

Lessons learned from one of New Zealand's most challenging civil engineering projects: rebuilding the earthquake damaged pipes, roads, bridges and retaining walls in the city of Christchurch 2011 - 2016.

Abstract: Rebuilding with resilience? A case study of post-disaster infrastructure reconstruction in Christchurch, New Zealand

Story: A PhD thesis for the University of Cambridge: Rebuilding with resilience? A case study of post-disaster infrastructure reconstruction in Christchurch, New Zealand

Theme: Governance and Decision Making

An abstract which describes the content of Kristen MacAskill's full PhD thesis.

This document has been provided as an example of a tool that might be useful for other organisations undertaking complex disaster recovery or infrastructure rebuild programmes.

For more information about this document, visit www.scirtlearninglegacy.org.nz



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ABSTRACT

Post-disaster reconstruction is an opportunity to rebuild more resilient infrastructure and reduce the risk of future damage. While this opportunity may allow for rethinking a city and its aging infrastructure, this does not mean that decision makers can or will respond. Why is this the case? In light of the challenges faced in such situations, are the opportunities to ‘build back better’ as prevalent as one might think?

This thesis critically assesses the reconstruction process to identify factors that affect the ability of engineers to include resilience measures in rebuilding civil infrastructure systems. A conceptual framework is used to categorise measures for increasing strength and limiting future exposure. The research primarily involved a longitudinal case study of the reconstruction of public infrastructure in Christchurch, New Zealand, following major earthquakes in 2010 and 2011. It also involved a secondary case study of post-flood reconstruction in Queensland, Australia, to compare findings. Information was gathered through interviews with engineers, executives, politicians and other professionals involved in the reconstructions and through an analysis of documentation related to recovery.

The research is novel in its use of qualitative methods to examine what is traditionally seen as a technical process of infrastructure design. Key themes emerged that capture the wider, contextual factors that influenced the ability to increase infrastructure resilience. It was found that these factors **excluded opportunities to build back better**. More specifically, the research found that:

- **Funding mechanisms** proved to be a crucial issue; the reliance on central government funding limited the scope to enhance infrastructure resilience because funding was geared towards direct replacement of what had existed.
- Reconstruction is a multi-organisational, complex process and the **organisational arrangements** both facilitated and inhibited opportunities for enhancing resilience. The scope set for organisations can have an unforeseen impact, constraining decisions in a way that leads to sub-optimal outcomes.
- An **iterative approach to infrastructure planning and design** is a useful strategy for managing reconstruction. However, as recovery becomes increasingly financially constrained this limits investment in resilience measures.
- **Community interest** in the reconstruction can influence outcomes. Making decisions on the basis of urgency may not lead to community acceptance. This links to a more general risk where decisions made quickly to expedite the reconstruction process may ultimately cause delays later in the programme.

Case study analyses, as undertaken here, provide insight into the effectiveness of different pathways for recovery. The research findings will help decision makers make better informed choices for governance arrangements best suited to their situation.