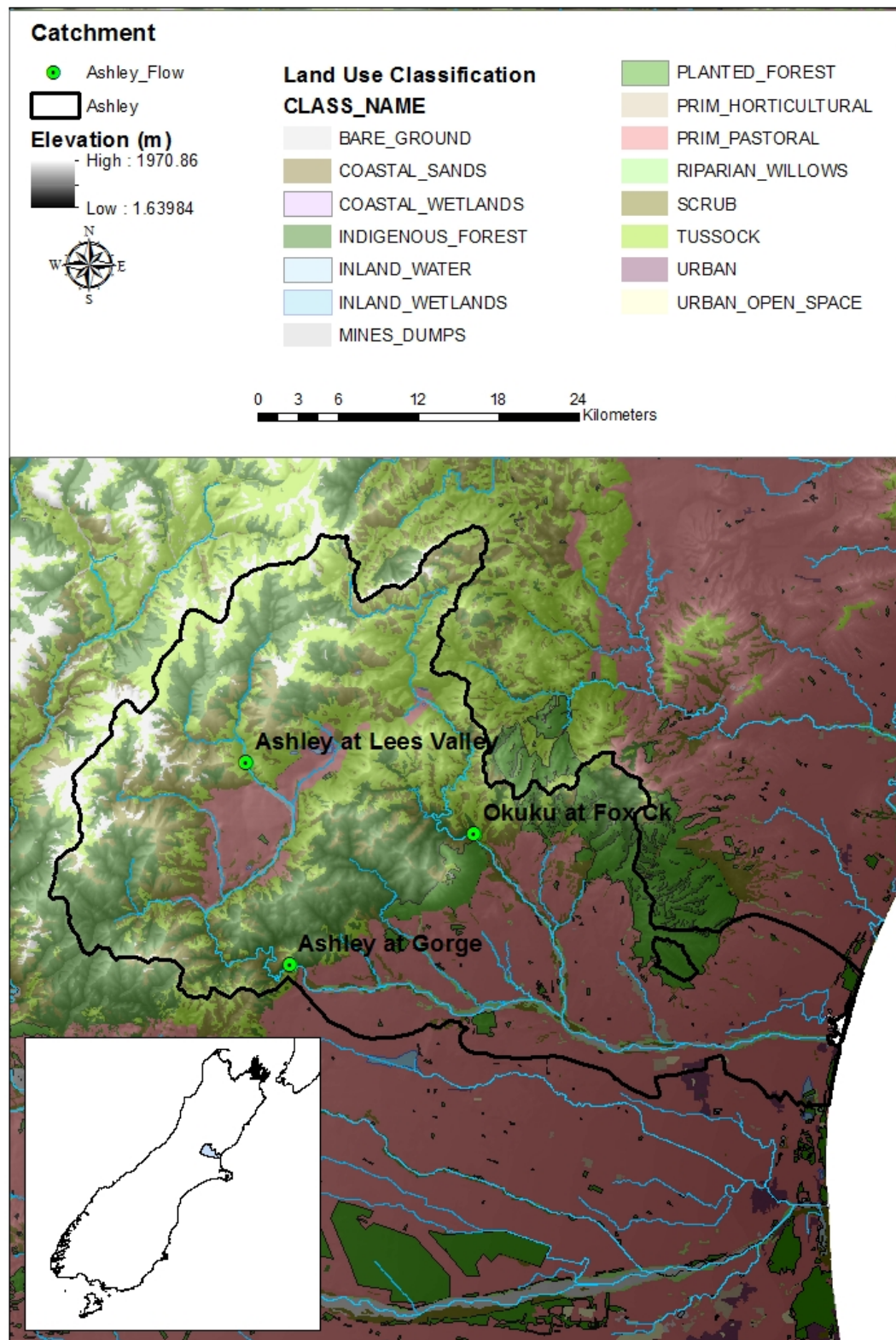


Climate change impact on monthly flow distribution for the Waimakariri catchment at Old State Highway Bridge for the current time period 1997-2011 (Current), for the nominal time period of 2085-2099 using MPI model (MPI); and for the nominal time period of 2085-2099 using CCC model (CCC). The Y axis represents the occurrence of discharge, while the X axis represents the hourly discharge. For sake of visibility simulated hourly discharge over 600 m³/s were truncated

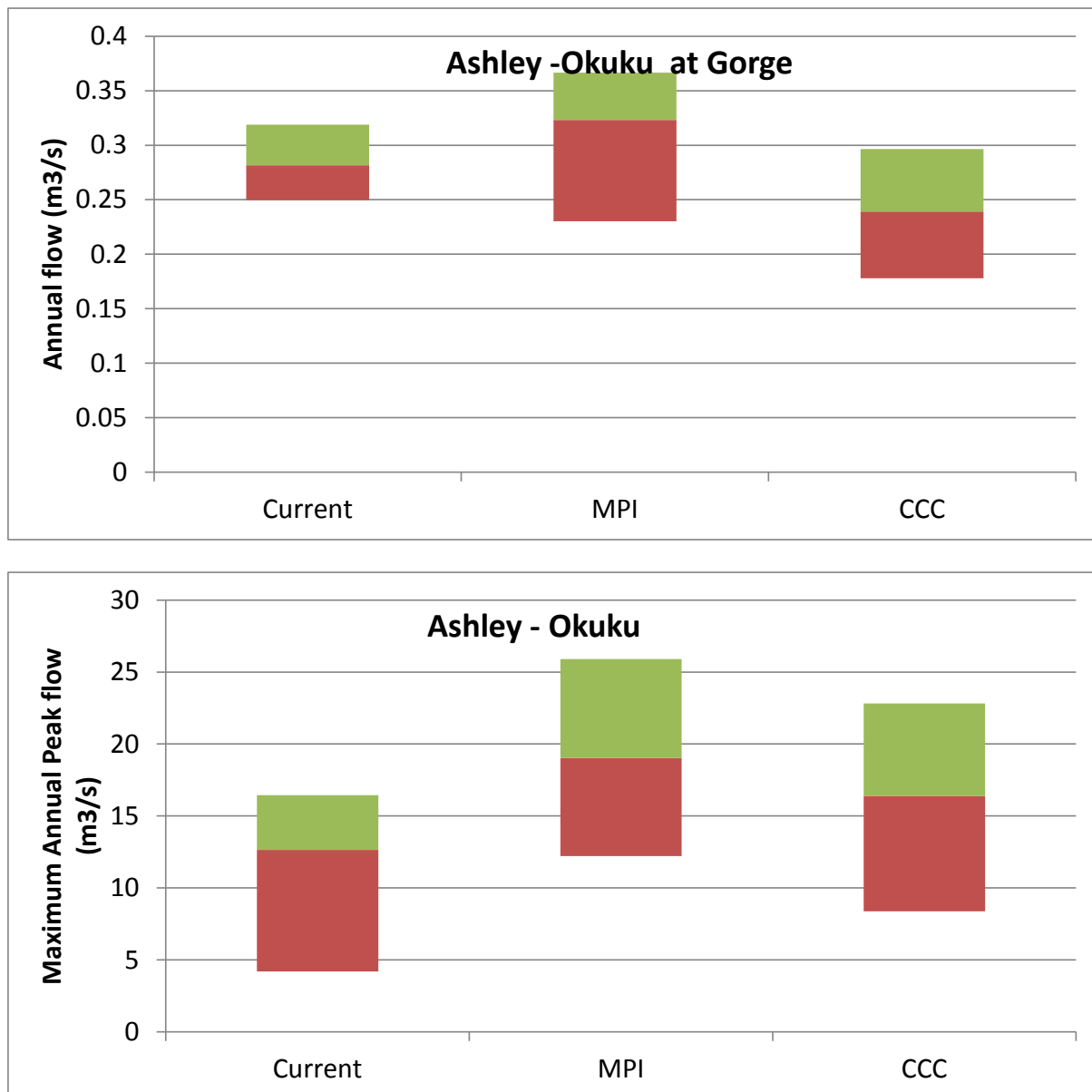


Climate change impact on simulated hourly flow duration curve for the Waimkariri catchment at Old State Highway Bridge for the current time period 1997-2011 (Current), for the nominal time period of 2085-2099 using MPI model; and for the nominal time period of 2085-2099 using CCC model.

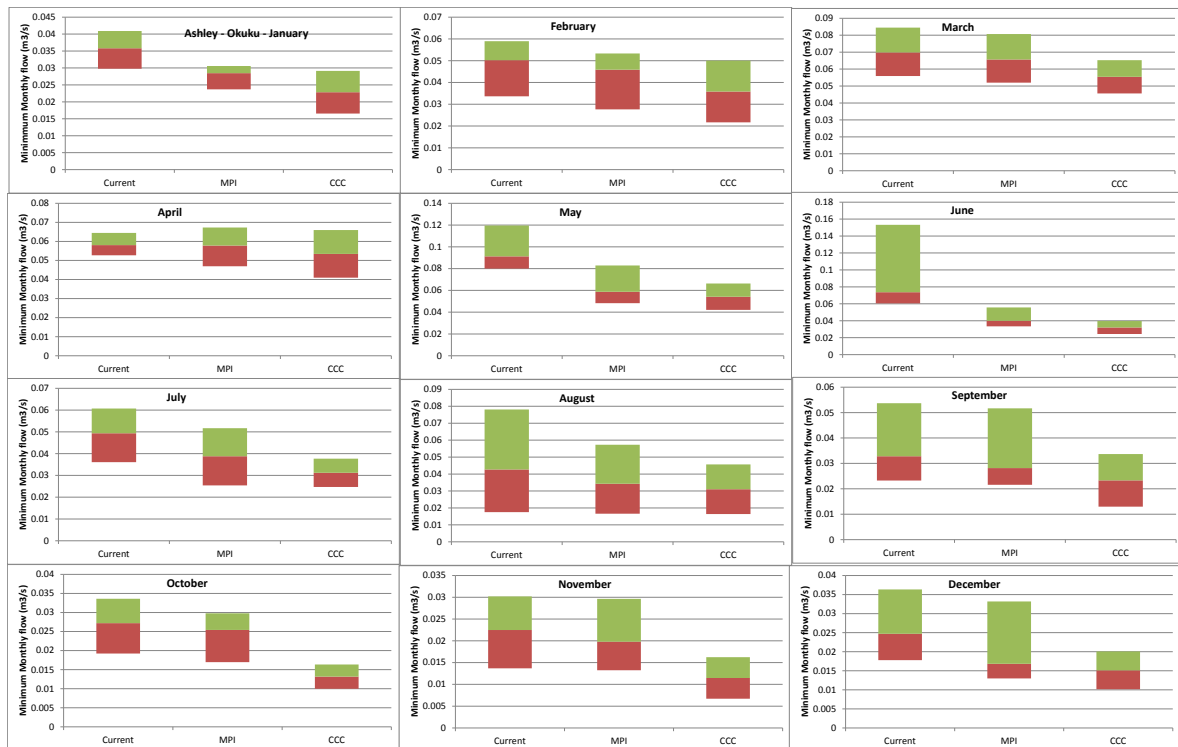
Appendix D: Ashley Catchment



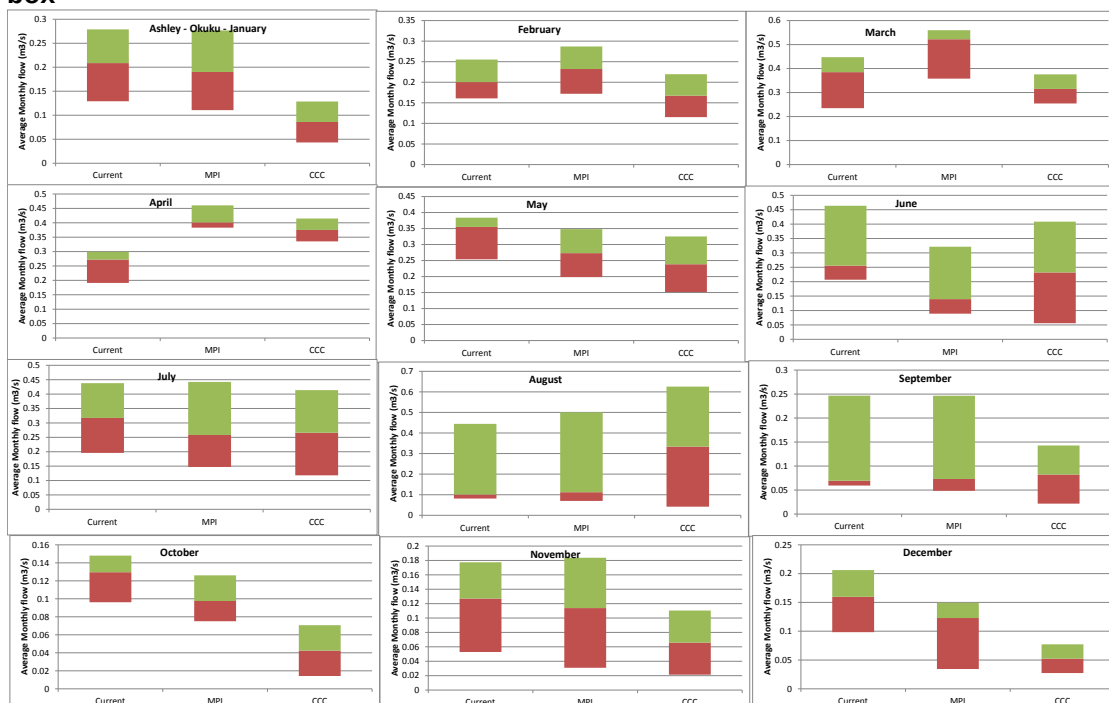
Appendix D1 - Ashley at Okuku



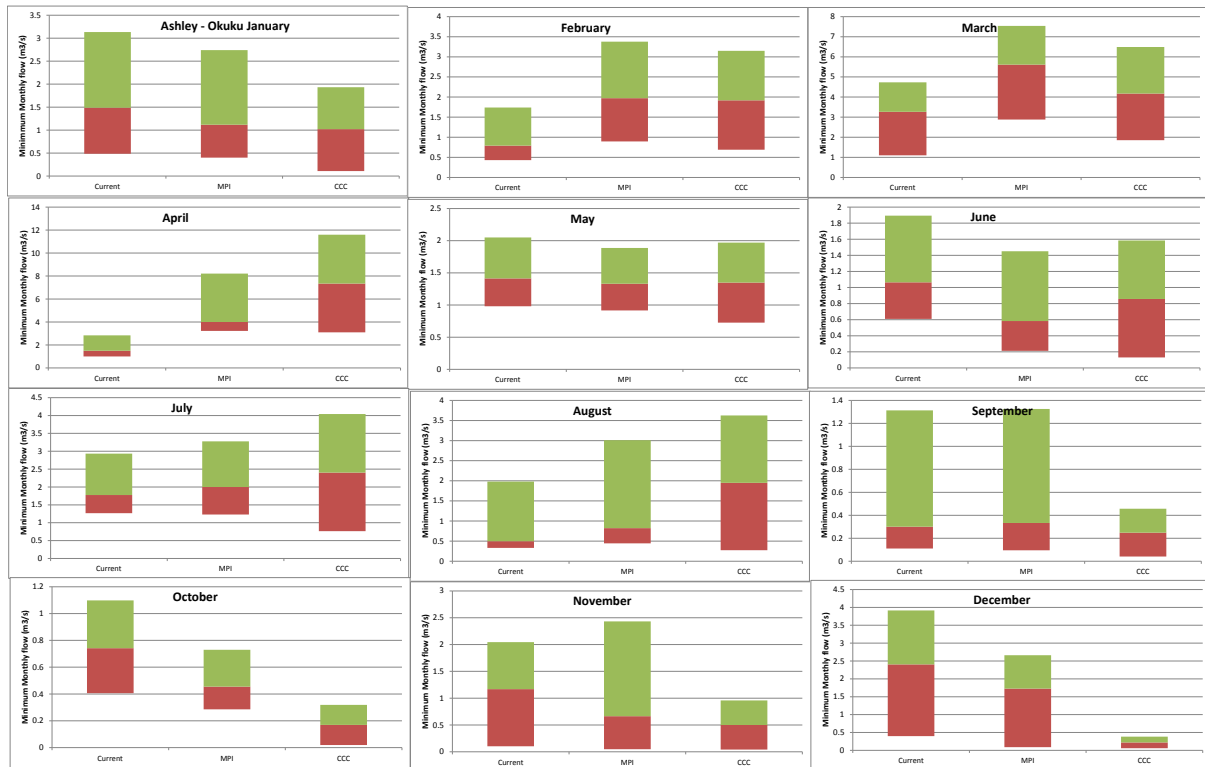
Box plot of climate change impact for the maximum annual flow and annual flow for the Ashley catchment at Okuku for the current time period 1997-2011 (Current), for the nominal time period of 2085-2099 using MPI model; and for the nominal time period of 2085-2099 using CCC model. The median annual flow is at the green/brown boundary, the 75th percentile of annual flow is at the top of the green box, and the 25th percentile is at the bottom of the brown



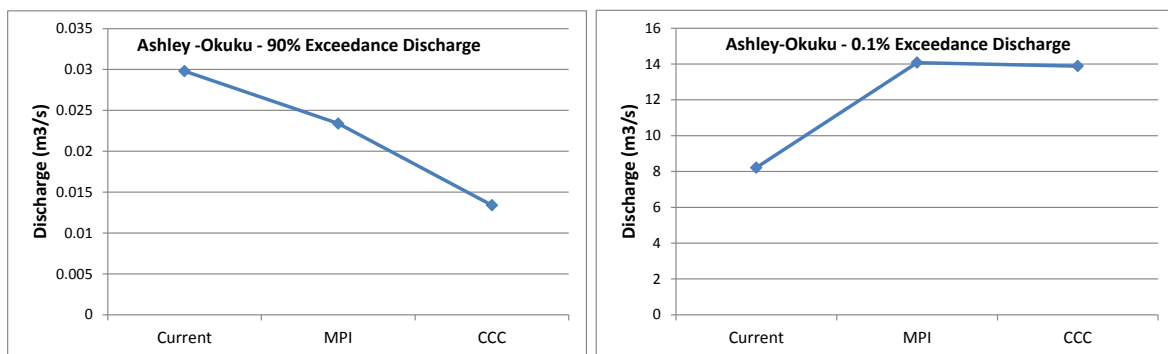
Box plot of climate change impact for the monthly minimum flow for the Ashley catchment at Okuku for the current time period 1997-2011 (Current), for the nominal time period of 2085-2099 using MPI model; and for the nominal time period of 2085-2099 using CCC model. The median minimum annual flow is at the green/brown boundary, the 75th percentile of minimum annual flow is at the top of the green box, and the 25th percentile is at the bottom of the brown box



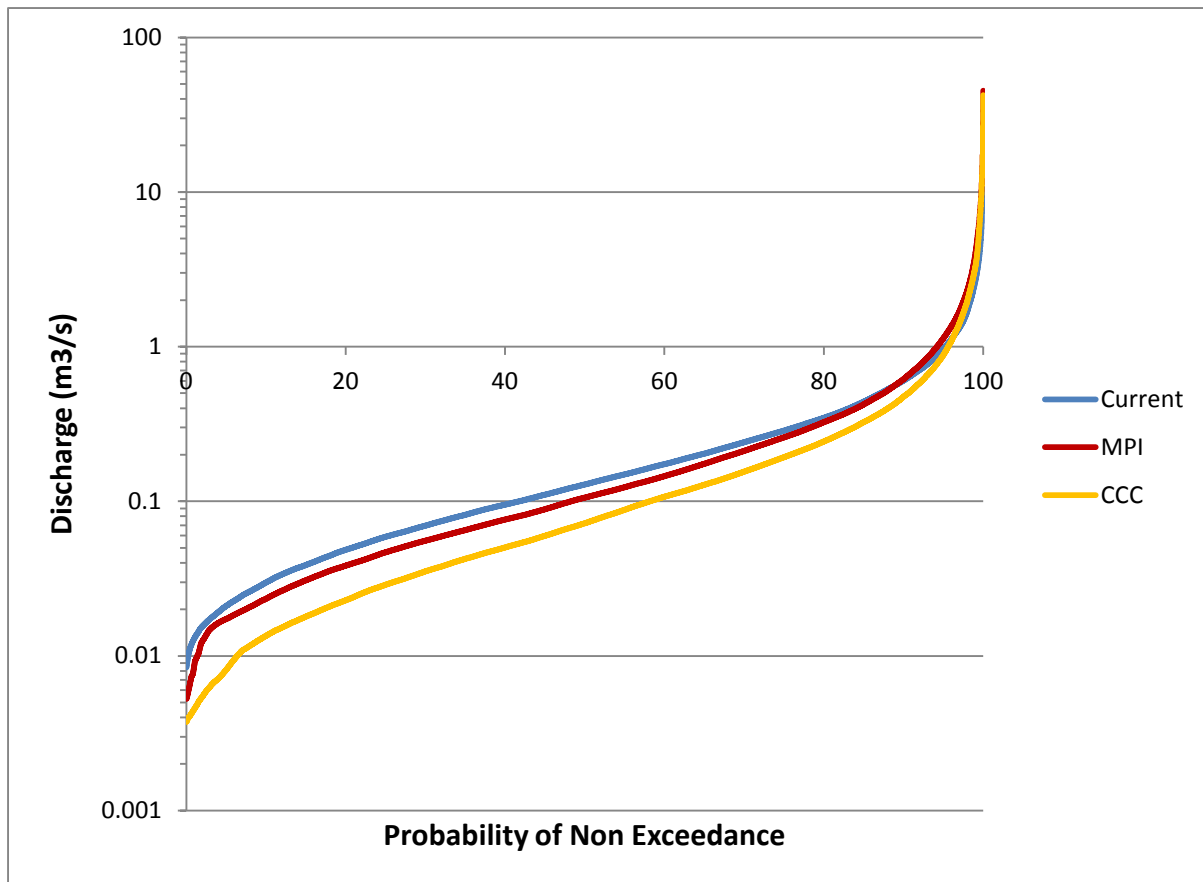
Box plot of climate change impact for the monthly average flow for the Ashley catchment at Okuku for the current time period 1997-2011 (Current), for the nominal time period of 2085-2099 using MPI model; and for the nominal time period of 2085-2099 using CCC model. The median minimum annual flow is at the green/brown boundary, the 75th percentile of minimum annual flow is at the top of the green box, and the 25th percentile is at the bottom of the brown box



