

Christchurch Earthquake Recovery – an example of resilience and sustainability

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The term ‘resilience’ is increasingly being used in a multitude of contexts. Seemingly the latest ‘buzz’ word, it can mean many things to many people, in many different situations. In a natural hazard context, the terms ‘sustainable planning’, and ‘resilience planning’ are now being used, often interchangeably. This poster provides an overview of resilience and sustainability within a land use planning and natural hazard context, and discusses how they are interrelated in the situation of the earthquake impacted city of Christchurch, New Zealand.

Reconciling resilience and sustainability

Is a resilient community a sustainable one? In order to be sustainable, does a community need to be resilient? To assist in answering these questions, first we must understand what a resilient and sustainable community is. Figure 1 provides several examples from the literature to assist with this understanding.

Reference	Definition
Tobin, 1999, p. 13	Sustainable and resilient communities are defined as societies which are structurally organised to minimize the effects of disasters, and, at the same time, have the ability to recover quickly by restoring the socio-economic vitality of the community.
Berke et al., 2000, p. 104	Communities with a coherent land-use plan and hazard-mitigation strategy are able to build settlements that will be resistant to natural disasters, able to recover quickly from a natural event, and able to last for many years with little cost in dollars or lives to their inhabitants. These are resilient, sustainable communities.
UN Commission on Sustainable Development, 2002 (In Godschalk 2002, p.3)	Sustainable development seeks to meet present needs without compromising the ability of future generations to meet their needs, but it cannot be successful without enabling societies to be resilient to natural hazards and ensuring that future development does not increase vulnerability.

Figure 1: Explanations of sustainable and resilient communities.

The definitions provided here suggest that sustainability and resilience are not one and the same; rather, they are interdependently linked. The definitions also imply that a sustainable community can only be sustainable if it holds some degree of resilience. Figure 2 shows the relationship between sustainability, resilience and risk management.

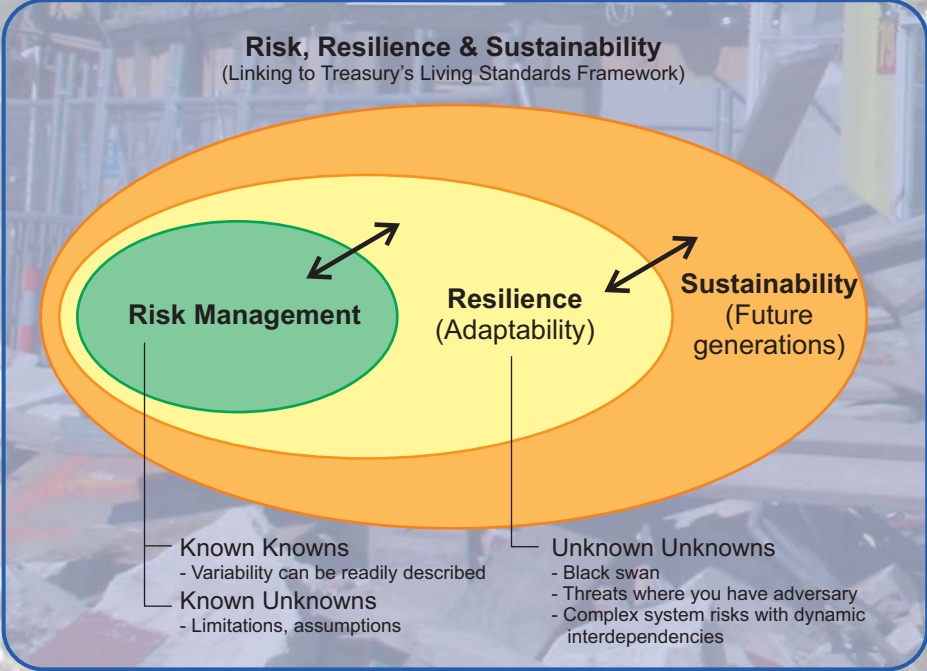


Figure 2: Resilience is related to both risk and sustainability (Blake, 2013, p6).

Planning response to the 2011 Christchurch earthquake

Due to the amount of liquefaction and land instability (i.e. rockfall and cliff collapse) that occurred in parts of Christchurch – and likelihood of continuing susceptibility to future events – a specific planning response was implemented. This included the introduction of the residential technical category (TC) zone system. Red zones were developed for the flat land subject to liquefaction, and for areas in the Port Hills susceptible to cliff collapse and boulder roll. Red zone land was classified as no longer suitable for development and retired - a sustainable land use response. Three TC zones were developed for areas generally considered to have a sufficiently low risk to life, where the land could be remediated independently of surrounding properties. This response has created both a sustainable and resilient approach to land use planning.

