

# Climate Change

(Clr Hook) (Report prepared by Kaye McIlveney, Stuart Donaldson and Stephen Rooney)

E320-003-001

## Purpose

1. To consider how climate change may impact on the 3 Waters activities.

## Background

2. This report is the second in the Climate Change Integrated Work Programme (the Programme) series. It details how climate change is incorporated into the decisions made in the management of the 3 Waters activities.
3. The Programme aims to inventory the data and information Council needs to make climate change related decisions. It will assess each Activity Group as to the impacts that climate change may have on that activity, will ensure that climate change is being properly taken into account when relevant and that staff have the data/information they need to assess the impacts of climate change.
4. Council has powers and obligations in relation to water supplies, stormwater controls and wastewater disposal under a number of statutes including the Local Government Act 2002.
5. Council's Infrastructure Strategy lists some of the significant asset management challenges for 3 Waters as including—
  - Increasing likelihood of infiltration of stormwater into the wastewater network as a result of ageing pipe network and climate change.
  - The need for water demand management (particularly in Renwick, Havelock, Picton, Wairau Valley and Awatere/Seddon) to ensure the water sources can meet future demand.
  - The effects of urban growth and climate change on stormwater volumes.
6. Building infrastructure to the latest standards and with the most suitable materials increases resilience to flood events and earthquakes. We are also prioritising the replacement of pipework and other assets made of older materials that are susceptible to natural hazards or have deteriorated more quickly than anticipated.
7. Upgrades and new work are being designed to gain efficiencies in power use as well as cost.
8. Our financial planning is another way we will ensure we can recover as quickly as possible from emergency events, ensuring we have reserves, flexible capital programmes and insurance to meet the expected losses.

## Comments

### *Climate changes expected*

9. The current advice from the Ministry for Environment is outlined below.

#### Temperature

Compared to 1995, by 2040, temperatures are likely to be 0.7°C – 1.0°C warmer; and by 2090, 0.7°C to 3.0°C warmer.

The number of days when the temperature exceeds 25°C is increasing and the number of frosts is decreasing.

By the end of the 21st century, these very hot days could rise from 6 days to 38 days over 25°C per year.

Frosts could decrease by around 7 to 19 per year.

The frequency of droughts could be more than double, compared to 1995.

#### Rainfall

Rainfall will vary locally within the region. The largest changes will be for particular seasons rather than annually.

Summer rainfall in Blenheim is projected to increase by 9% by 2090 by the coast. It is expected to be drier in the high country.

Extreme rainy days are likely to become more frequent by 2090.

#### Snowfall

Marlborough is likely to experience significant decreases in seasonal snow; by up to 30 to 40 days in some parts of the region. The duration of snow cover is also likely to decrease.

Less winter snowfall and an earlier spring melt may cause marked changes in the annual cycle of river flows.

Places that receive snow now are likely to get increased rainfall as snowlines rise to higher elevations as the temperature rises.

For rivers where the winter precipitation currently falls as snow and is stored until the snowmelt season, there is the possibility of larger winter floods.

#### Wind

The frequency of extremely windy days in Marlborough by 2090 is likely to increase by 2 to 10 percent. There may be an increase in westerly wind during winter, and north-easterlies in summer.

#### Storms

Changes in the frequency of storms are likely to be small compared to the natural inter-annual variability. Some increase in storm intensity, local wind extremes, and thunderstorms is likely to occur.

#### Sea level rise

NZ tidal records show an average rise in relative mean sea level of 1.7mm per year over the last century (NIWA now says that rate has risen to 3.3mm/year).

Globally, the rate of rise has increased, and further rise is expected in the future.

The effects will exacerbate, changing tide patterns, storm surges and potential tsunamis.

### *Analysis & advice*

#### *Implications of climate change on 3 Waters*

##### **Water Supply**

10. The eastern areas of Marlborough are predicted to experience longer periods of dry weather as a result of climate change. Water demand peaks during the dry spells as gardens are irrigated and swimming pools are topped up. Longer droughts will increase the frequency and duration of periods of high demand, with potential implications for both water sources and the water supply infrastructure.
11. Increased frequency and duration of droughts will put strain on the water sources particularly where aquifers are shared between public water supply and production water. One method to assist in managing demand is the introduction of water meters.
12. Increased droughts will place additional demands on water treatment and reticulation plants.
13. Sea level rise will affect the freshwater–saline balance in groundwater systems and may further restrict the capacity of the Havelock and Riverlands water bores to continue to supply freshwater to the community.

##### **Stormwater**

14. More frequent high intensity rainfall events will place greater demands on the stormwater system. Urban drainage reticulation will be tested, detention areas will temporarily fill with storm water and overland flow paths will need to be utilised.
15. The expectation of more intense storms as a result of climate change must be accommodated through a combination of larger pipes, channels and pump stations, overland secondary flow paths, and specially designed detention areas that will hold back the peak flows, preventing downstream flooding.
16. A collaborative working relationship between the Council's Rivers & Land Drainage and the Stormwater and Operations departments is proving to be an effective mechanism for implementing the stormwater strategy. The strategy is a detailed analysis of the stormwater issues for Blenheim and is a

fundamental element of infrastructure planning. The strategy groups many small drainage catchments throughout Blenheim into 11 Stormwater Management Areas (SMAs.) Detailed, integrated action plans are being developed for each SMA which will meet the future requirements for growth in stormwater flows and quality standards.