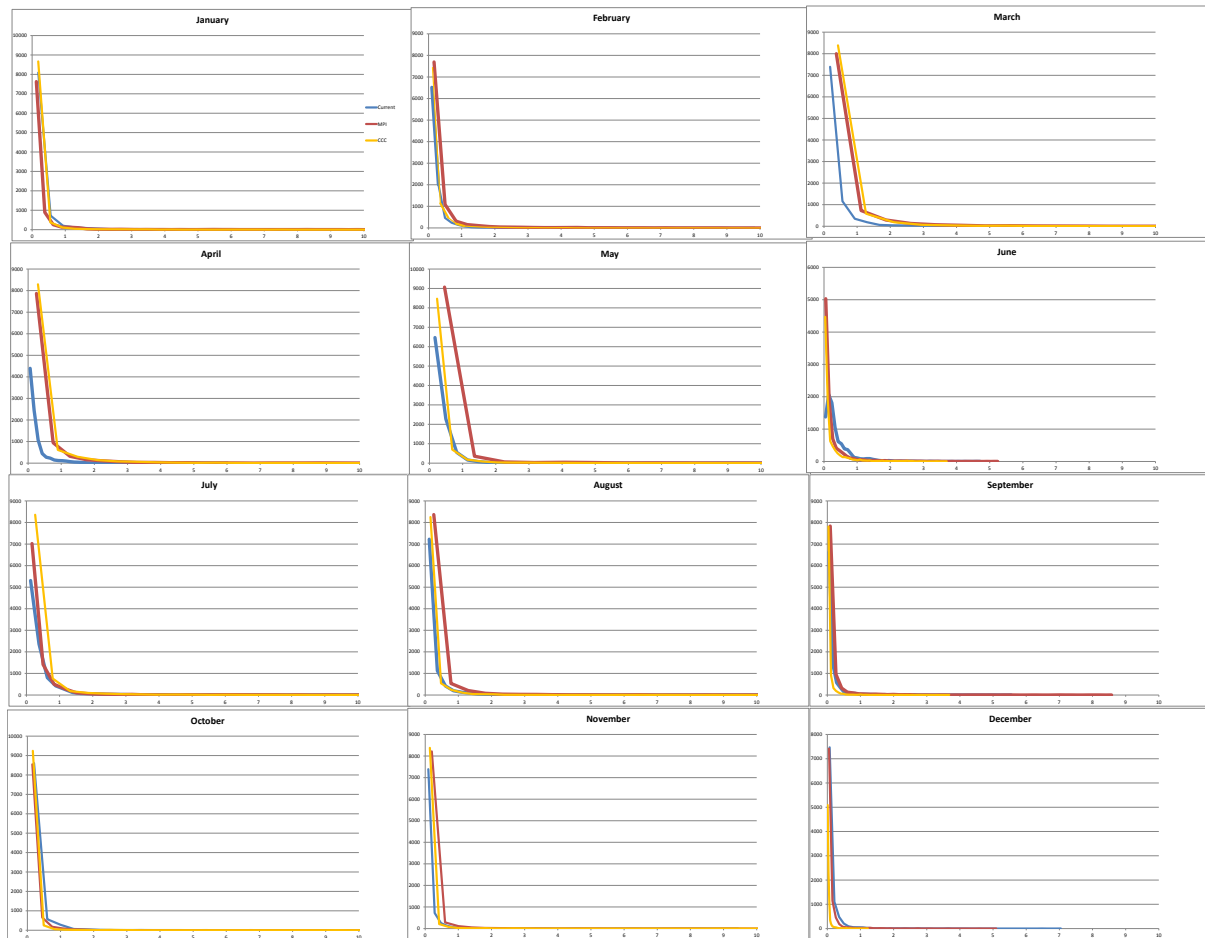
Box plot of climate change impact for the monthly maximum flow for the Ashley catchment at Okuku for the current time period 1997-2011 (Current), for the nominal time period of 2085-2099 using MPI model; and for the nominal time period of 2085-2099 using CCC model. The median minimum annual flow is at the green/brown boundary, the 75th percentile of minimum annual flow is at the top of the green box, and the 25th percentile is at the bottom of the brown box



Climate change impact on low flow and high flows for the Ashley catchment at Okuku for the current time period 1997-2011 (Current), for the nominal time period of 2085-2099 using MPI model; and for the nominal time period of 2085-2099 using CCC model.

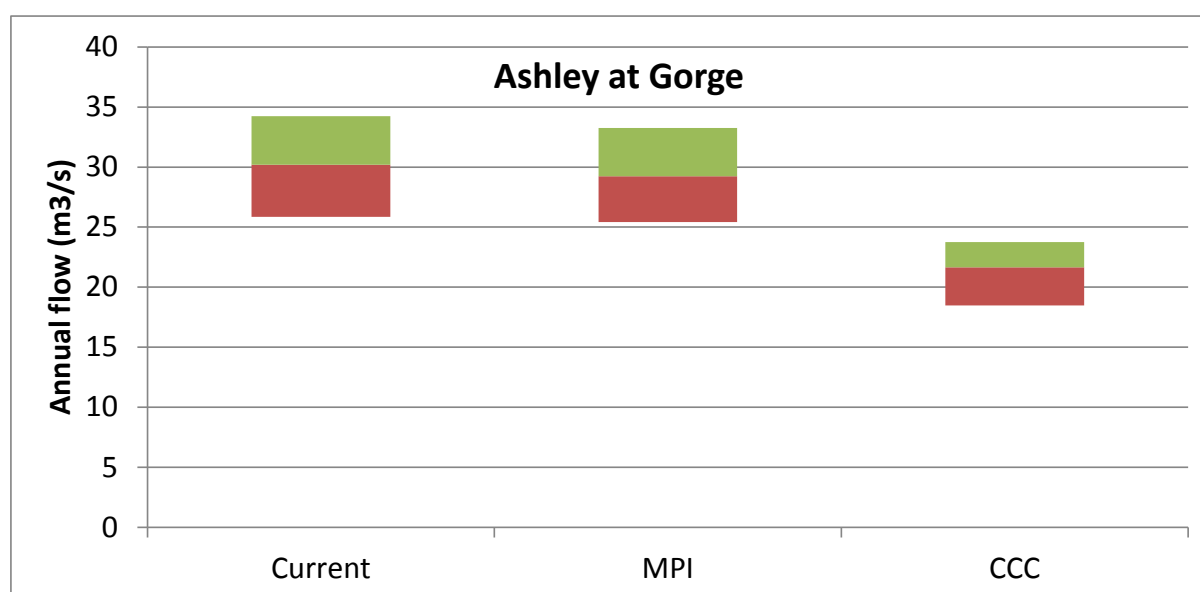
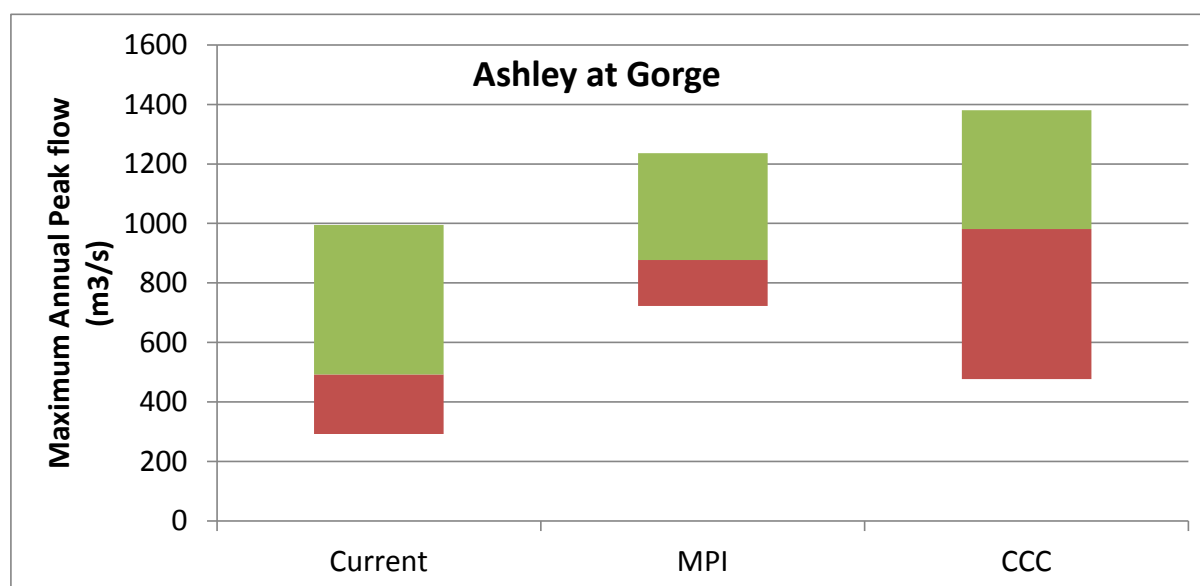


Climatic change impact on simulated hourly flow duration curve for the Ashley catchment at Okuku for the current time period 1997-2011 (Current), for the nominal time period of 2085-2099 using MPI model; and for the nominal time period of 2085-2099 using CCC model.

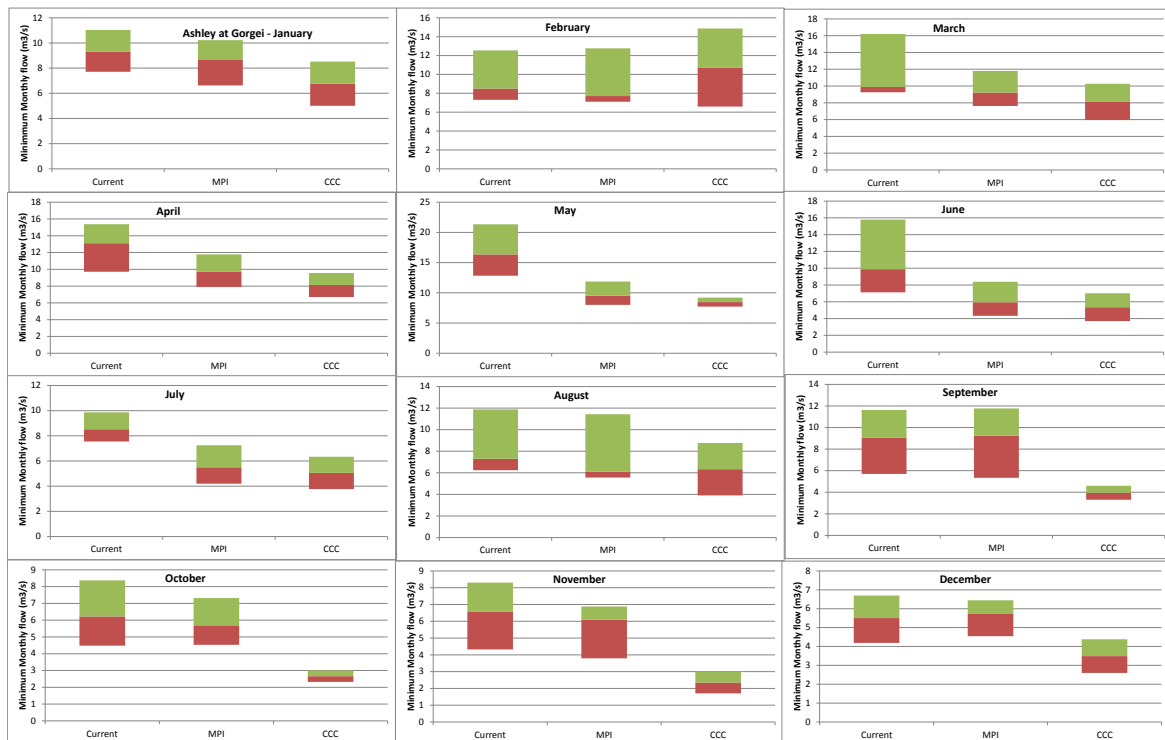


Climate change impact on monthly flow distribution for the Ashley catchment at Okuku for the current time period 1997-2011 (Current), for the nominal time period of 2085-2099 using MPI model (MPI); and for the nominal time period of 2085-2099 using CCC model (CCC). The Y axis represents the occurrence of discharge, while the X axis represents the hourly discharge. For sake of visibility simulated hourly discharge over 10 m³/s were truncated Frequency distribution monthly flow

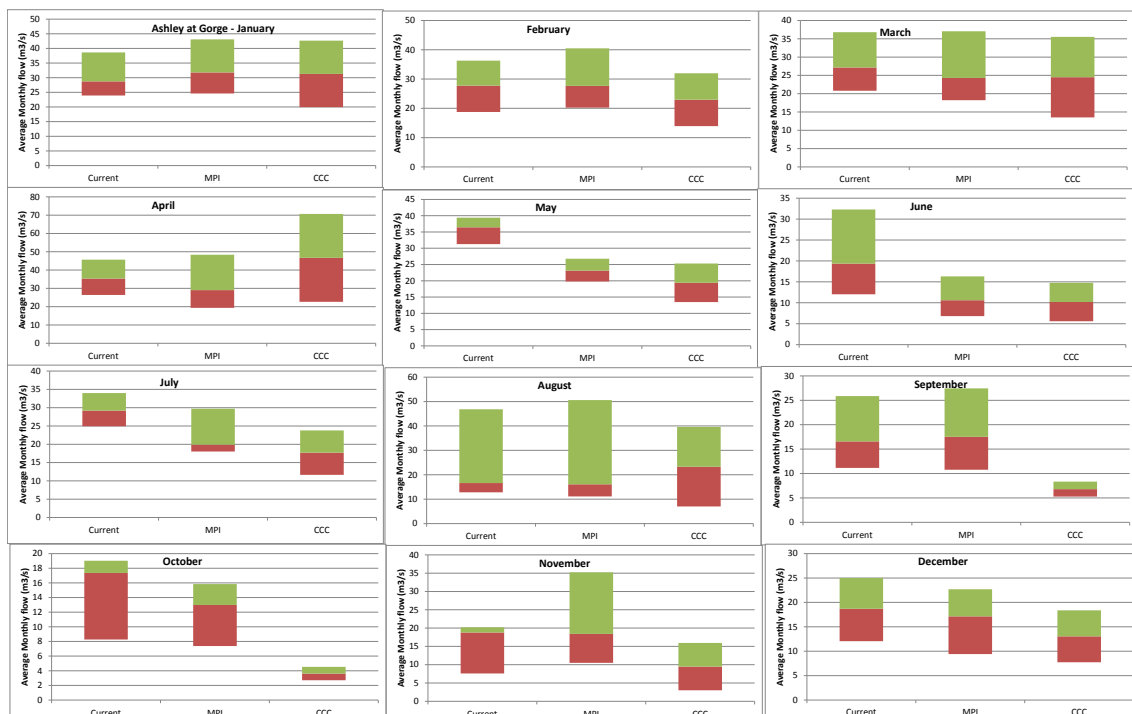
Appendix D2 - Ashley at Gorge



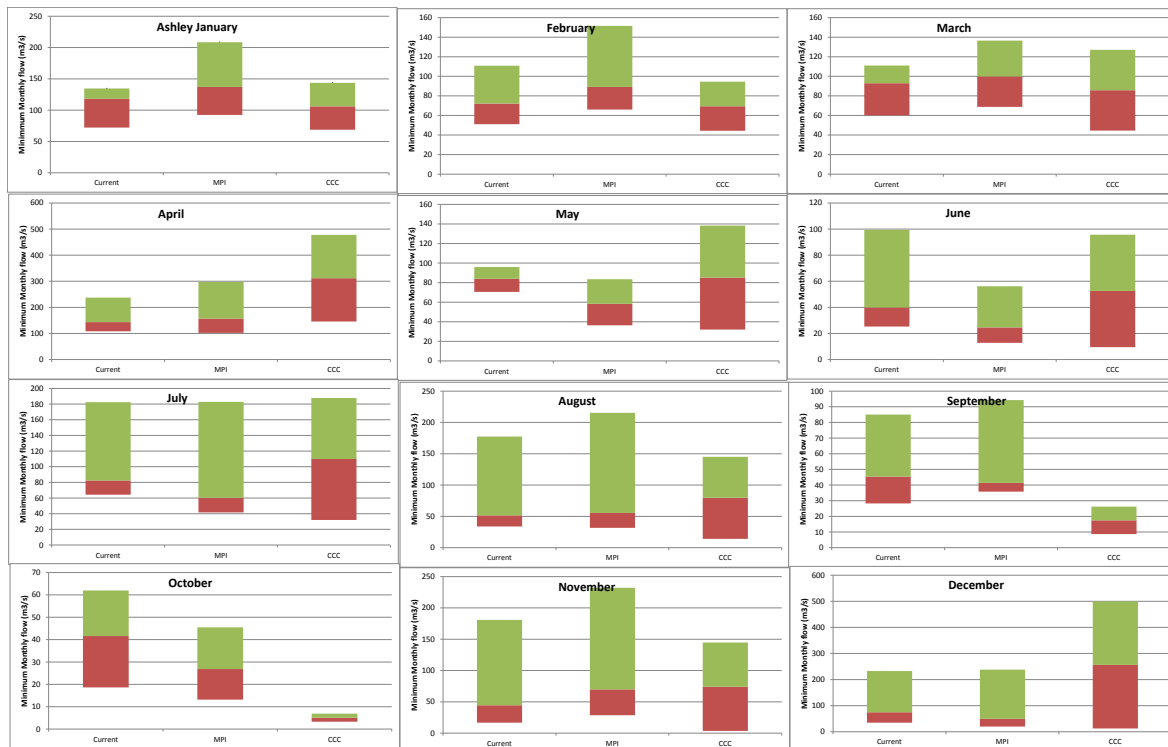
Box plot of climate change impact for the maximum annual flow and annual flow for the Ashley catchment at Gorge for the current time period 1997-2011 (Current), for the nominal time period of 2085-2099 using MPI model; and for the nominal time period of 2085-2099 using CCC model. The median annual flow is at the green/brown boundary, the 75th percentile of annual flow is at the top of the green box, and the 25th percentile is at the bottom of the brown box



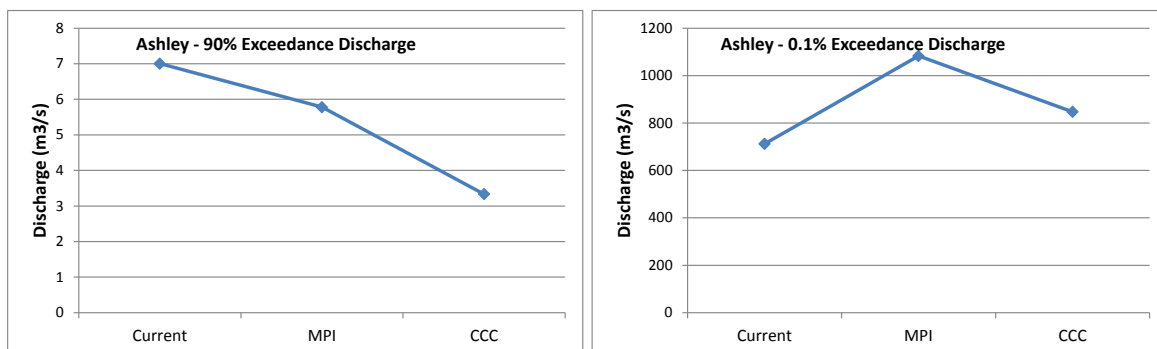
Box plot of climate change impact for the monthly minimum flow for the Ashley catchment at Gorge for the current time period 1997-2011 (Current), for the nominal time period of 2085-2099 using MPI model; and for the nominal time period of 2085-2099 using CCC model. The median minimum annual flow is at the green/brown boundary, the 75th percentile of minimum annual flow is at the top of the green box, and the 25th percentile is at the bottom of the brown box