Post-disaster zoning in Christchurch – options for resilience and sustainability?

Following the earthquakes, land in the flat zone was divided into three technical categories for liquefaction: TC1 (grey), TC2 (yellow) and TC3 (blue), shown in Figure 3. These categories describe how the land is expected to perform in future earthquakes, and also describe the foundation systems most likely to be required in the corresponding areas:

- **Technical Category 1 (TC1, grey)** – future land damage is unlikely. You can use standard foundations for concrete slabs or timber floors.
- **Technical Category 2 (TC2, yellow)** – minor to moderate land damage is possible in future significant earthquakes. You can use standard timber piled foundations for houses with lightweight cladding and roofing and suspended timber floors or enhanced concrete foundations.
- **Technical Category 3 (TC3, blue)** – moderate to significant land damage is possible in future large earthquakes. Site-specific geotechnical investigation and specific engineering foundation design is required.

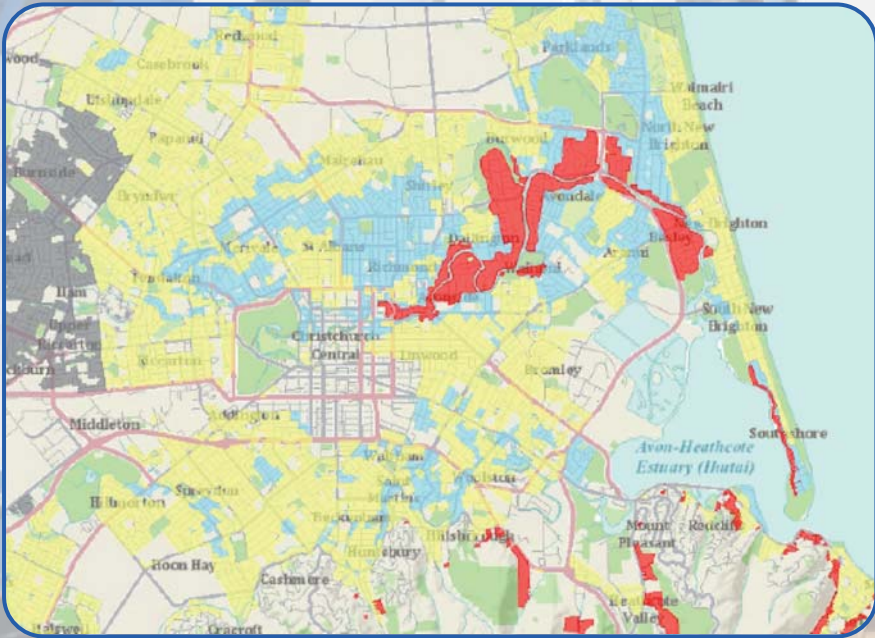


Figure 3: Map of greater Christchurch area showing red and TC zones developed for residential properties.

In contrast to the red zone - which requires the complete retirement of land to ensure a sustainable land use in the long term - the TC zones allow for adaptive measures to be completed so the land use can remain. By adapting engineering practices for foundations, resilience is improved (i.e. foundation requirement solutions) as is people's adaptive capacity. By adapting building and consent requirements, residential property owners can adapt to the new ground conditions and continue to live in these locations.

Summary

A resilient community should also be a sustainable community, for two reasons: to meet legislative requirements, and – more importantly – to ensure the needs of future generations are met: economically, socially, culturally, and environmentally. The ability to recover from an event, and in the process improve sustainable practices and adaptive capacity, is a positive outcome for communities.

Sustainability and resilience both have the ultimate aim of developing strong communities and creating places that are enjoyable and safe to live in over time. However, there are still some current definitions and frameworks that focus on resilience as a shorter term phenomena, whereby people are expected to adapt in immediate response to a disaster, or in the short term recovery phase. Sustainability is often related to longer term aspirations where the consideration of future generations is important. The differences between resilience and sustainability become most evident where recovery from a disaster is protracted – for example, where communities get hit by multiple events or recovery is long and hard. It is in such a context that short-term adaptations can actually lead to unsustainable practices in the long term, and that a more strategic overview on resilience and sustainability is required.

Christchurch provides examples of resilient (i.e. TC area zoning), and sustainable (i.e. red zoning), redevelopment during the recovery process. In order to be fully resilient and sustainable, a community also needs to incorporate other measures to accompany land use initiatives, such as providing engineering solutions for foundations, i.e. adapting to the changed environment so that communities can continue to live in TC zone areas. Another important contributor to resilience is ensuring that communities are engaged and empowered to take part in the land use planning process, so that they can effectively contribute to reducing their own risks before and after a disaster.

Acknowledgements:

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