CLIMATE CHANGE & STORMWATER AND WASTEWATER SYSTEMS

An Executive Summary of Motu Note #28

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Coastal drains and pipes
combined with climatic change,
need thought and action.

We know climate change is happening and we know our stormwater and wastewater systems are particularly vulnerable. A recent example is the Edgecumbe floods, where raw sewage floated through the streets, making the clean-up a near-impossible mission. Six months later, 500 houses are still unlivable and flood-proofing the town remains a distant goal. The asset value of stormwater and wastewater assets in New Zealand is well over $20 billion. This includes 24,000 kilometres of public wastewater network with more than 3,000 pump stations, and over 17,000 kilometres of stormwater network. Much of it however, is poorly designed for the challenges climate change will bring, from sea level rise to the predicted changes in precipitation frequency and intensity.

We are yet to truly understand how the impact of climate change will unfold in different regions, specific locations, and over varying timescales. This makes it difficult to know how best to adapt.

Early in 2017, the Deep South National Science Challenge Impacts and Implications Programme brought experts together to discuss the challenges and concerns for the sector in Aotearoa New Zealand. Participants included academics and scientists; industry groups and and government policy analysts; water service providers and consultants. This discussion resulted in a paper, co-authored by participants in that dialogue. The paper is designed to outline our current knowledge and the priority areas of research needed to prepare our stormwater and wastewater systems for a changing climate.

Stormwater systems vary widely across Aotearoa New Zealand. The primary stormwater system uses the topology of the landscape with gravity to pipe unwanted water underground and out into chosen waterways. Roads are often designed to be used as a secondary system that will see water flowing over them and towards waterways or designated flood storage areas in more extreme flooding.Wastewater systems generally consist of piped networks from properties to treatment facilities. Treated water is then discharged into fresh or sea water, though in some cases, land treatments are used to avoid this. Although Aotearoa New Zealand has a high proportion of households with septic tank solutions, we focus on piped systems in this paper.

We have some information about how climate change is likely to affect our stormwater and wastewater systems:

- Sea level rise will affect all coastal infrastructure, and as many of our water networks use gravity to discharge to water bodies, the most costly areas of the network are often located in low-lying areas or on the coast. From this, increasing sewage overflows, pipes corroded by salt water, and exposure to liquefaction are all likely.
- An increase in the severity and frequency of coastal storms will also affect coastal infrastructure in particular, causing increasing inundation, physical damage, and electrical failure at treatment plants.
- Changes in extreme rainfall will also add stress to the system by overwhelming the networks, restricting opportunities for maintenance, and increasing the occurrence of infiltration of wastewater into stormwater. This has concerning flow on effects for health, ecology, cultural and recreational spaces, and water supply for drinking.
- Drought will also affect networks, disrupting gravity systems by slowing flow and leading to blocked pipes. Particularly lengthy droughts can also affect wastewater treatment processes, creating functional and safety concerns.

It is very likely that these four effects will have a considerable impact on health, transport, culturally significant locations, evacuation routes, recreational and commercial activities, waterway ecology, and more. Adaptation is likely to require significant and expensive change to our stormwater and wastewater networks.

The first priority for further research in this space is to better understand the risks to our stormwater and wastewater systems, including cascading indirect effects of which we may not yet be aware. This evidence base will allow us to better understand what is at risk where, when, and why. This, in turn, provides a stronger foundation for other high priority research to consider the most appropriate adaptation responses, including identifying new solutions to help reduce these impacts. We also need to incorporate adaptation within our decision making frameworks, so another priority is to investigate the way that decision processes can be improved to make better adaptation decisions. Filling these research gaps will help Aotearoa New Zealand reduce future disruption and cost by adapting to our changing climate.

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