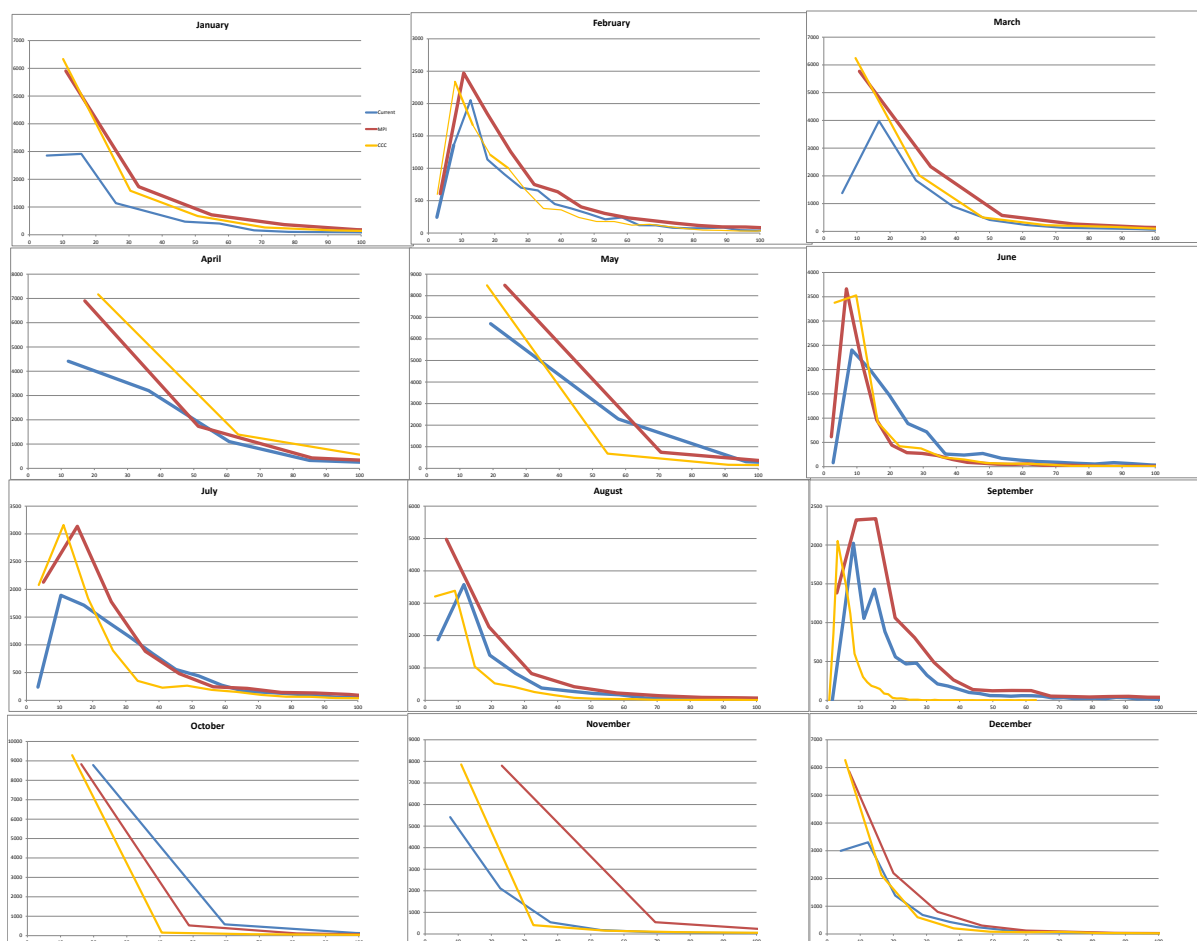
Box plot of climate change impact for the monthly flow for the Ashley catchment at Gorge for the current time period 1997-2011 (Current), for the nominal time period of 2085-2099 using MPI model; and for the nominal time period of 2085-2099 using CCC model. The median minimum annual flow is at the green/brown boundary, the 75th percentile of minimum annual flow is at the top of the green box, and the 25th percentile is at the bottom of the brown box



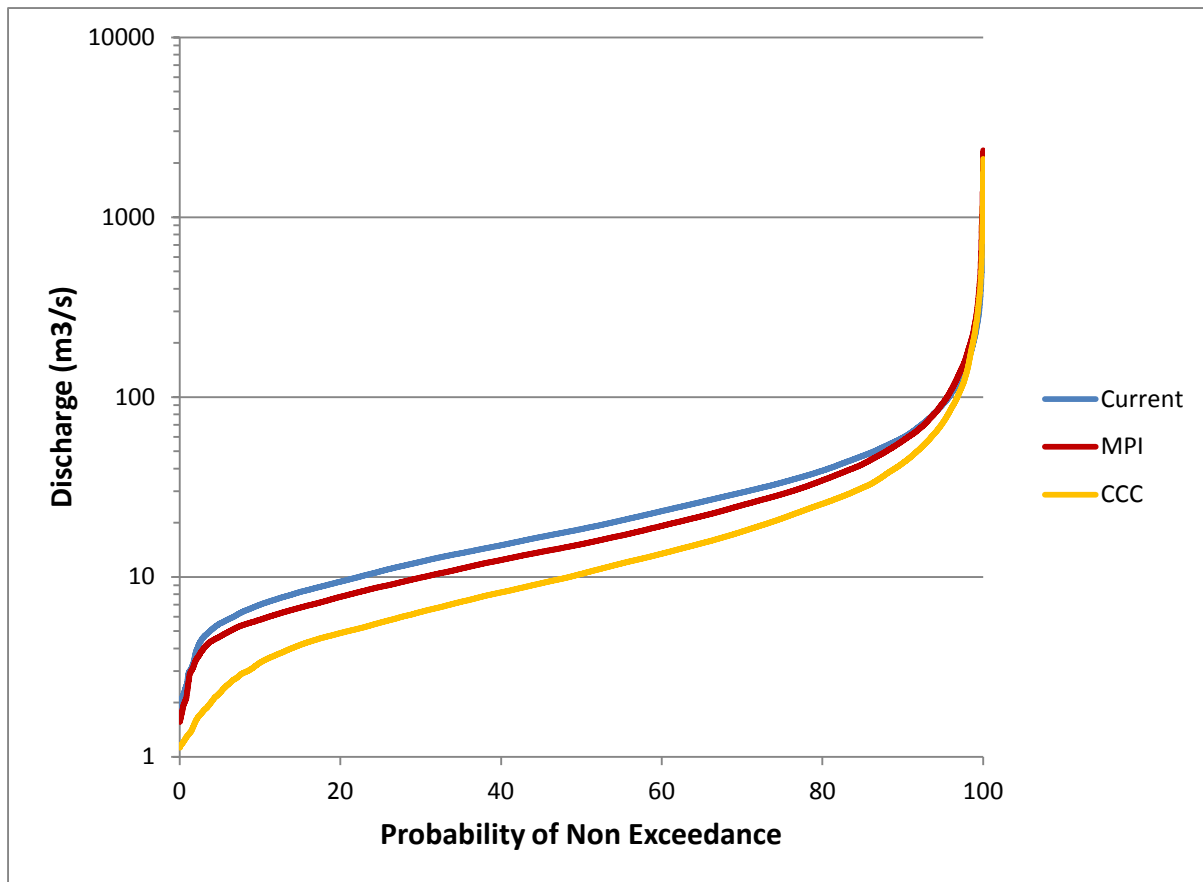
Box plot of climate change impact for the monthly flow for the Ashley catchment at Gorge for the current time period 1997-2011 (Current), for the nominal time period of 2085-2099 using MPI model; and for the nominal time period of 2085-2099 using CCC model. The median minimum annual flow is at the green/brown boundary, the 75th percentile of minimum annual flow is at the top of the green box, and the 25th percentile is at the bottom of the brown box



Climate change impact on low flow and high flows for the Ashley catchment at Gorge for the current time period 1997-2011 (Current), for the nominal time period of 2085-2099 using MPI model; and for the nominal time period of 2085-2099 using CCC model.



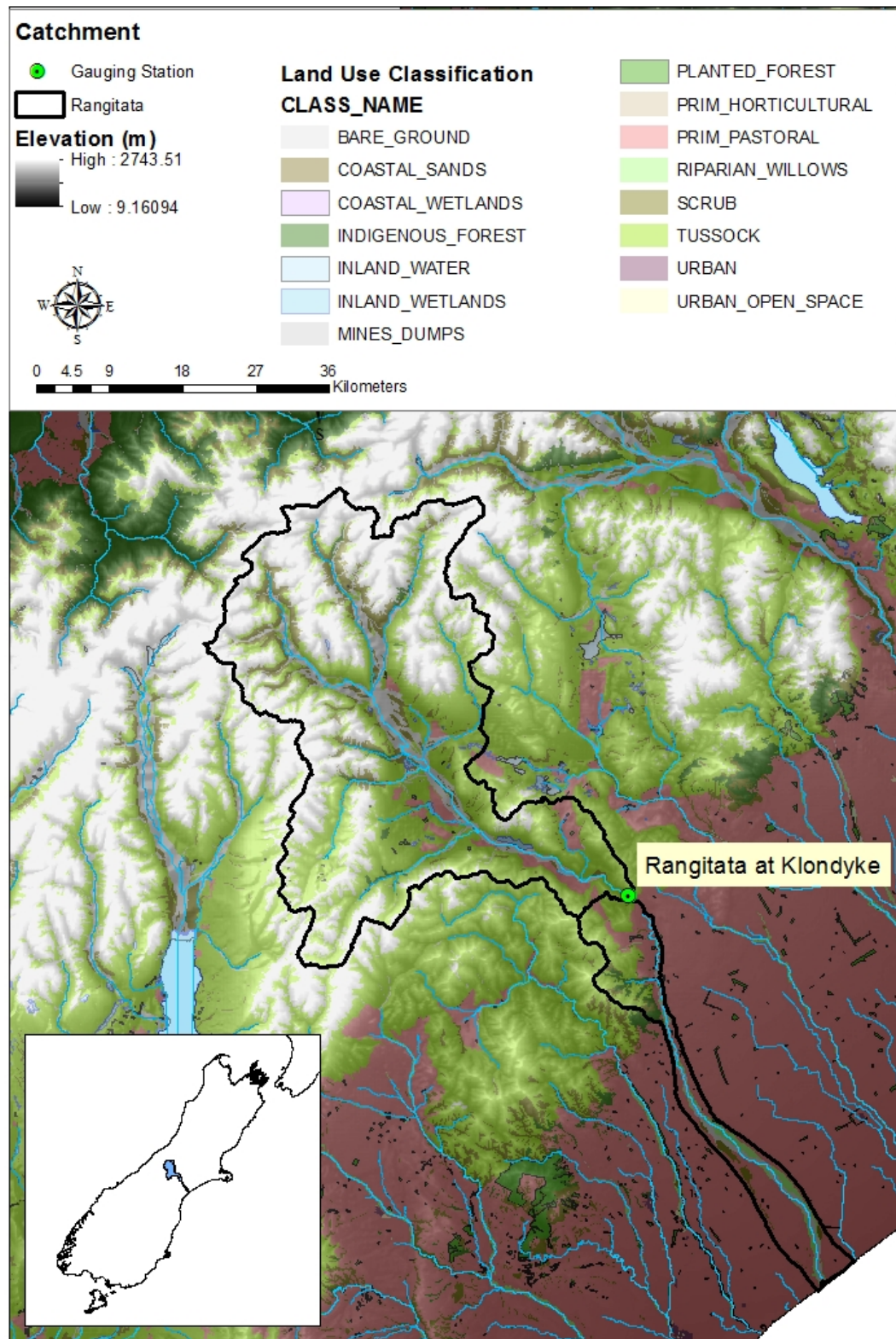
Climate change impact on monthly flow distribution for the Ashley catchment at Gorge for the current time period 1997-2011 (Current), for the nominal time period of 2085-2099 using MPI model (MPI); and for the nominal time period of 2085-2099 using CCC model (CCC). The Y axis represents the occurrence of discharge, while the X axis represents the hourly discharge. For sake of visibility simulated hourly discharge over 100 m³/s were truncated

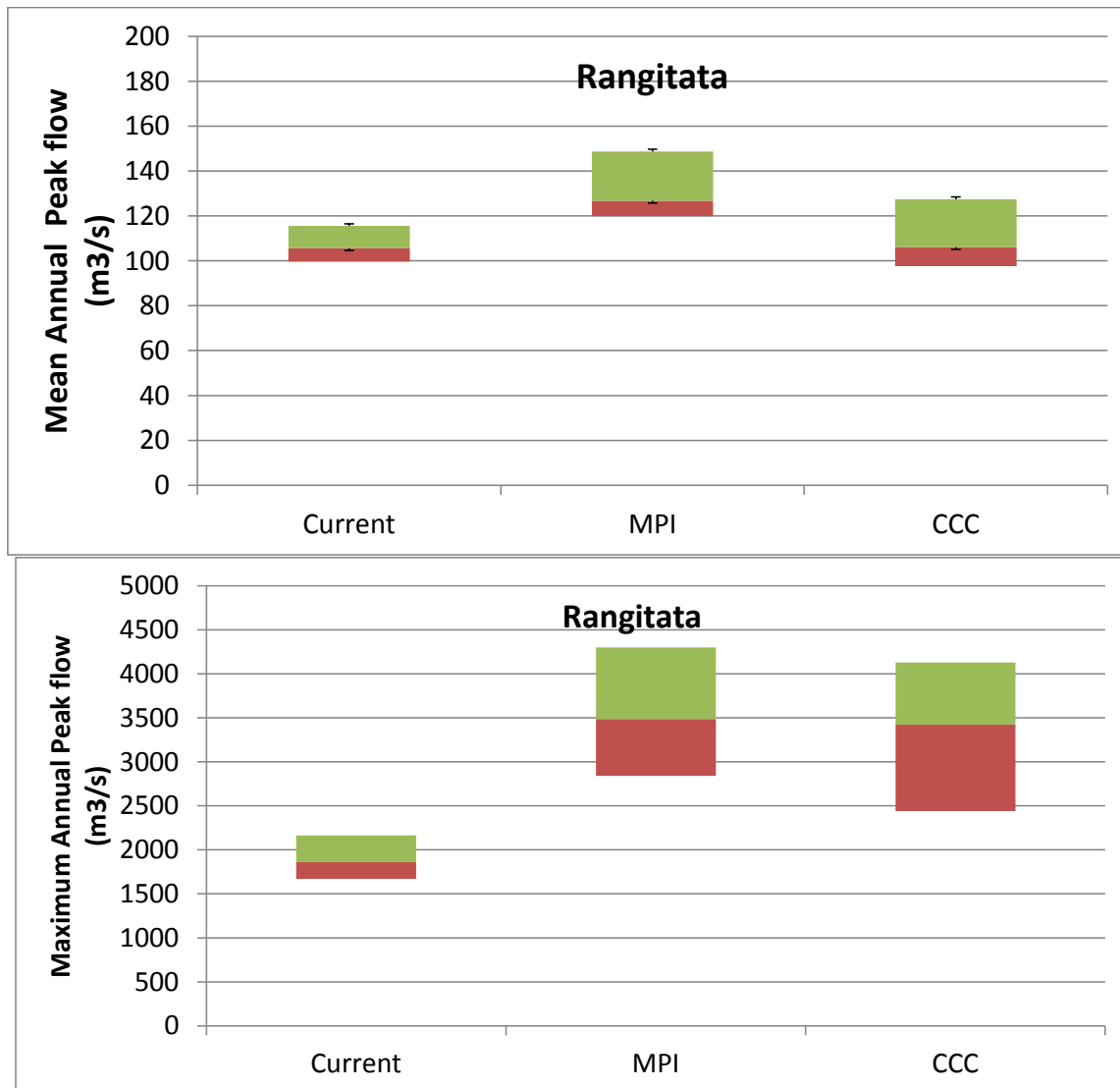


Climatic change impact on simulated hourly flow duration curve for the Ashley catchment at Gorge for the current time period 1997-2011 (Current), for the nominal time period of 2085-2099 using MPI model; and for the nominal time period of 2085-2099 using CCC model.

