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Resilient Adaptation

Climate action research includes work that focuses on mitigation (how to restrict temperature increases and environmental degradation) and adaptation (how to change our planning, development, and lifestyles to be more resilient and better cope with environmental changes brought about by climate change). Tom's research uses advanced risk, geospatial and statistical

modelling to improve understanding of the changes experienced in a changing climate so that we can better adapt where we live and bolster community resilience to climate change.

The biosphere is a complex environment, with interrelationships across all systems and life forms, where changes in one domain result in changes for other domains. But those effects aren't always clear or direct, and many of our current models have shown a poor ability to predict the change happening, which is occurring at a faster pace than originally anticipated. Tom's research says one reason for this is because most models only examine the direct influences within the environment, while missing important and powerful indirect effects. Cascade modelling, which Tom develops, better accommodates these complexities, and in turn better estimates future risks for communities.

A good example of how this gets applied is in Tom's collaborative research with Christchurch City Council to better understand flood risk in Ōtautahi Christchurch. Most city planning has traditionally looked at sea level rise and how many properties will be inundated with water (a direct effect). However, equally important are the ways in which transport will be cut off and people won't be able to access essential services such as grocery stores, work/school, and medical care (indirect effects). Tom's modelling helps capture indirect effects, and therefore better plan for the range of risks associated with the changing climate.

Tom's interdisciplinary research team has a strong focus on building resilient communities that are able to effectively adapt to climate change risks.

About Tom

- Bachelor (Honours) Natural Resources Engineering
- Bachelor Mathematics
- Master Geography and Environmental Engineering
- Doctorate Industrial and Operations Engineering
- Co-Director Cluster for Community and Urban Resilience (CURE), UC



The whole team is mission led. It's less about the tools and more about figuring out how we can support resilient communities. We can use optimisation strategies or this or that method--we're ok with taking different approaches to the problem. We have people from anthropology, communications, accounting, environmental planning, as well as engineers, who come together as a risk team. We need to understand things beyond a single discipline and be able to communicate to a range of people, agencies, and sectors.

The issue: The recently proposed National Adaptation Plan requires that all NZ councils rigorously assess their risks from climate change. However, the current guidance only considers direct risk within its assessment, which will lead to misestimates of both risk and the timing of impacts. Tom's preliminary analysis shows there could be at least 150,000 people (including 35,000 Māori) in NZ indirectly at risk from rising sea levels, who may be unaware of this threat.

The research: Tom's research recognises the importance of the built and natural environments and their influences on people's social, cultural, and basic needs that contribute to wellbeing. Tom's team develops the models of risk, then works in collaboration with local councils, the Ministry for the Environment, and other agencies to ensure that these more comprehensive models are guiding planning and development.

The impact: Without a proper understanding of the risks, subsequent adaptation planning could occur too late, be directed to the wrong places, and be inequitable. From the loss of productivity alone, avoiding detrimental mental health impacts could save the NZ economy \$160 million/year. Key real-world impacts from the research include:

- Provide better evidence and improved techniques to guide public service planning and delivery by developing and demonstrating climate risk assessment methodologies that capture indirect effects of climate change and natural hazards.
- Improve understanding of resilience and risk, which enables communities to find effective interventions with co-benefits for people, the environment, and economy.
- Provide a new mode of delivering public services by supporting the development of an interactive dashboard so that the public can access and understand their climate change's risk and engage with decision-making processes surrounding climate adaptation.

