

A CLIMATE CHANGE ADAPTION STRATEGY FOR WAIMAKARIRI'S 3 WATERS ASSETS

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ABSTRACT

Waimakariri District Council provides 3 Waters services (drinking water, wastewater and stormwater) to properties generally located in four townships – Rangiora, Kaiapoi, Oxford and Woodend Pegasus, seven rural villages and some rural areas. Drinking water is supplied to over 80% of the population (50,000 people) and provides both a source of sustenance and exposure for the community when it is not available. The 3 Waters assets collectively have a replacement valued at 2022 of \$839M, with renewals of \$149M forecast over the next 50 years. Some of these assets may be exposed to climate change impacts earlier than their forecast replacement date.

Rivers define the land and its use – the Ashely, Cust, Eyre and Waimakariri provide conduits for in river ecology while indirectly providing a source of drinking and directly taking flood flows through the District and ultimately out to sea. The District relies upon generally deep groundwater to provide safe drinking water, treats and discharges wastewater to land and sea and has a series of stormwater to drainage systems which minimise the risk of flooding of properties.

Council recognises that climate change will have an impact on its ability to provide 3 Waters services. The likely scale and extent of across the District was not clear, resulting in the commissioning of a 2022 climate change assessment from the National Institute of Water and Atmospheric Research (NIWA). That report identified more extremes in weather, including increased river flows, more hot days (above 25 degrees Celsius) and increases in rainfall intensity. Following this, Waugh Infrastructure Management Ltd (WIML) were engaged to look specifically at the scale and extent of climate related exposure, including costs, providing an adaptation strategy. A representative concentration pathway (RCP) of 8.5 modelling carbon dioxide equivalent levels to mid-century (2050) scenario was applied while reporting on the initial assets requiring focus- particularly those with the highest criticality ranking – AA, A and B.

This project's approach was to develop preliminary cost estimates of the most likely adaptation interventions for 3 Waters while setting up a framework assessment process that could also be used for other assets. This project has relied predominantly on the utilisation of existing data to support the assessments, however some additions to and development of that data were required to contextualise it from a natural hazard risk perspective. Development included:

- An expanded 3 Waters Criticality Framework to include criteria such as the relative importance of assets from a disaster response and management perspective i.e. engineering lifelines (See Table 1)
- Completion of an asset fragility assessment. This recognised that asset types and components are not equally vulnerable to the impacts of hazard events. Factors such as design standards, current conditions and material types make a specific asset more or less robust against the impacts of weather events. Asset fragility was rated according to the specific factors applicable to the different asset types
- Completion of an asset failure impacts table. Existing best practice was used and contextualised around the land and assets inside the district. As a result, an understanding the most likely failure or impacts of natural hazards on infrastructure was obtained e.g. a well-known consequence of flooding is the inundation of the entire wastewater system where surcharge in the adjacent stormwater network occurs

- Provision of adaptation intervention strategies. Following the completion of the climate risk assessment process, a series of adaptation options were defined to address risks at an appropriate level (See Figure 1 and Figure 2). This allowed for a range of options and cost to be applied for specific asset given its overall climate risk

Because this project focuses on providing adaptation strategies for the highest-risk assets (See Table 1), there is confidence in the assets forming the core of an investment programme. With completion of an additional project covering the remainder of Council’s significant assets (transport, facilities, greenspace, drainage, solid waste) which is expected by September 2023, an even stronger basis for determining which assets (individual or group) to invest in will be clear. That does not, however, stop progressing a climate based programme for 3 Waters in the short term. Longer-term uncertainties will be addressed through long-term adaptation pathways, which were not considered for this initial work.

The outcome of the climate risk assessment process shows that 4% of the 3 Water asset base has a high climate risk, while a further 16 % is at a medium level.

KEYWORDS

Adaptation, Asset, Criticality, Exposure, Fragility, Interdependency, Investment, IPCC, RCP 8.5, Strategy

TABLES

Table 1. Asset Portion by Criticality and Risk Level

Criticality	High	Medium	Low	Very low
AA	0.4%	3.7%	9.6%	3.4%
A	0.4%	3.2%	10.7%	4.6%
B	0.3%	2.2%	9.3%	4.7%
C	0.9%	3.5%	13.0%	12.6%
Unknown	1.5%	3.7%	11.2%	1.0%
Total	3.5%	16.2%	53.8%	26.4%

The expected investment cost and the identified intervention level across the respective waters for Criticality A and AA is provided in Figure 1. As expected, the wastewater system requires the most significant investment levels, given this system’s particular vulnerability to weather events such as flooding - Figure 1.

FIGURES

Figure 1: Investment Required in Criticality A and AA Assets

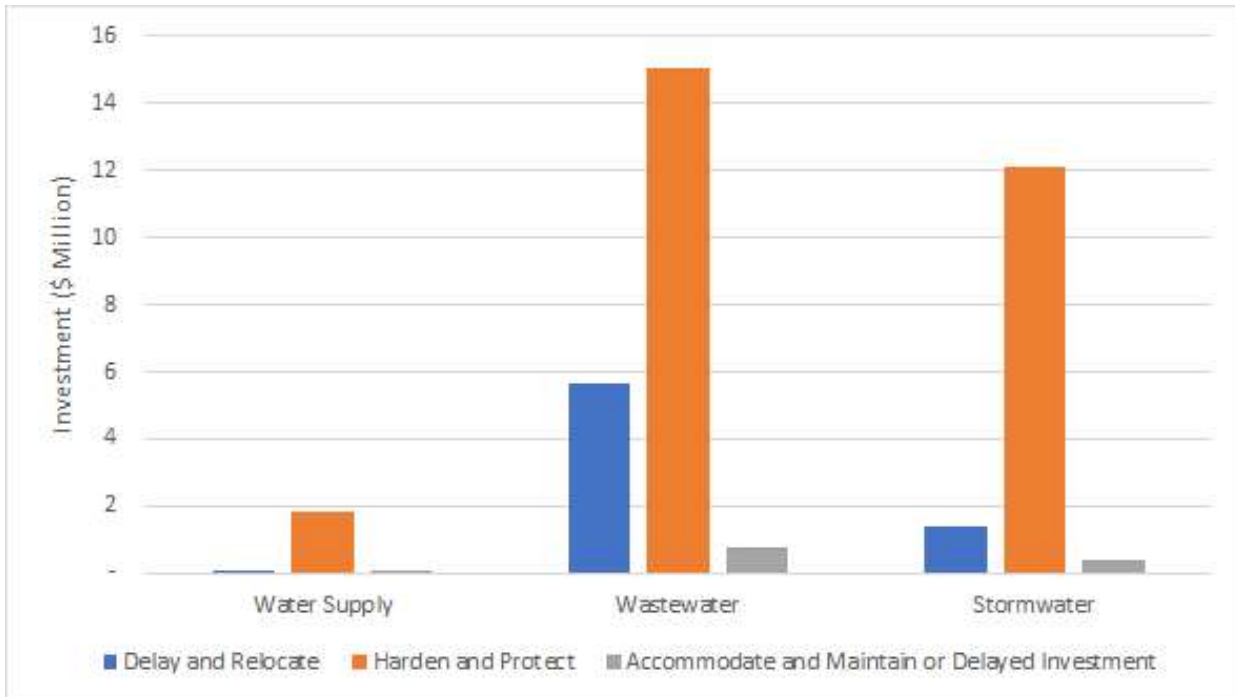


Figure 2: Wastewater Assets – Adaptation Response