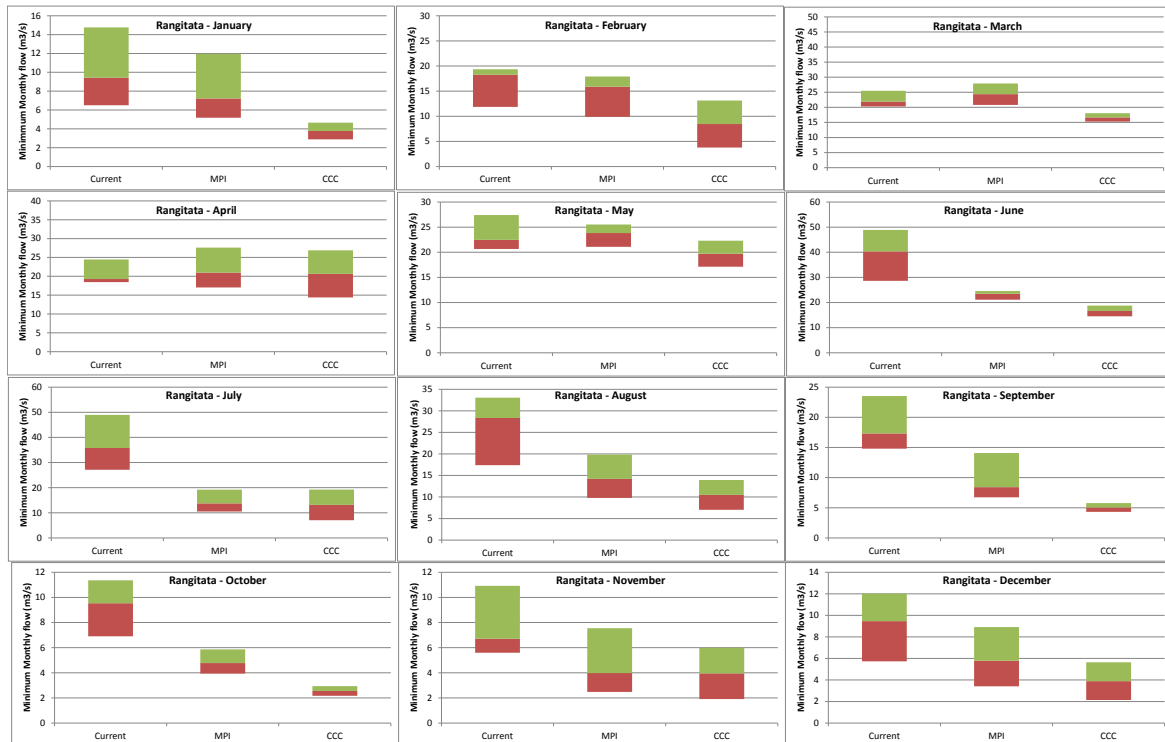
Appendix E : Rangitata Catchment

Location

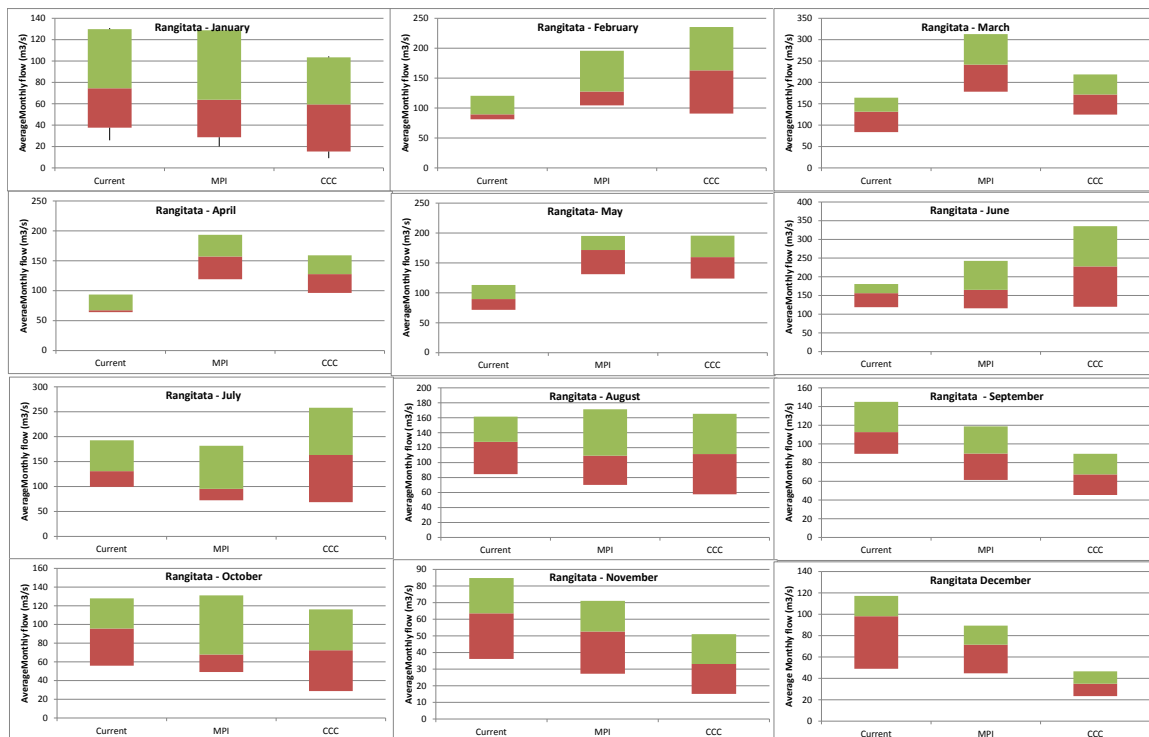




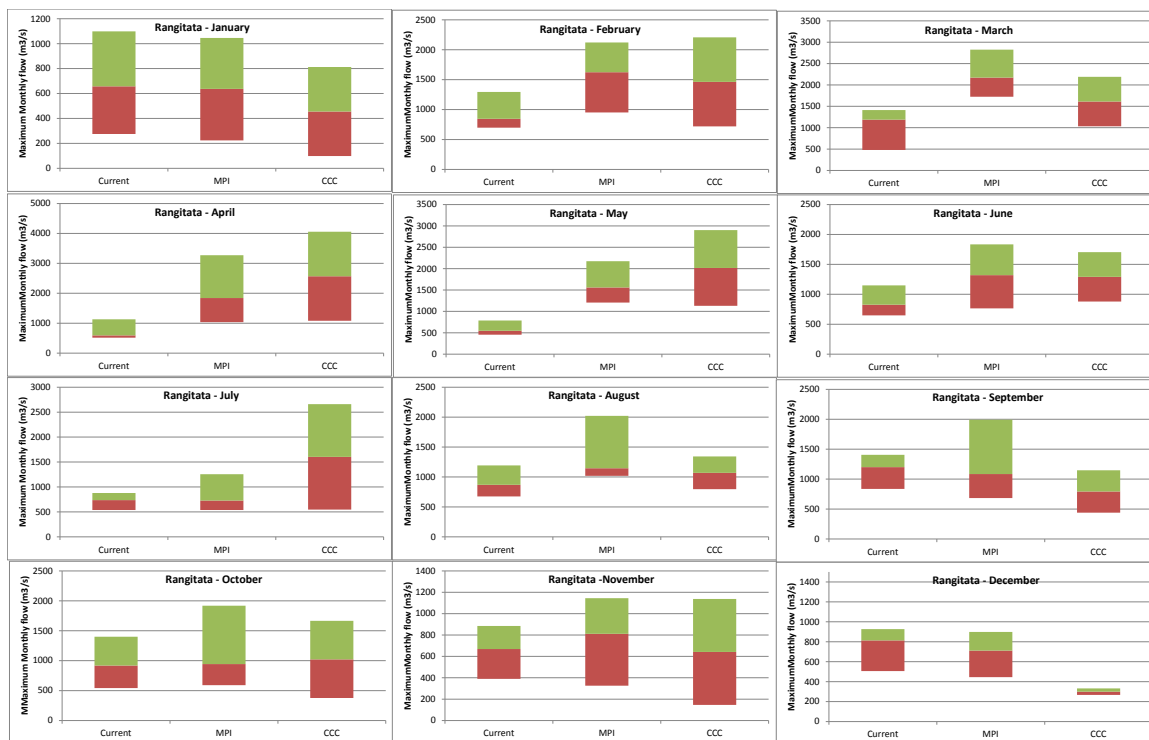
Box plot of climate change impact for the maximum annual flow and annual flow for the Rangitata catchment for the current time period 1997-2011 (Current), for the nominal time period of 2085-2099 using MPI model; and for the nominal time period of 2085-2099 using CCC model. The median annual flow is at the green/brown boundary, the 75th percentile of annual flow is at the top of the green box, and the 25th percentile is at the bottom of the brown box



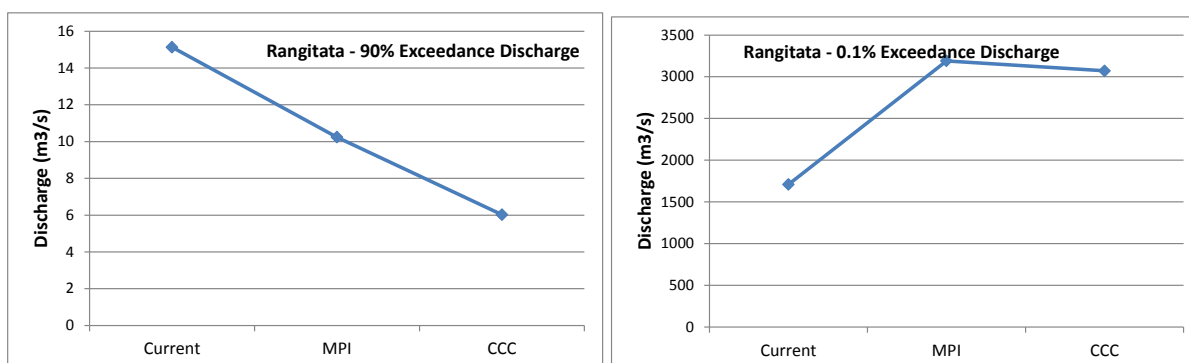
Box plot of climate change impact for the monthly minimum flow for the Rangitatai catchment for the current time period 1997-2011 (Current), for the nominal time period of 2085-2099 using MPI model; and for the nominal time period of 2085-2099 using CCC model. The median minimum annual flow is at the green/brown boundary, the 75th percentile of minimum annual flow is at the top of the green box, and the 25th percentile is at the bottom of the brown box



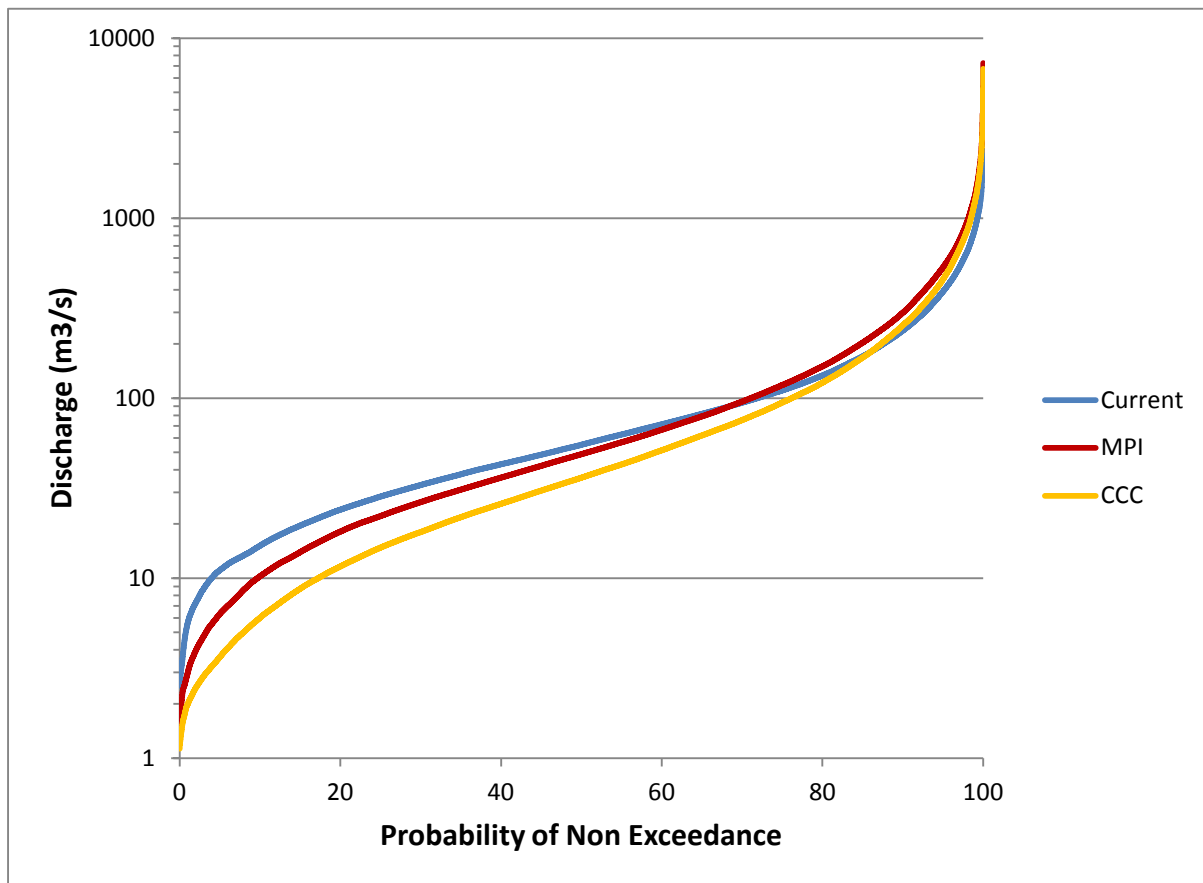
Box plot of climate change impact for the average monthly flow for the Rangitatai catchment for the current time period 1997-2011 (Current), for the nominal time period of 2085-2099 using MPI model; and for the nominal time period of 2085-2099 using CCC model. The median minimum annual flow is at the green/brown boundary, the 75th percentile of minimum annual flow is at the top of the green box, and the 25th percentile is at the bottom of the brown box



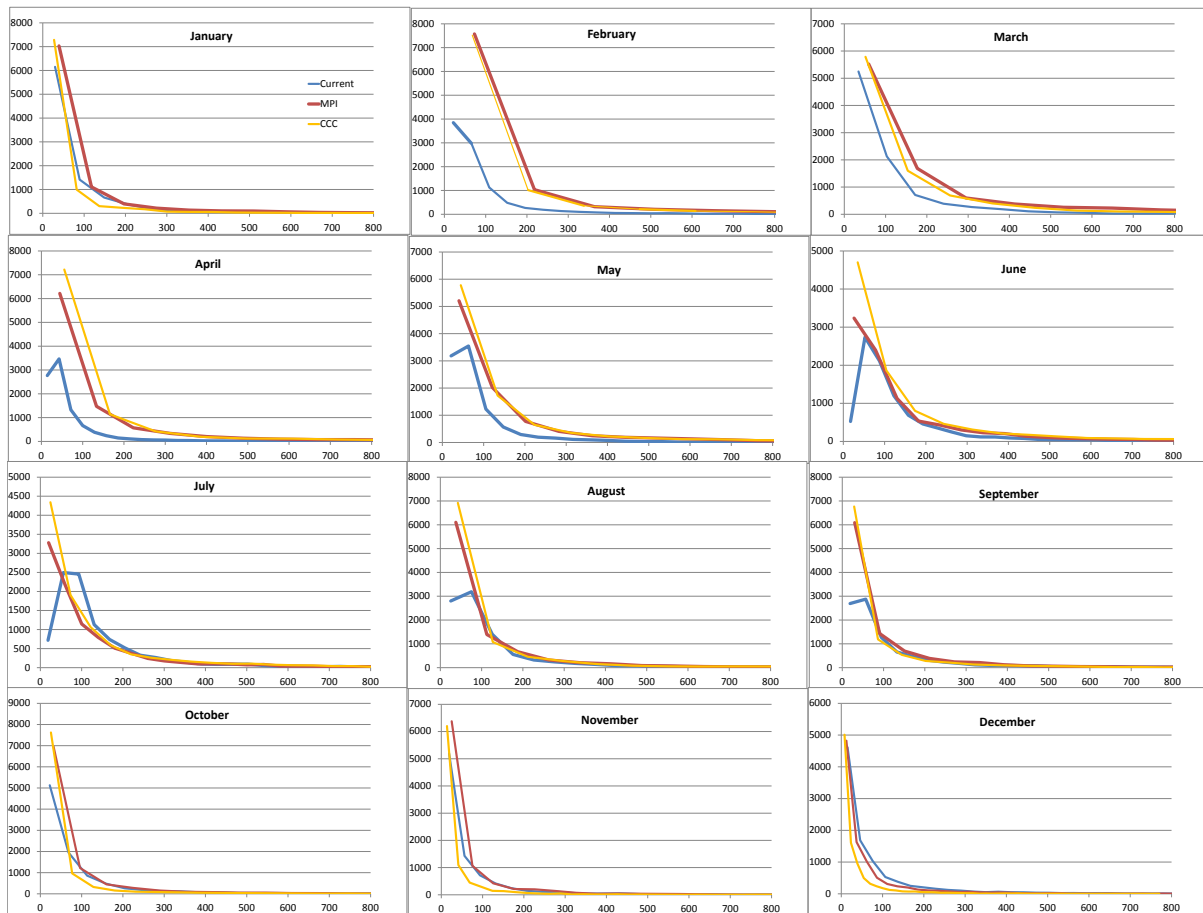
Box plot of climate change impact for the monthly maximal flow for the Rangitata catchment for the current time period 1997-2011 (Current), for the nominal time period of 2085-2099 using MPI model; and for the nominal time period of 2085-2099 using CCC model. The median minimum annual flow is at the green/brown boundary, the 75th percentile of minimum annual flow is at the top of the green box, and the 25th percentile is at the bottom of the brown box



Climate change impact on low flow and high flows for the Rangitata catchment for the current time period 1997-2011 (Current), for the nominal time period of 2085-2099 using MPI model; and for the nominal time period of 2085-2099 using CCC model.



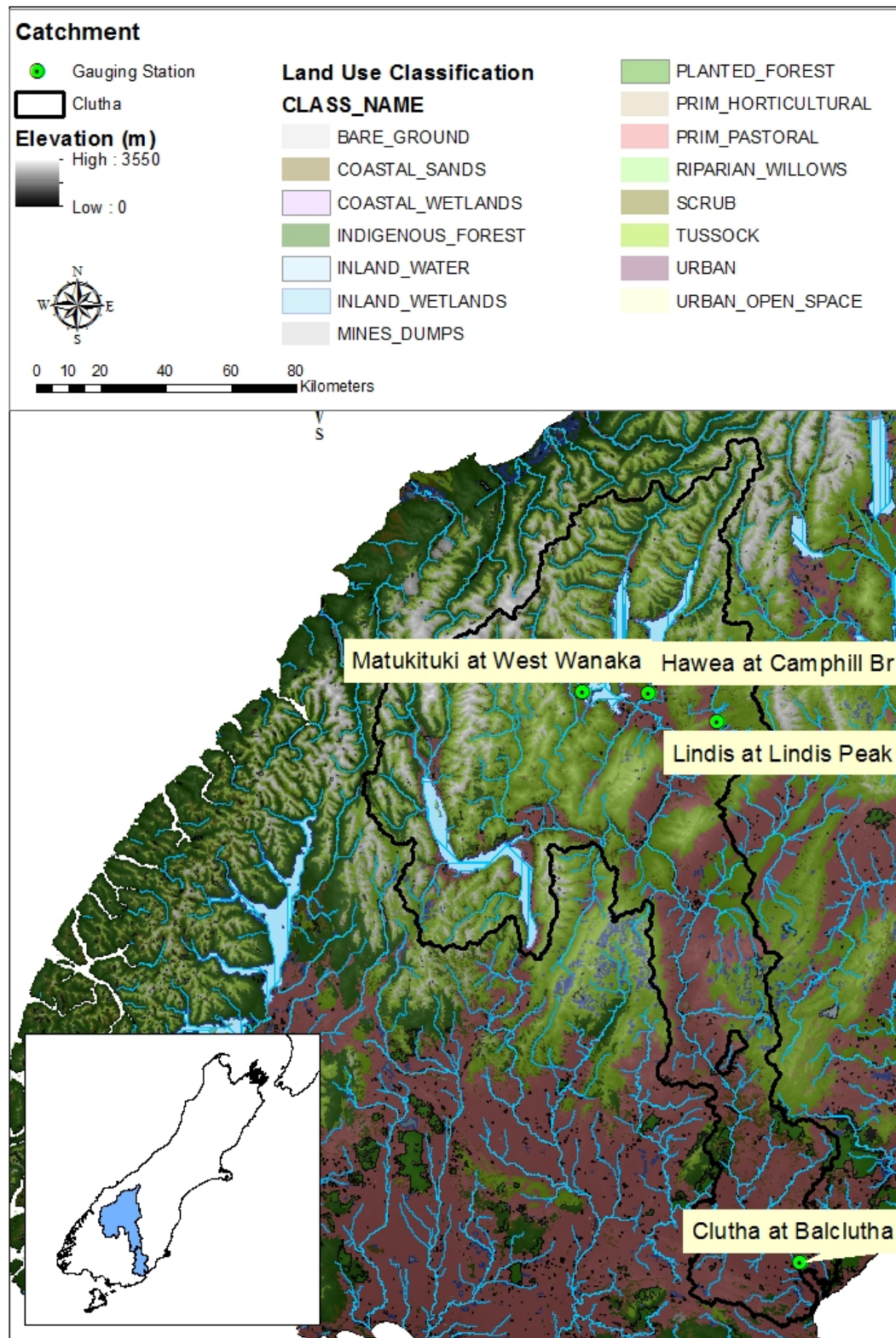
Climate change impact on simulated hourly flow duration curve for the Rangitata catchment for the current time period 1997-2011 (Current), for the nominal time period of 2085-2099 using MPI model; and for the nominal time period of 2085-2099 using CCC model.



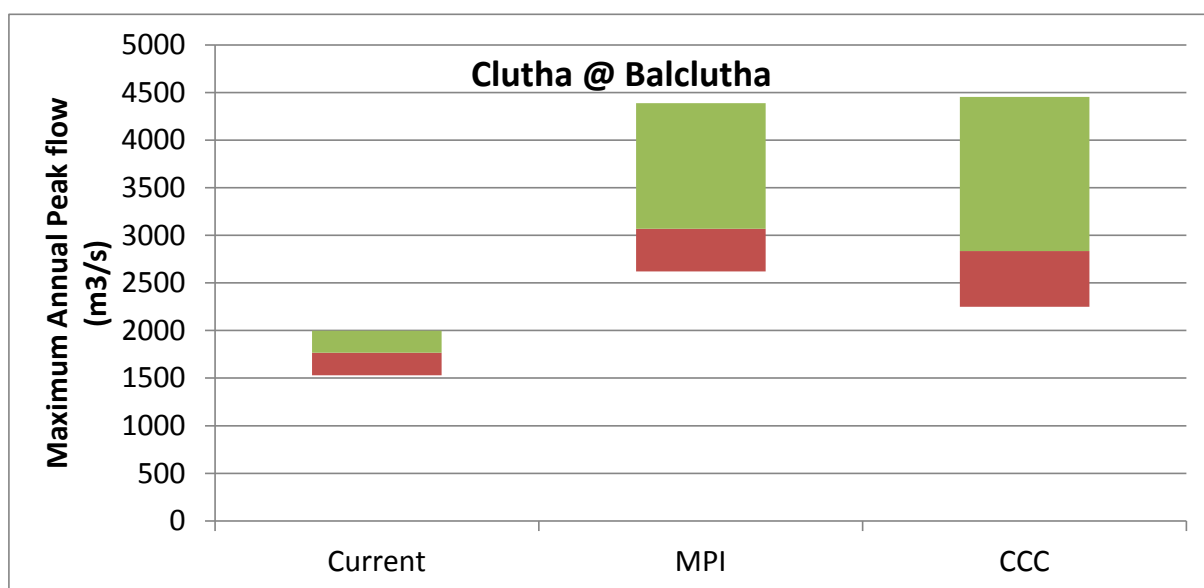
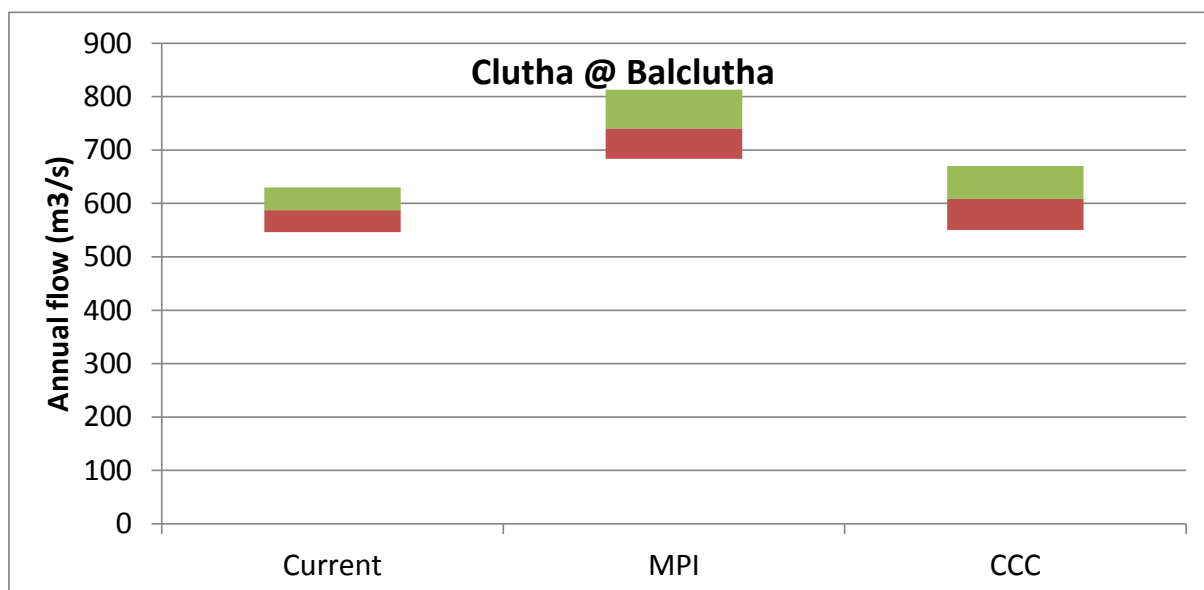
Climate change impact on monthly flow distribution for the Ashley catchment at Gorge for the current time period 1997-2011 (Current), for the nominal time period of 2085-2099 using MPI model (MPI); and for the nominal time period of 2085-2099 using CCC model (CCC). The Y axis represents the occurrence of discharge, while the X axis represents the hourly discharge. For sake of visibility simulated hourly discharge over 800 m³/s were truncated