17. Strategies are being developed to manage the effects of more intense storms. Building bigger infrastructure and ensuring renewed pipes are sized to meet the new standards will be important. Advanced mathematical models are used to project future stormwater flow patterns and ensure infrastructure is designed with sufficient contingency to accommodate the current uncertainties. A good understanding of historic rainfall patterns and the powerful hydraulic models allow different combinations of factors to be simulated. Non-infrastructure alternatives can be modelled and the engineering solutions adjusted.
18. The use of overland flow paths along roads can avoid the expense of installing additional stormwater infrastructure, but roads and adjacent properties need to be designed appropriately to provide this function. Stormwater detention areas can make an important contribution to stormwater management by removing the peak flows and allowing stormwater to drain away once the peak flood waters have receded. Maximising the potential for soakage into the ground is useful, as are roof water collection tanks.

### **Wastewater**

19. Blenheim's wastewater treatment plants can continue to operate with a 300mm increase in sea level rise, as is predicted to occur over the next 30 years. However, the existing wastewater treatment plants will be seriously impacted by 700mm of sea level rise, which is predicted to occur by 2100.
20. Rising water tables will affect the Council's ability to continue irrigating land with treated wastewater from the Blenheim wastewater plant (when the land is too wet and/or the water table is high). Other solutions will need to be found. The Blenheim wastewater treatment plant includes a facility to recycle a portion of the treated effluent to irrigate land. This is only permitted when the soil requires additional moisture and when the groundwater levels are low enough to prevent surface ponding. Longer, drier summers may prolong the irrigation season but rising sea levels may raise the groundwater levels, preventing irrigation.
21. More frequent and intense storms will increase the risk of sewer overflows in urban areas via stormwater leaks into the sewer reticulation.
22. Stormwater infiltration into the wastewater network becomes a more significant problem during storms and when groundwater levels are high. Climate change is likely to make this problem worse as storms are predicted to become more intense and frequent.
23. Hotter drier summers will have an impact on the bacteria and algae used in the wastewater treatment process because they require dissolved oxygen in the wastewater to effectively process the waste into treated effluent. Dissolved oxygen decreases as the temperature of the ponds increases. Additional aeration in the plant may be required to increase the oxygen in the treatment ponds.
24. The Seddon treatment plant discharges to the Starborough Creek which can have very low natural flows. The impact of the discharge may be affected by a change in the volume and temperature of the receiving water. A land-based discharge solution is being sought.
25. The likely effects of climate change will be taken into consideration when Council applies to renew the treatment plant resource consents. The next resource consents will include conditions to prevent environmental deterioration.
26. The Picton sewer system has been designed and built so that, at some stage, treated water can be recycled to customers. The water would be treated as non-potable and would be for commercial and industrial uses.
27. Planning is underway for relocation of the Havelock Sewerage Treatment Plant. There are a number of reasons for the relocation; one factor is sea level rise. This is another example of climate change having already been considered is the Picton Sewerage Pump Station having been built up.

## **LGNZ Report: Vulnerable: The quantum of local government infrastructure exposed to sea level rise**

28. This report was released by LGNZ in January this year. It assessed the replacement value of local government infrastructure at risk from sea level rise. It contained four scenarios—a 0.5m rise, a 1m rise, a 1.5m rise and a 3m sea level rise. The report summary states—

*Councils are already experiencing the impacts of climate change and are beginning to recognise that communities' resilience to climate change depends in large part on what is being done to adapt to it.*

*However, until now councils have not had a good understanding of the type, amount and replacement value of local government owned infrastructure exposed to sea level rise, and therefore if and where adaptation planning should be prioritised.*

29. Council participated in this report but as we did not have the whole of the district covered by LIDAR, LGNZ could only use a 3m data layer they provided. Most of our 3 Waters infrastructure is not expected to be vulnerable under a 3m rise. However, once the LIDAR is completed, we will be able to make this assessment for the areas that may be vulnerable at 0.5m, 1m, and 1.5m sea level rises (likely to be some roading in the Sounds). This will give Council greater accuracy on those areas and allow scheduling of decisions and work to deal with any issues that may arise.

### **Conclusions**

30. The decisions taken today or in the near future about investment in 3 Waters infrastructure will have long term consequences, given the lifetimes of these assets. This means that climate change needs to be factored into planning and design now. If possible, they need to build in flexibility to adjust to change. Scientific certainty about the changes and how they will affect us is unlikely before we will need to act.

### **Next steps**

31. The further scientific study proposed for the Flood Protection & Control activity will assist the 3 Waters, especially stormwater, in its forward planning.
32. A report on the Solid Waste Activity Group will be presented to the next Planning, Finance & Community Committee.

### **RECOMMENDED**

**That the report be received.**