Appendix F : Clutha Catchment

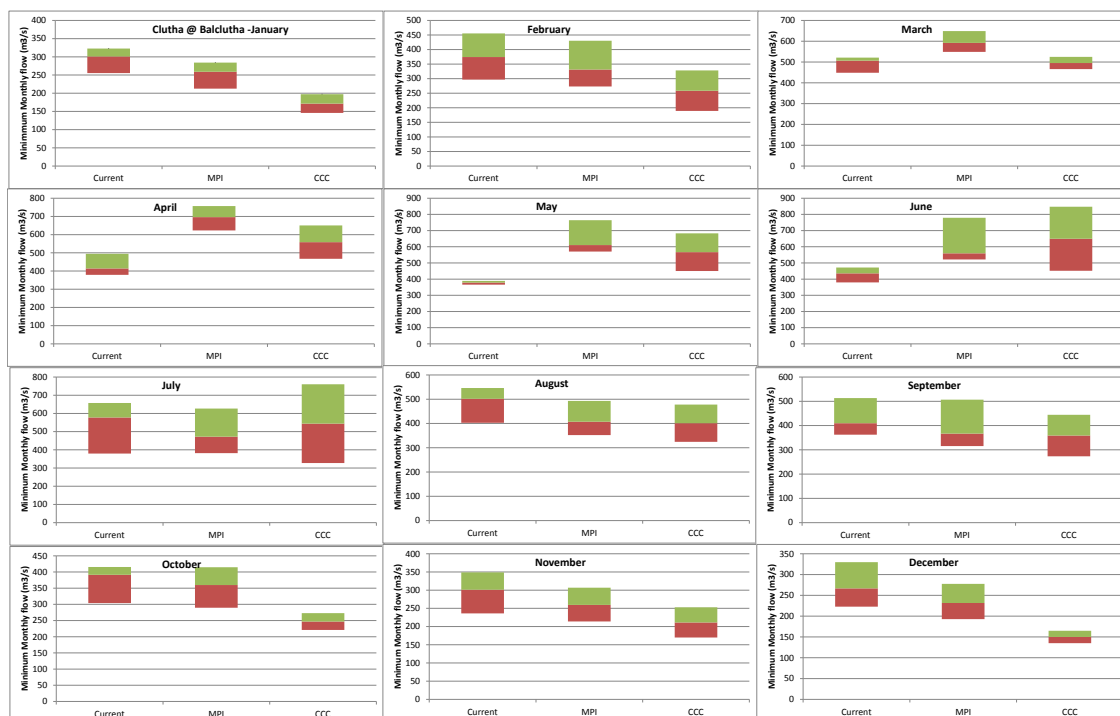
Location



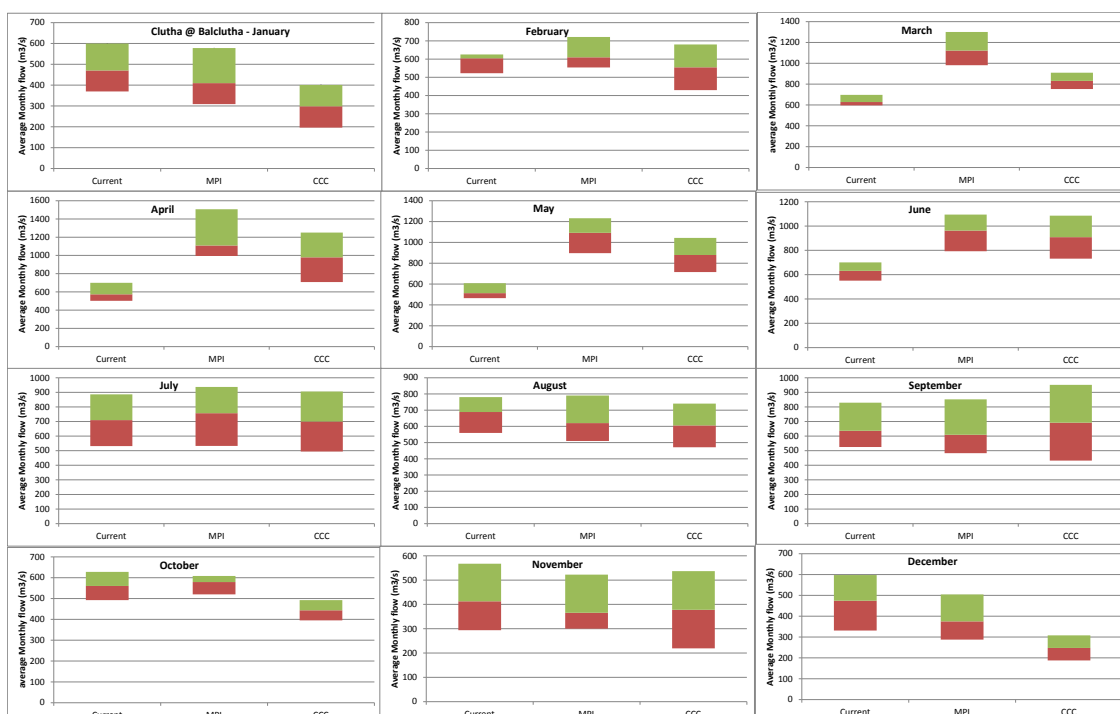
Appendix F1 - Clutha at Balclutha



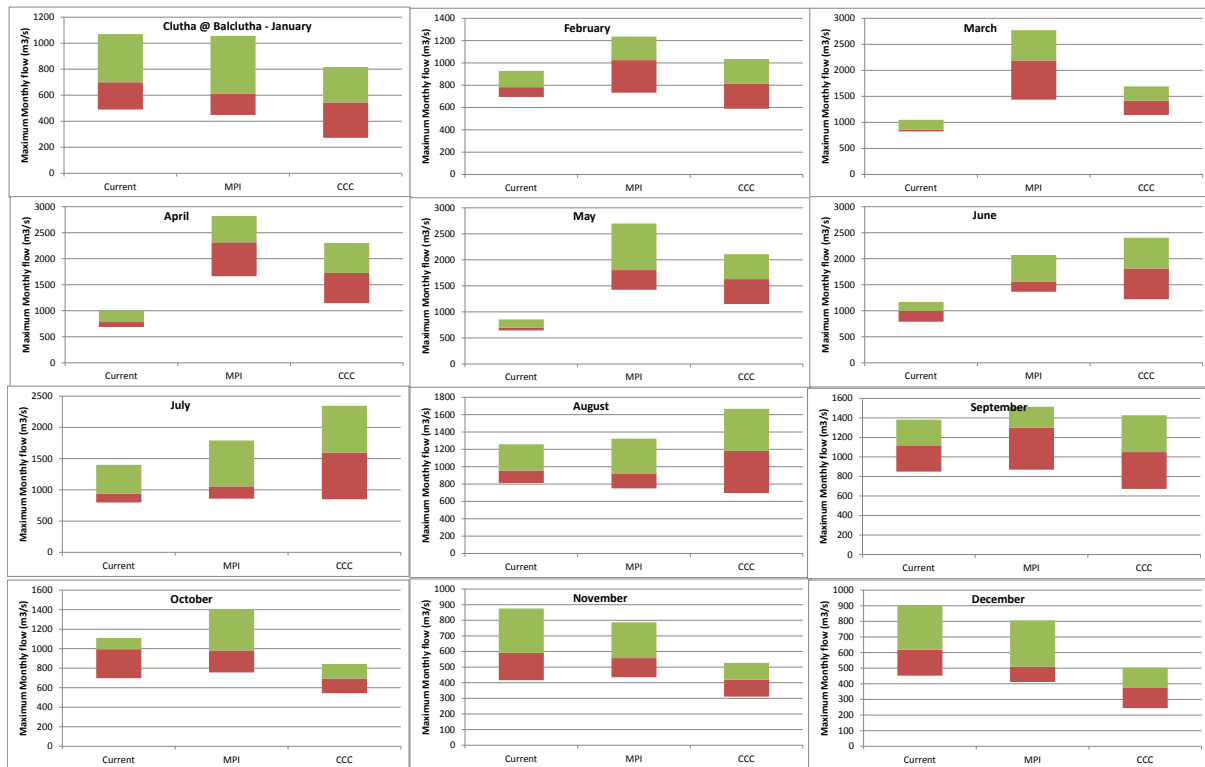
Impact of climate change impact for the maximum annual flow and annual flow for the Clutha catchment at Balclutha for the current time period 1997-2011 (Current), for the nominal time period of 2085-2099 using MPI model; and for the nominal time period of 2085-2099 using CCC model. The median annual flow is at the green/brown boundary, the 75th percentile of annual flow is at the top of the green box, and the 25th percentile is at the bottom of the brown boxMin/Max annual



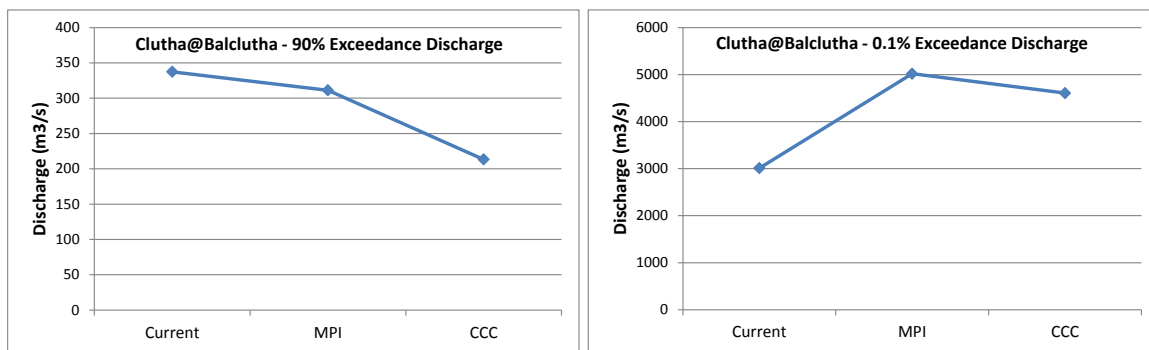
Box plot of climate change impact for the monthly minimum flow for the Clutha catchment at Balclutha for the current time period 1997-2011 (Current), for the nominal time period of 2085-2099 using MPI model; and for the nominal time period of 2085-2099 using CCC model. The median minimum annual flow is at the green/brown boundary, the 75th percentile of minimum annual flow is at the top of the green box, and the 25th percentile is at the bottom of the brown box



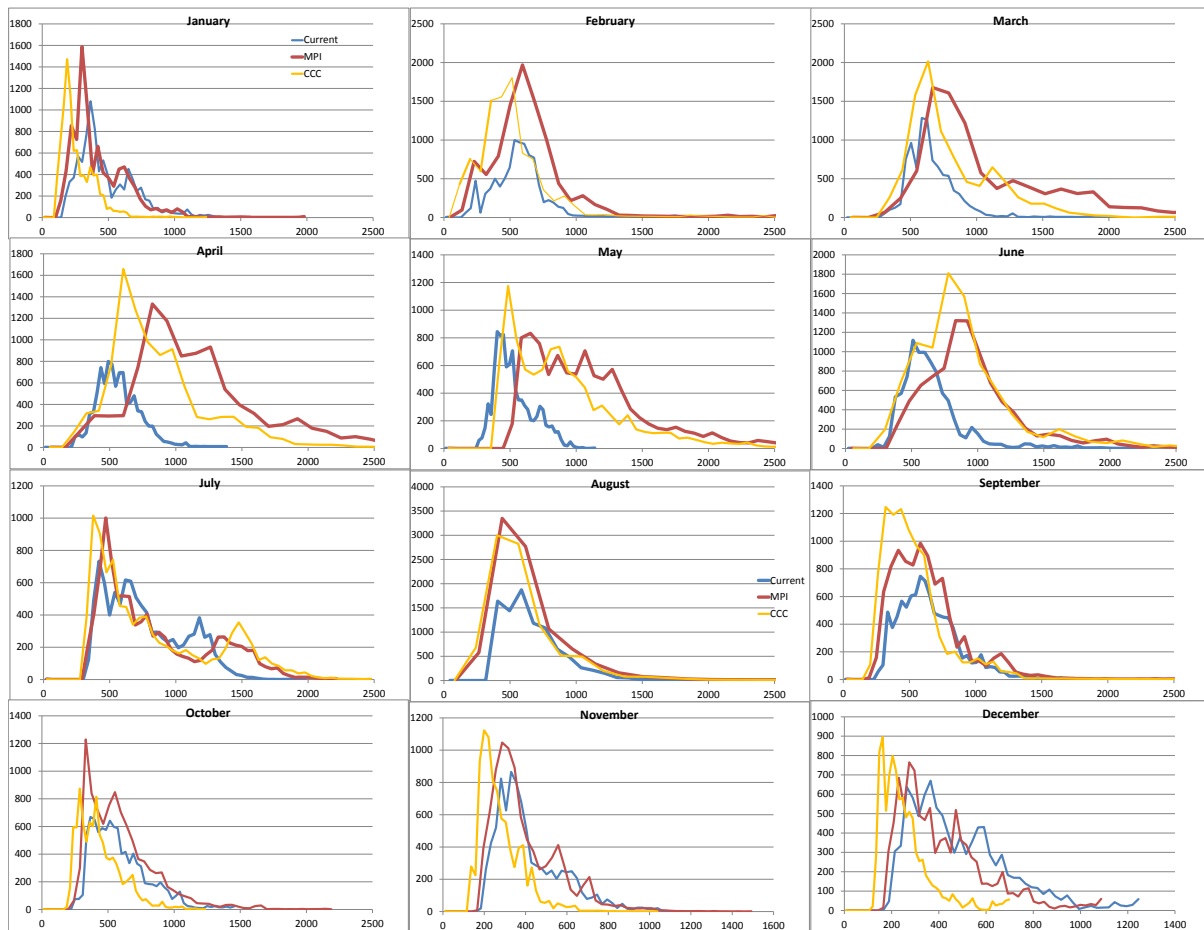
Box plot of climate change impact for the monthly average flow for the Clutha catchment at Balclutha for the current time period 1997-2011 (Current), for the nominal time period of 2085-2099 using MPI model; and for the nominal time period of 2085-2099 using CCC model. The median minimum annual flow is at the green/brown boundary, the 75th percentile of minimum annual flow is at the top of the green box, and the 25th percentile is at the bottom of the brown box



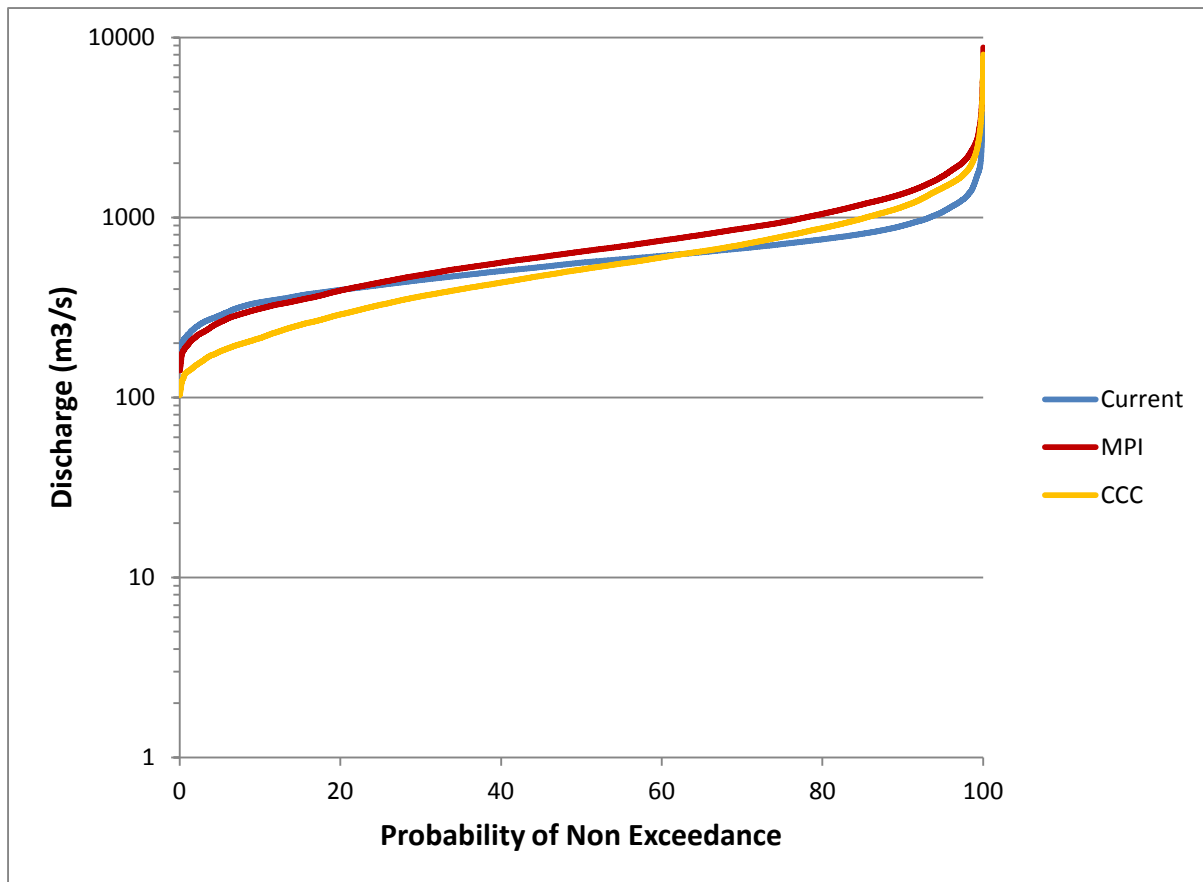
Box plot of climate change impact for the monthly flow for the Clutha catchment at Balclutha for the current time period 1997-2011 (Current), for the nominal time period of 2085-2099 using MPI model; and for the nominal time period of 2085-2099 using CCC model. The median minimum annual flow is at the green/brown boundary, the 75th percentile of minimum annual flow is at the top of the green box, and the 25th percentile is at the bottom of the brown box



Climate change impact on low flow and high flows for the Clutha catchment at Balclutha for the current time period 1997-2011 (Current), for the nominal time period of 2085-2099 using MPI model; and for the nominal time period of 2085-2099 using CCC model.

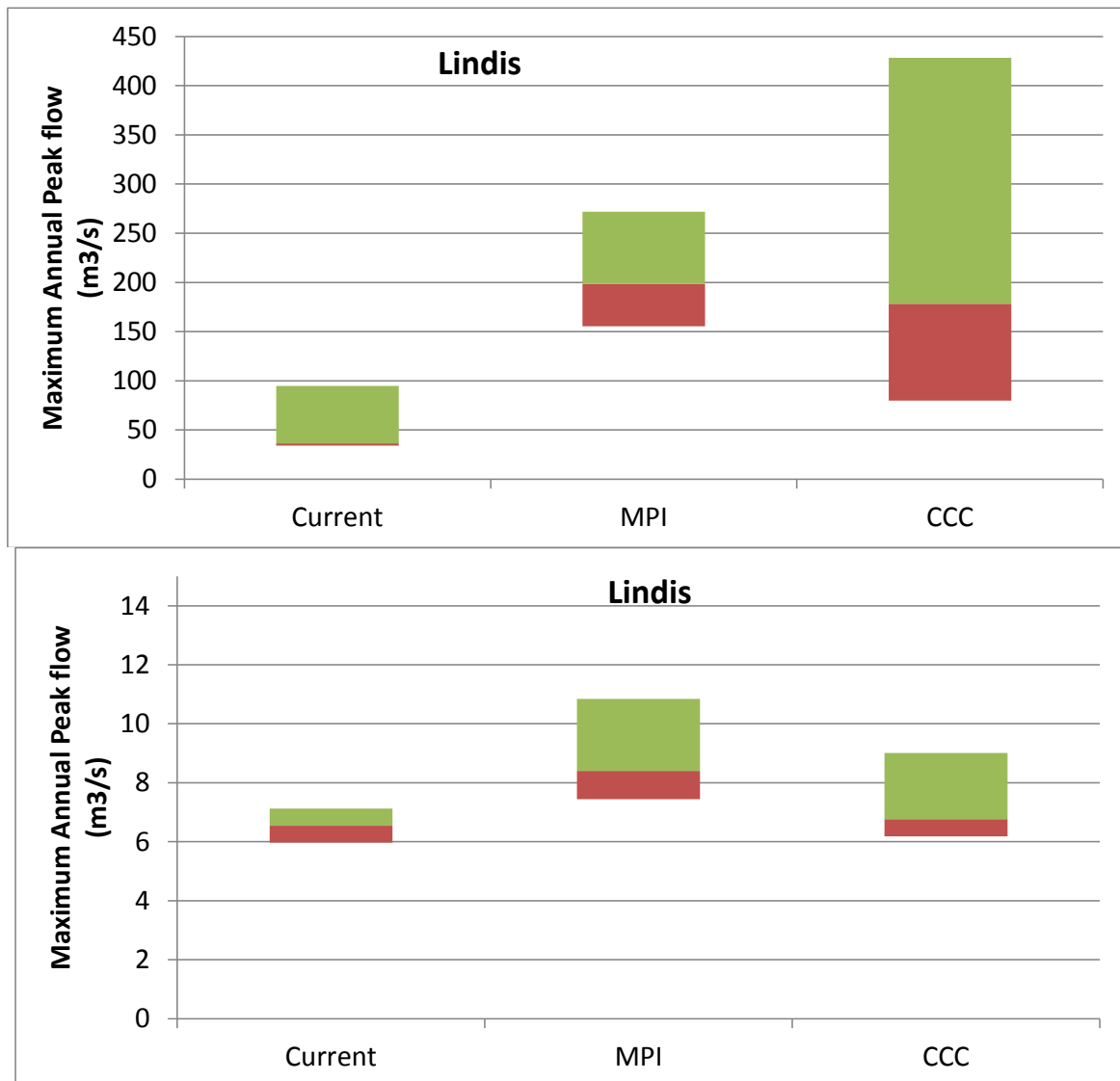


Climate change impact on monthly flow distribution for the Clutha catchment at Balclutha for the current time period 1997-2011 (Current), for the nominal time period of 2085-2099 using MPI model (MPI); and for the nominal time period of 2085-2099 using CCC model (CCC). The Y axis represents the occurrence of discharge, while the X axis represents the hourly discharge. For sake of visibility simulated hourly discharge over 2500 m³/s were truncated

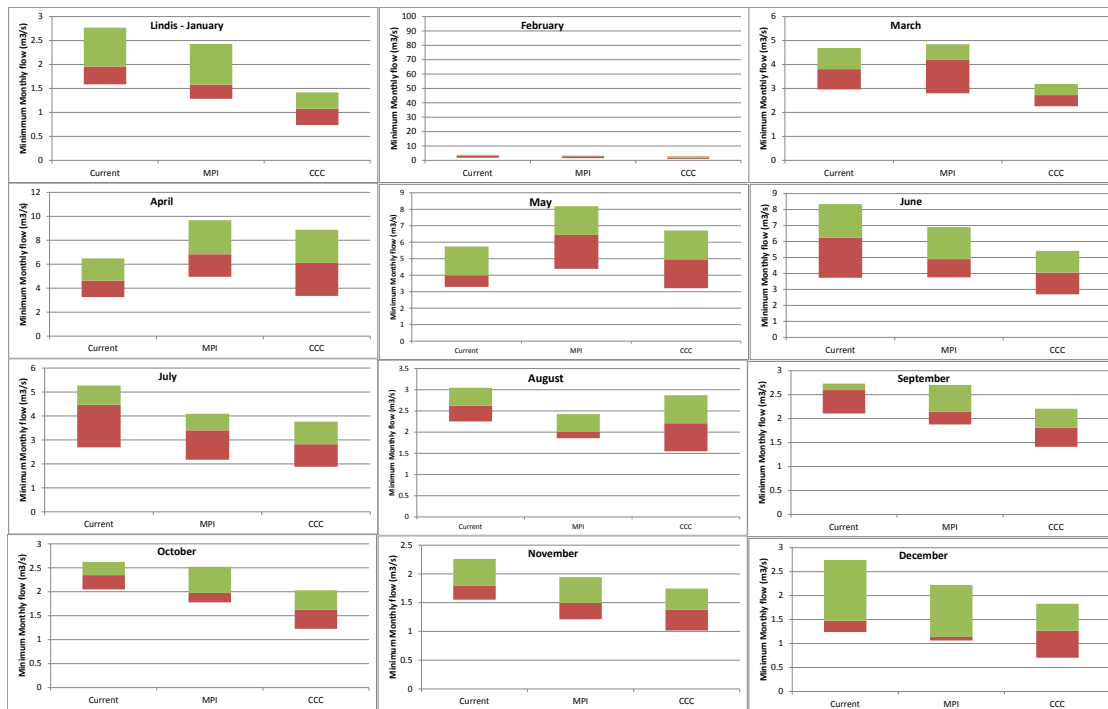


Climate change impact on simulated hourly flow duration curve for the Clutha catchment at Balclutha for the current time period 1997-2011 (Current), for the nominal time period of 2085-2099 using MPI model; and for the nominal time period of 2085-2099 using CCC model.

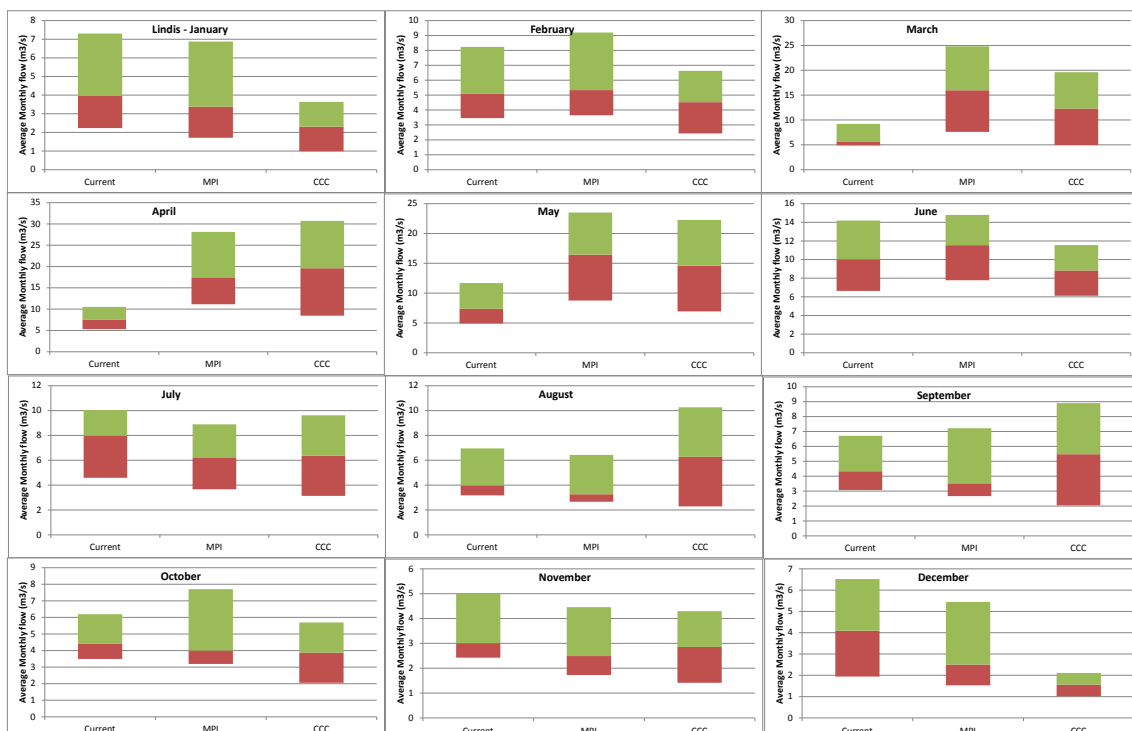
Appendix F2 - Clutha at Lindis



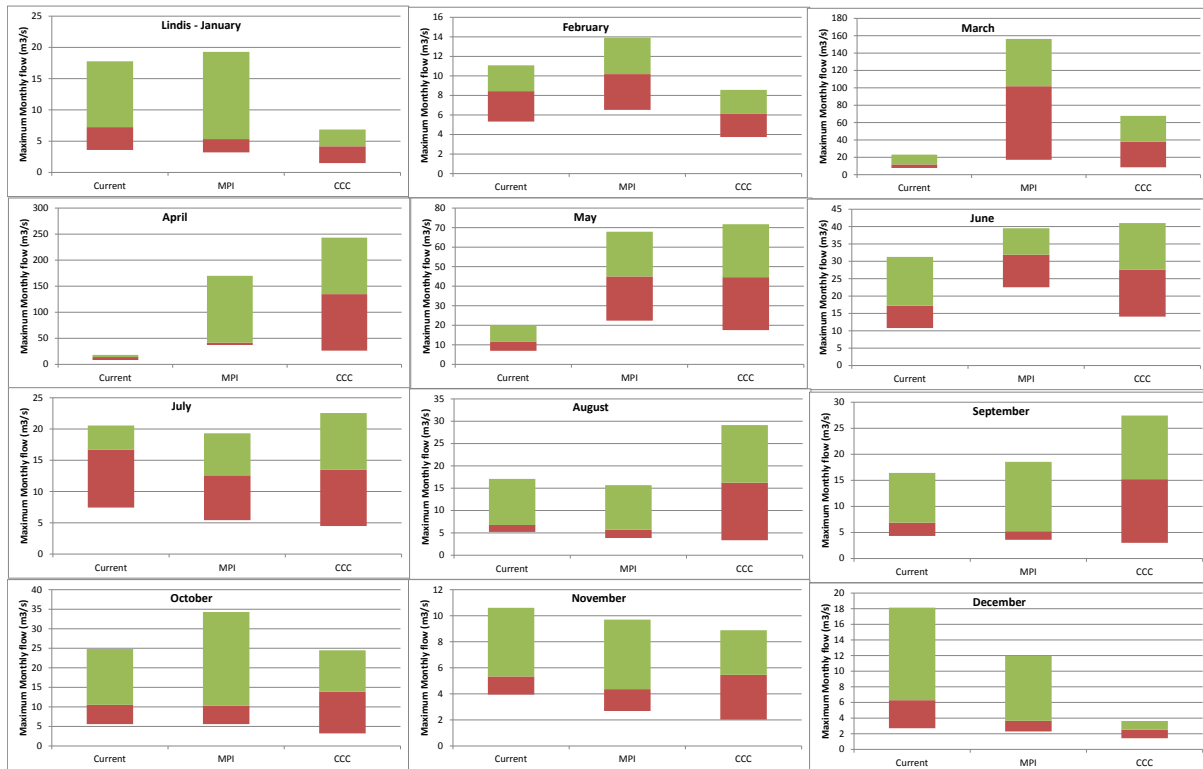
Box plot of climate change impact for the maximum annual flow and annual flow for the Clutha catchment at Lindis for the current time period 1997-2011 (Current), for the nominal time period of 2085-2099 using MPI model; and for the nominal time period of 2085-2099 using CCC model. The median minimum annual flow is at the green/brown boundary, the 75th percentile of minimum annual flow is at the top of the green box, and the 25th percentile is at the bottom of the brown box



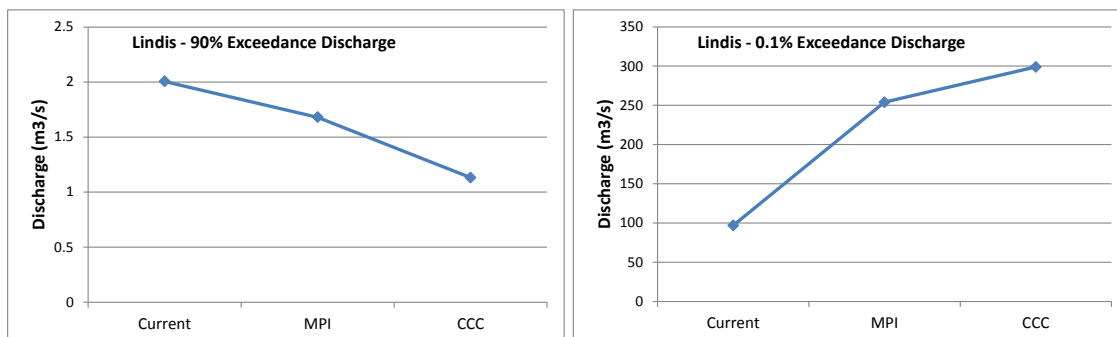
Box plot of climate change impact for the monthly minimum flow for the Clutha catchment at Lindis for the current time period 1997-2011 (Current), for the nominal time period of 2085-2099 using MPI model; and for the nominal time period of 2085-2099 using CCC model. The median minimum annual flow is at the green/brown boundary, the 75th percentile of minimum annual flow is at the top of the green box, and the 25th percentile is at the bottom of the brown box



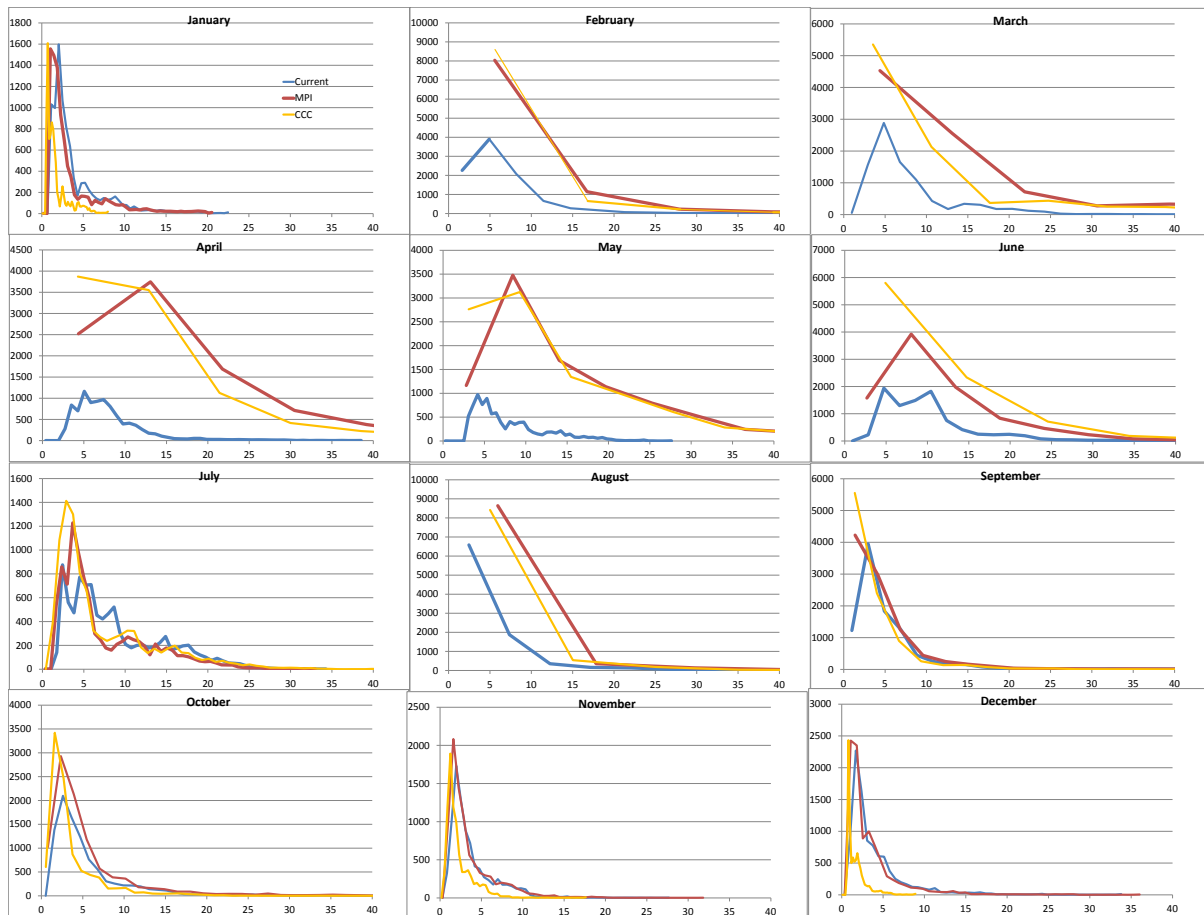
Box plot of climate change impact for the monthly average flow for the Clutha catchment at Lindis for the current time period 1997-2011 (Current), for the nominal time period of 2085-2099 using MPI model; and for the nominal time period of 2085-2099 using CCC model. The median minimum annual flow is at the green/brown boundary, the 75th percentile of minimum annual flow is at the top of the green box, and the 25th percentile is at the bottom of the brown box



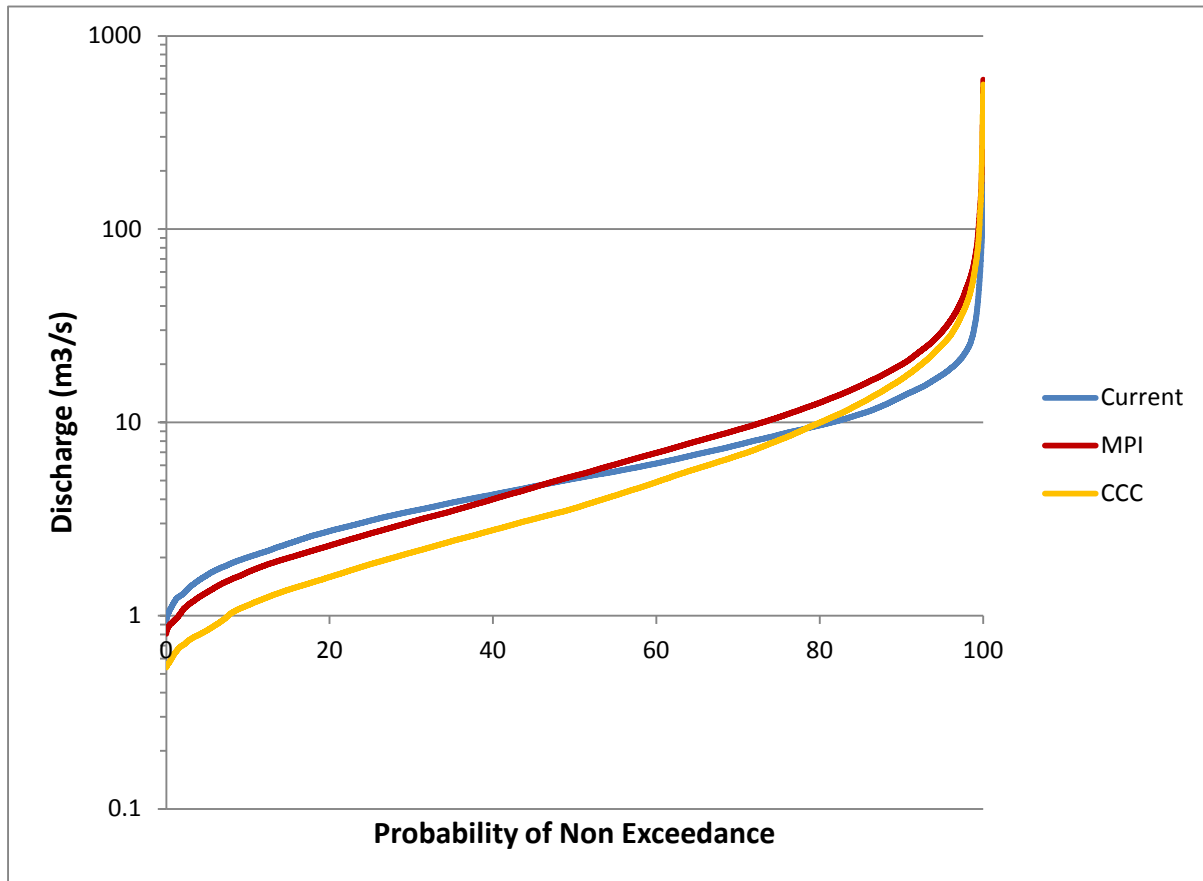
Box plot of climate change impact for the monthly maximum flow for the Clutha catchment Lindis for the current time period 1997-2011 (Current), for the nominal time period of 2085-2099 using MPI model; and for the nominal time period of 2085-2099 using CCC model. The median minimum annual flow is at the green/brown boundary, the 75th percentile of minimum annual flow is at the top of the green box, and the 25th percentile is at the bottom of the brown box



Climate change impact on low flow and high flows for the Clutha catchment at Lindis for the current time period 1997-2011 (Current), for the nominal time period of 2085-2099 using MPI model; and for the nominal time period of 2085-2099 using CCC model.

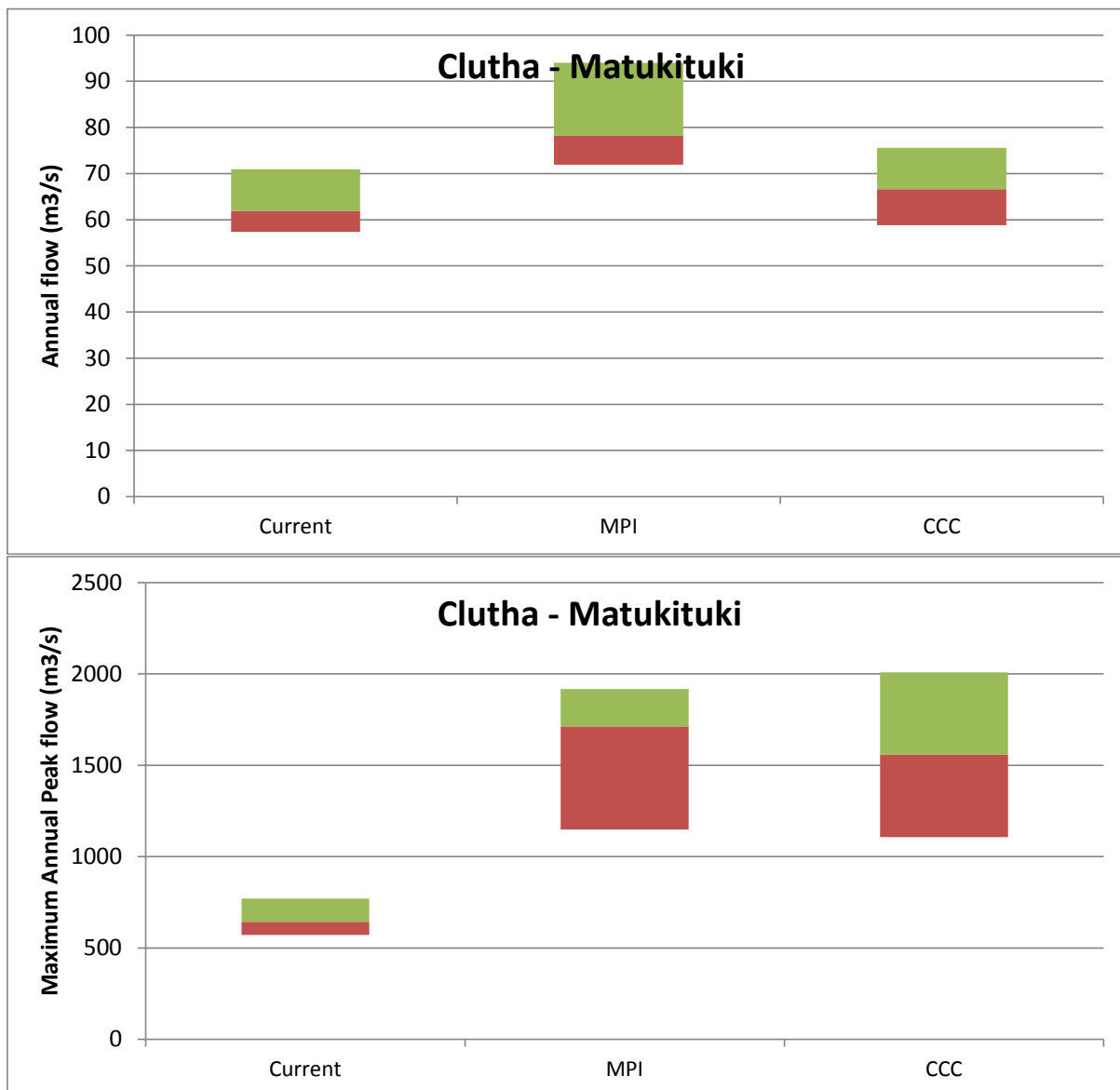


Climate change impact on monthly flow distribution for the Clutha catchment at Lindis for the current time period 1997-2011 (Current), for the nominal time period of 2085-2099 using MPI model (MPI); and for the nominal time period of 2085-2099 using CCC model (CCC). The Y axis represents the occurrence of discharge, while the X axis represents the hourly discharge. For sake of visibility simulated hourly discharge over 40 m³/s were truncated

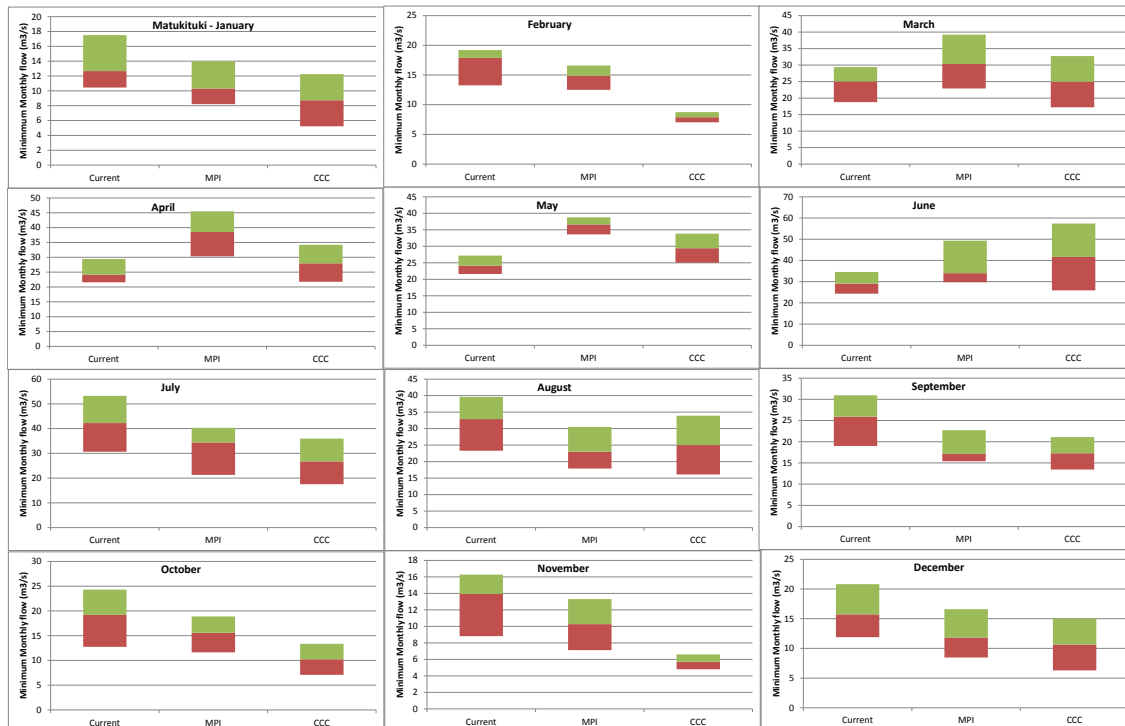


Climate change impact on simulated hourly flow duration curve for the Clutha catchment at Lindis for the current time period 1997-2011 (Current), for the nominal time period of 2085-2099 using MPI model; and for the nominal time period of 2085-2099 using CCC model.

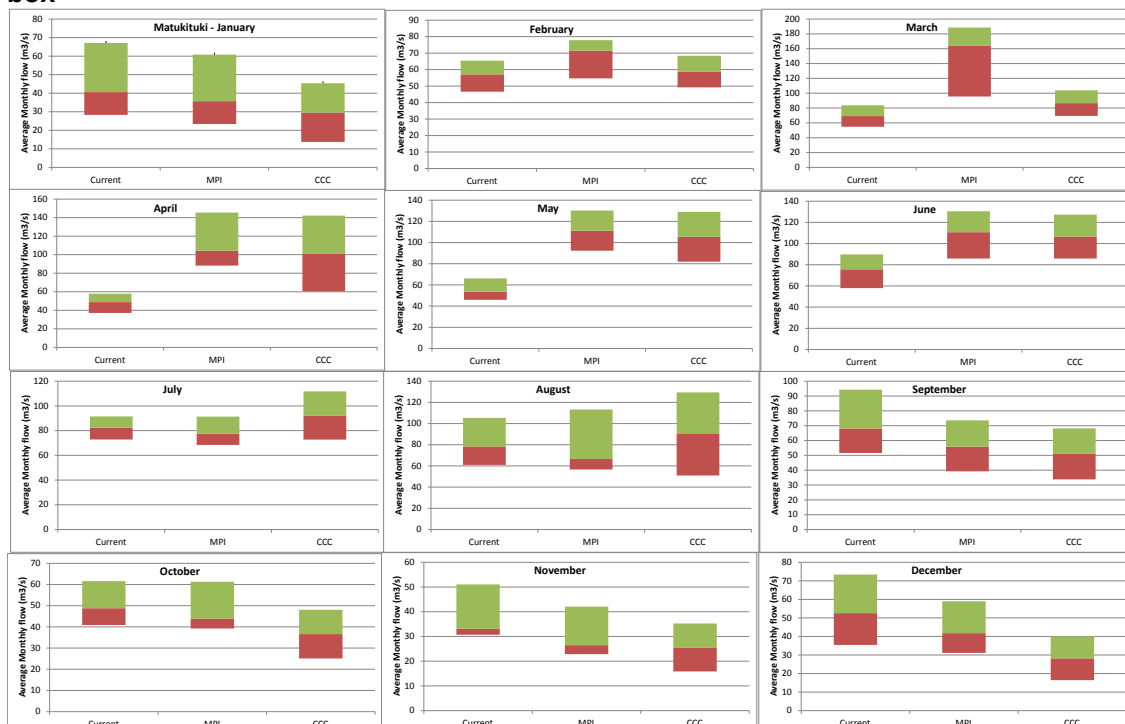
Appendix F3 - Clutha at Matukituki



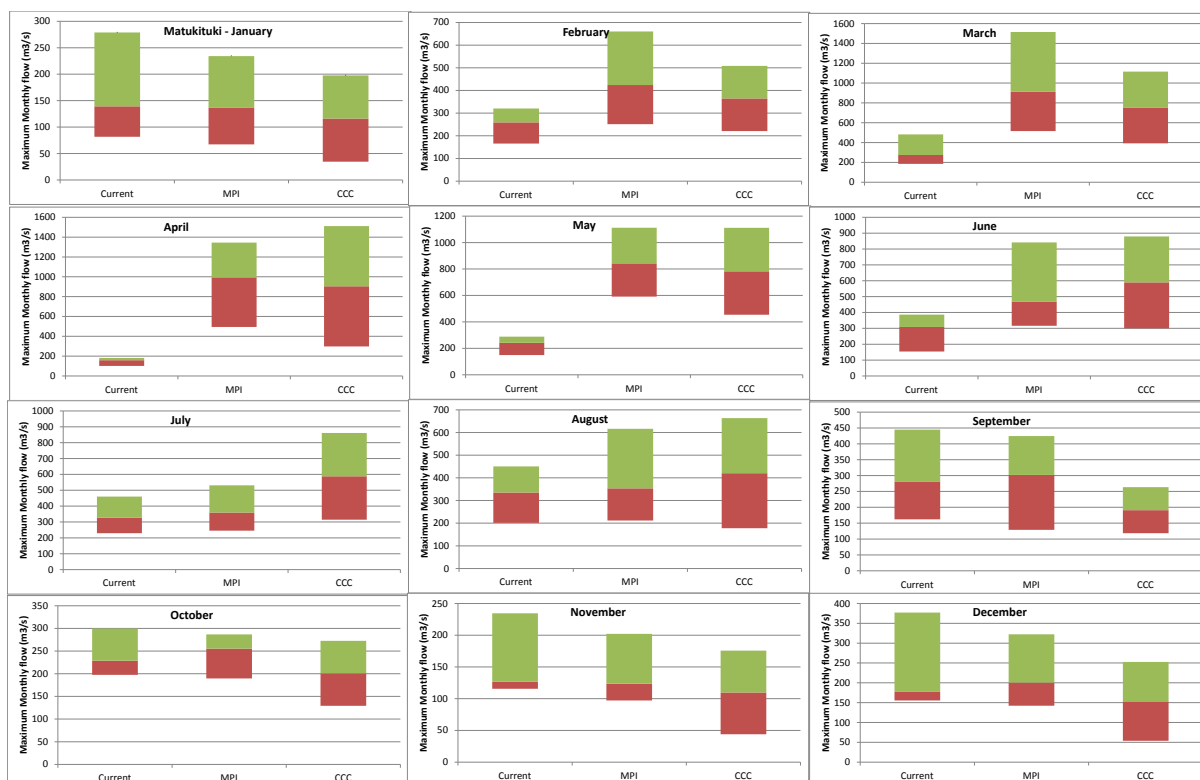
Box plot of climate change impact for the maximum annual flow and annual flow for the Clutha catchment at Matukituki for the current time period 1997-2011 (Current), for the nominal time period of 2085-2099 using MPI model; and for the nominal time period of 2085-2099 using CCC model. The median annual flow is at the green/brown boundary, the 75th percentile of annual flow is at the top of the green box, and the 25th percentile is at the bottom of the brown box



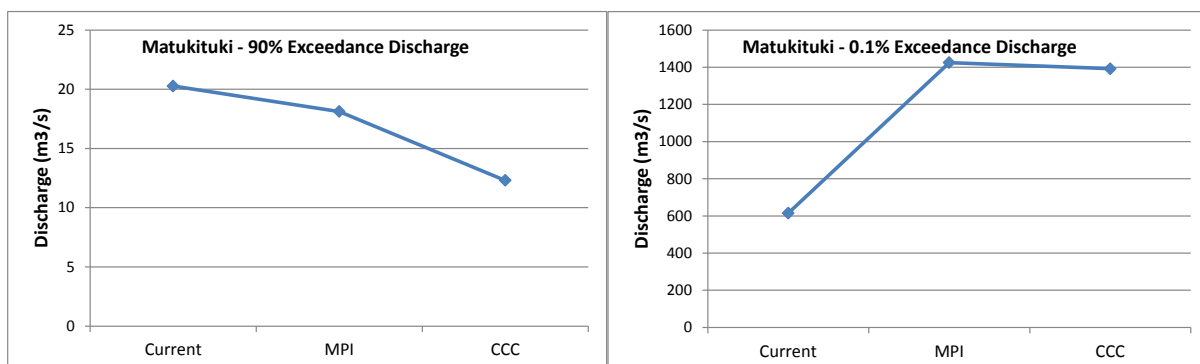
Box plot of climate change impact for the monthly minimum flow for the Clutha catchment at Matukituki for the current time period 1997-2011 (Current), for the nominal time period of 2085-2099 using MPI model; and for the nominal time period of 2085-2099 using CCC model. The median minimum annual flow is at the green/brown boundary, the 75th percentile of minimum annual flow is at the top of the green box, and the 25th percentile is at the bottom of the brown box



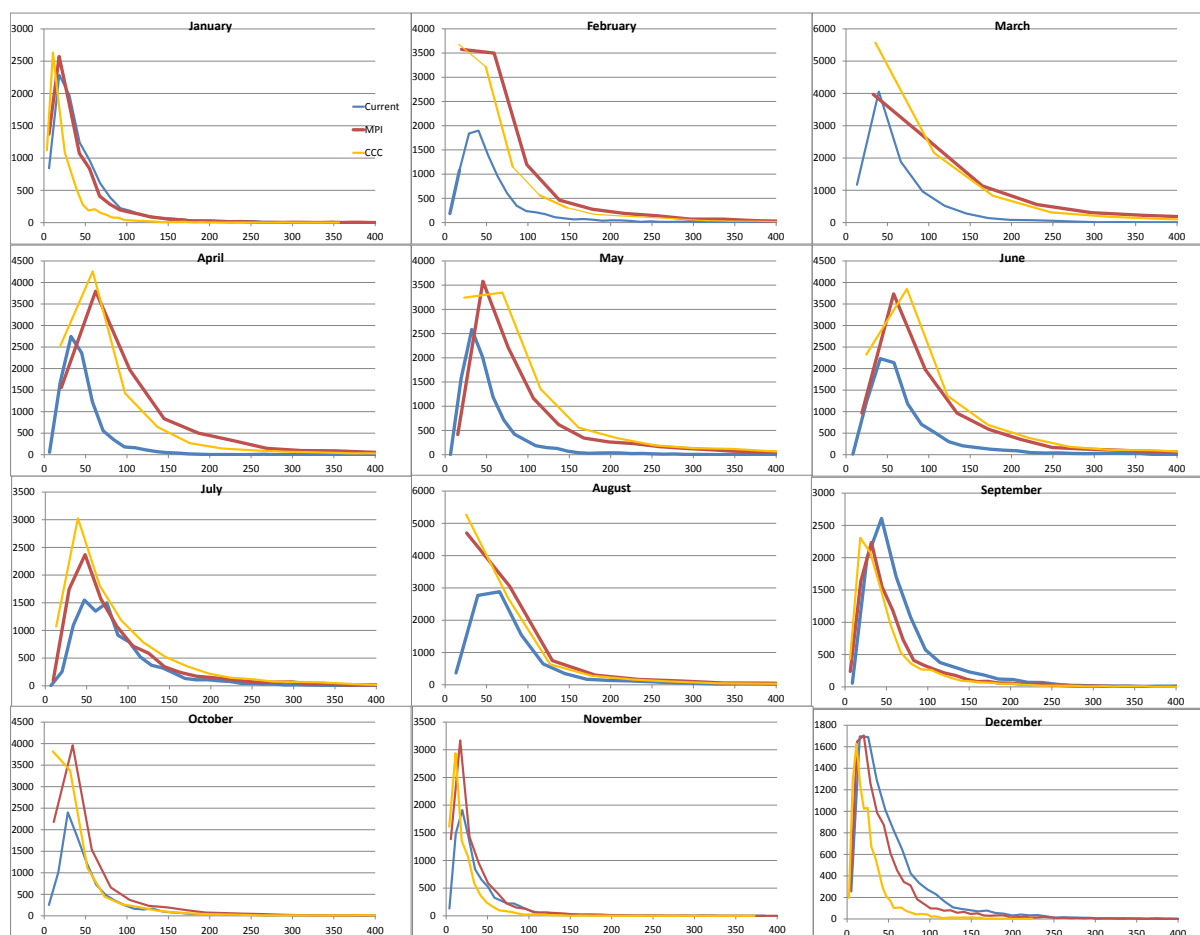
Box plot of climate change impact for the monthly average flow for the Clutha catchment at Matukituki for the current time period 1997-2011 (Current), for the nominal time period of 2085-2099 using MPI model; and for the nominal time period of 2085-2099 using CCC model. The median minimum annual flow is at the green/brown boundary, the 75th percentile of minimum annual flow is at the top of the green box, and the 25th percentile is at the bottom of the brown box



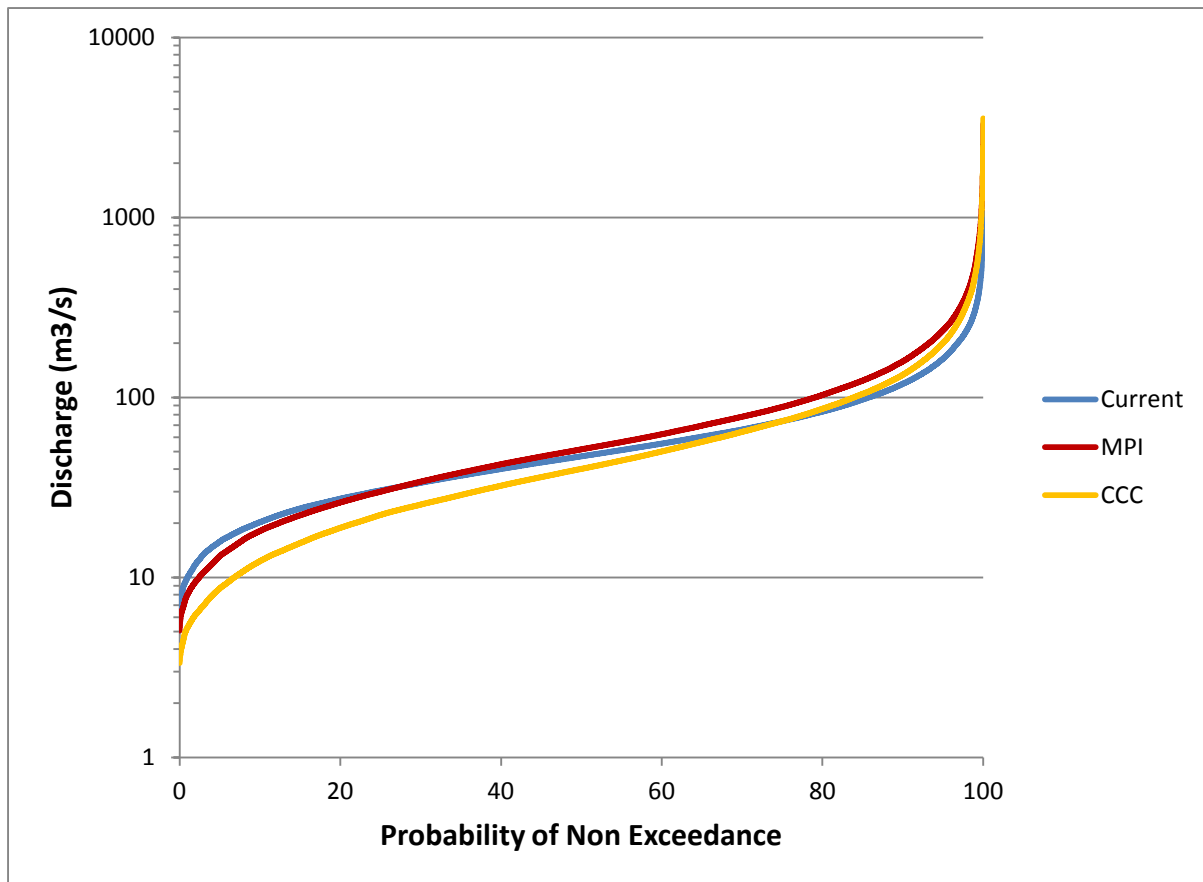
Box plot of climate change impact for the monthly maximum flow for the Clutha catchment at Matukituki for the current time period 1997-2011 (Current), for the nominal time period of 2085-2099 using MPI model; and for the nominal time period of 2085-2099 using CCC model. The median minimum annual flow is at the green/brown boundary, the 75th percentile of minimum annual flow is at the top of the green box, and the 25th percentile is at the bottom of the brown box



Climate change impact on low flow and high flows for the Clutha catchment at Matukituki for the current time period 1997-2011 (Current), for the nominal time period of 2085-2099 using MPI model; and for the nominal time period of 2085-2099 using CCC model.

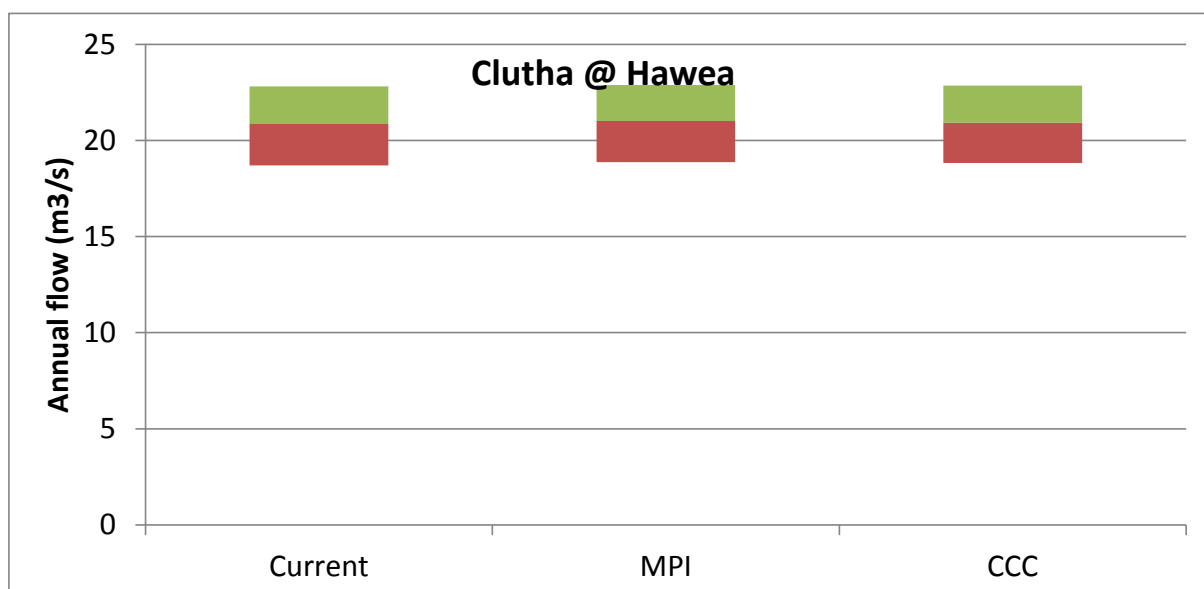
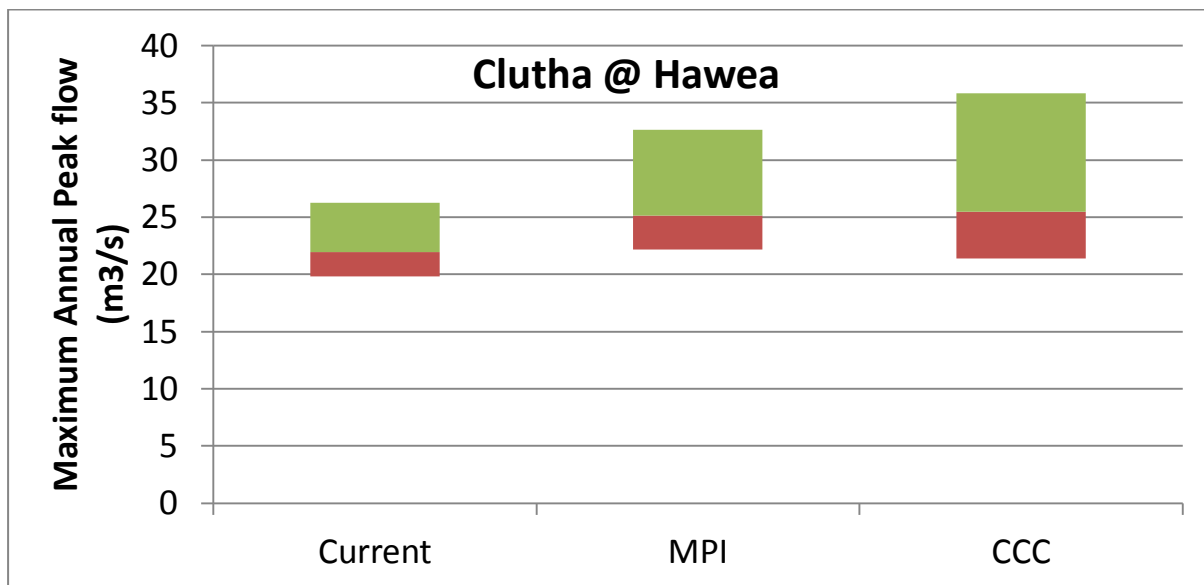


Climate change impact on monthly flow distribution for the Clutha catchment at Matukituki for the current time period 1997-2011 (Current), for the nominal time period of 2085-2099 using MPI model (MPI); and for the nominal time period of 2085-2099 using CCC model (CCC). The Y axis represents the occurrence of discharge, while the X axis represents the hourly discharge. For sake of visibility simulated hourly discharge over 400 m³/s were truncated

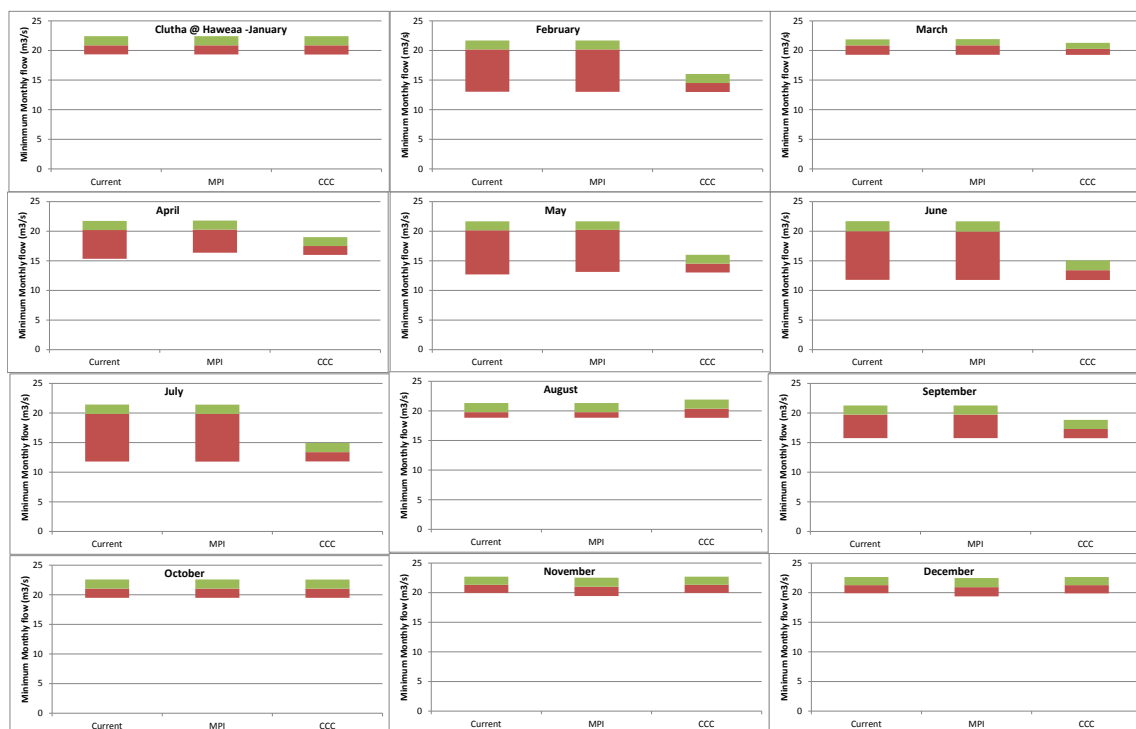


Climate change impact on simulated hourly flow duration curve for the Clutha catchment at Matukituki for the current time period 1997-2011 (Current), for the nominal time period of 2085-2099 using MPI model; and for the nominal time period of 2085-2099 using CCC model.

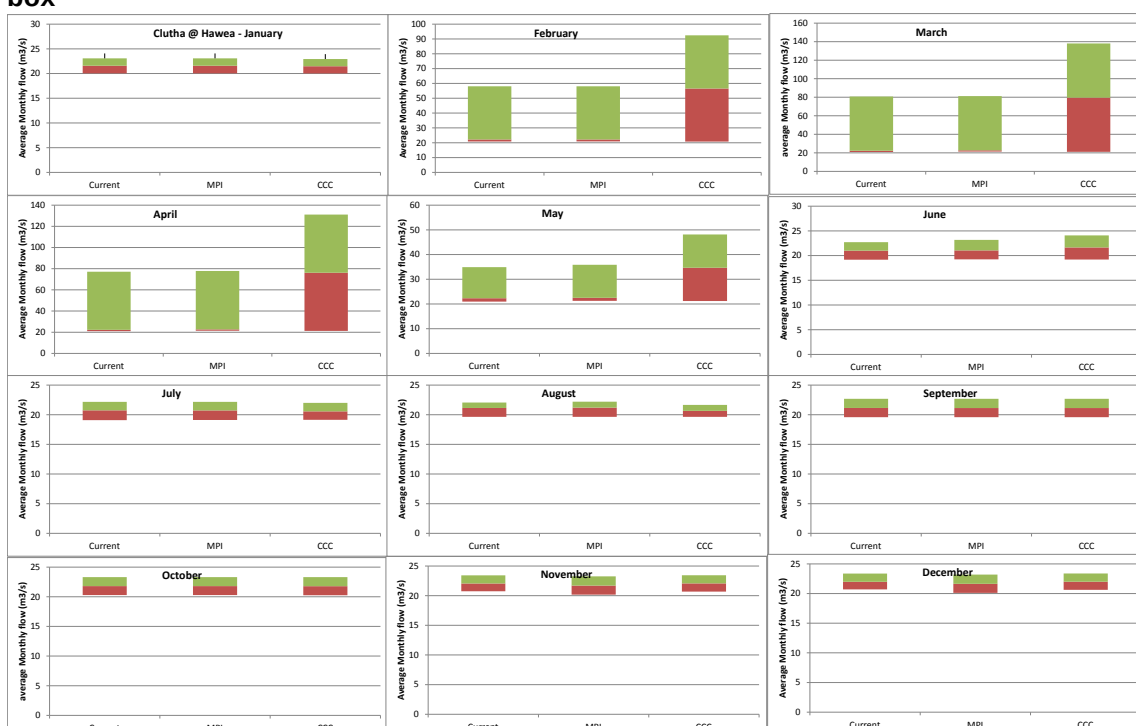
Appendix F4 - Clutha at Hawea



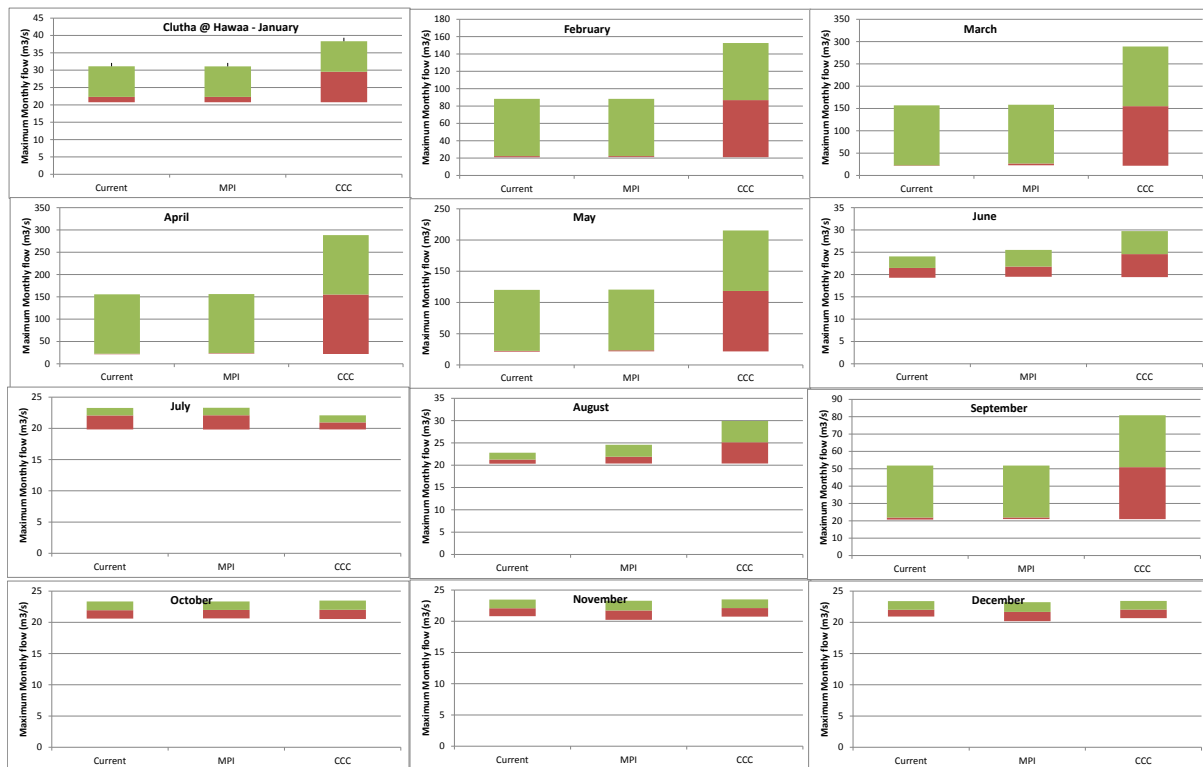
Box plot of climate change impact for the maximum annual flow and annual flow for the Clutha catchment at Hawea for the current time period 1997-2011 (Current), for the nominal time period of 2085-2099 using MPI model; and for the nominal time period of 2085-2099 using CCC model. The median annual flow is at the green/brown boundary, the 75th percentile of annual flow is at the top of the green box, and the 25th percentile is at the bottom of the brown box



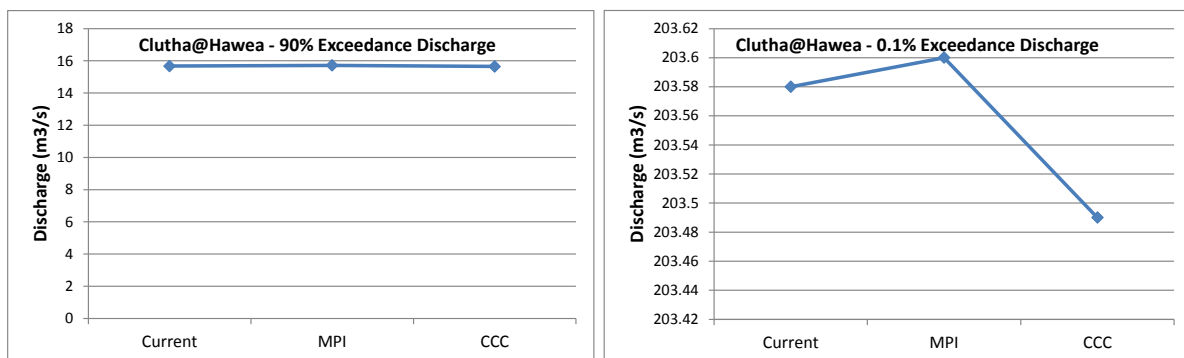
Box plot of climate change impact for the monthly minimum flow for the Clutha catchment at Hawea for the current time period 1997-2011 (Current), for the nominal time period of 2085-2099 using MPI model; and for the nominal time period of 2085-2099 using CCC model. The median minimum annual flow is at the green/brown boundary, the 75th percentile of minimum annual flow is at the top of the green box, and the 25th percentile is at the bottom of the brown box



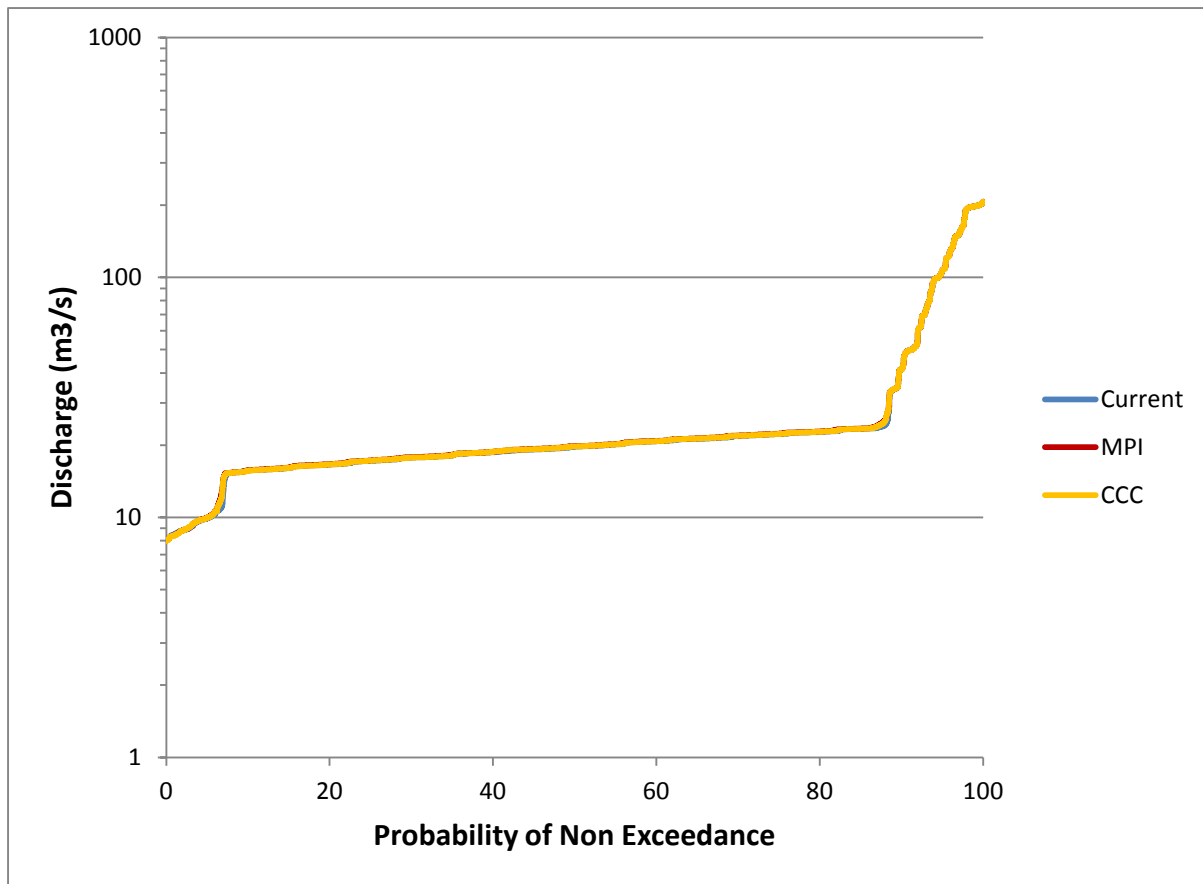
Box plot of climate change impact for the monthly average flow for the Clutha catchment at Hawea for the current time period 1997-2011 (Current), for the nominal time period of 2085-2099 using MPI model; and for the nominal time period of 2085-2099 using CCC model. The median minimum annual flow is at the green/brown boundary, the 75th percentile of minimum annual flow is at the top of the green box, and the 25th percentile is at the bottom of the brown box



Box plot of climate change impact for the monthly maximum flow for the Clutha catchment at Hawea for the current time period 1997-2011 (Current), for the nominal time period of 2085-2099 using MPI model; and for the nominal time period of 2085-2099 using CCC model. The median minimum annual flow is at the green/brown boundary, the 75th percentile of minimum annual flow is at the top of the green box, and the 25th percentile is at the bottom of the brown box



Climate change impact on low flow and high flows for the Clutha catchment at Hawea for the current time period 1997-2011 (Current), for the nominal time period of 2085-2099 using MPI model; and for the nominal time period of 2085-2099 using CCC model.



Climate change impact on simulated hourly flow duration curve for the Clutha catchment at Hawea for the current time period 1997-2011 (Current), for the nominal time period of 2085-2099 using MPI model; and for the nominal time period of 2085-2099 using CCC model.



Climate change impact on monthly flow distribution for the Clutha catchment at Hawea for the current time period 1997-2011 (Current), for the nominal time period of 2085-2099 using MPI model (MPI); and for the nominal time period of 2085-2099 using CCC model (CCC). The Y axis represents the occurrence of discharge, while the X axis represents the hourly discharge. For sake of visibility simulated hourly discharge over 200 m³/s were truncated Frequency distribution monthly flow