

# Building the Carbon Case for Resilient Design

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## Outline

### Building the Carbon Case for Resilient Design

1

**Objectives**

2

**Background**

3

**Methodology**

4

**Next Steps**

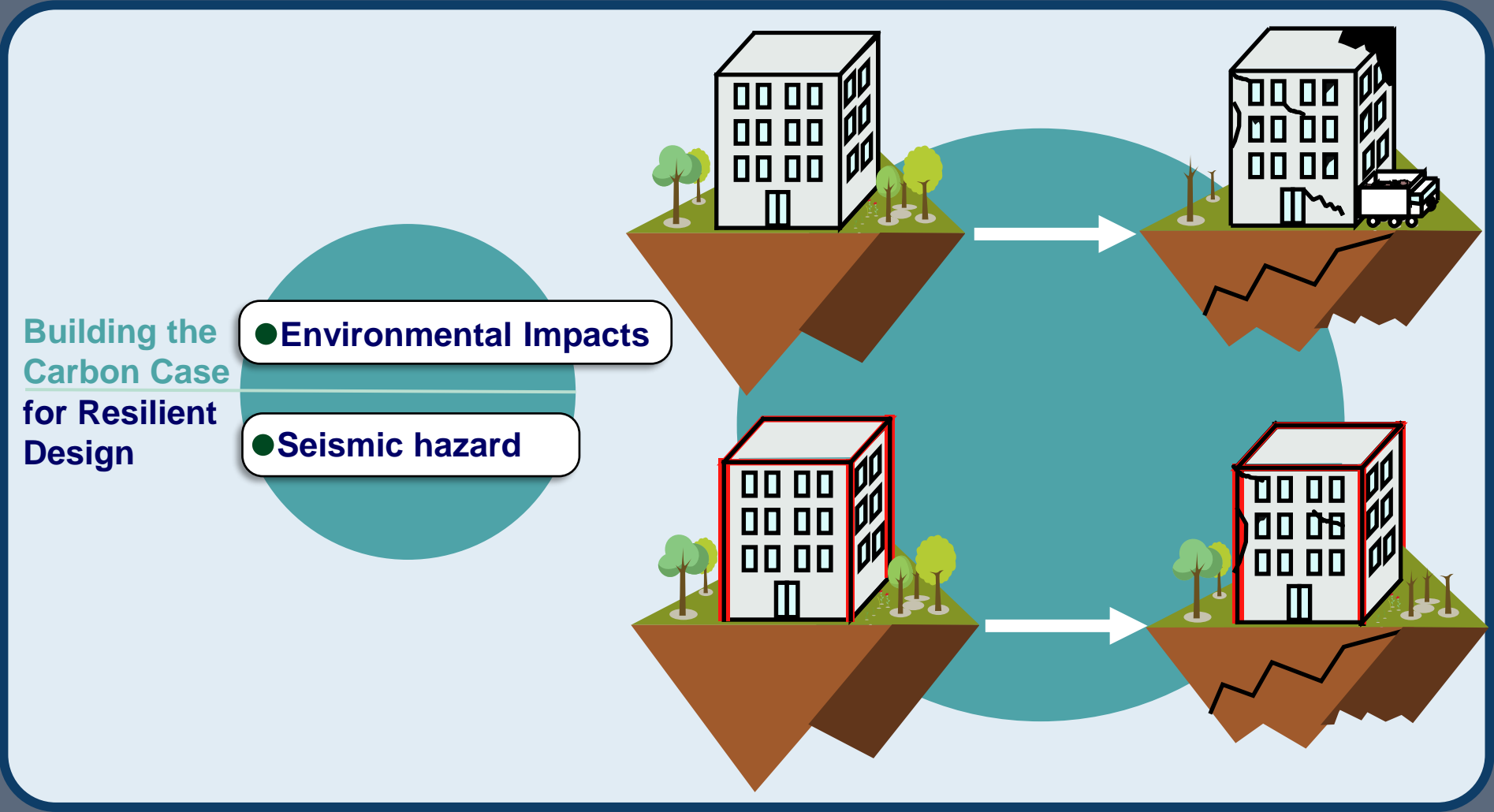
## Goals and Scope of Study

### Objective

This research aims to provide valuable insight into the **carbon cost of designing** seismically resilient buildings in New Zealand.

Calculate the environmental impact of the Canterbury Earthquake Sequence - Initial assessment to provide a baseline (Completed)

Quantify the carbon cost of designing seismically resilient buildings by comparing the life cycle environmental impacts of baseline buildings, and “above code” buildings considering environmental seismic losses.



### Environmental Context




Zero  
Carbon

Ambitious plan to tackle Climate Change  
- The Zero Carbon Amended



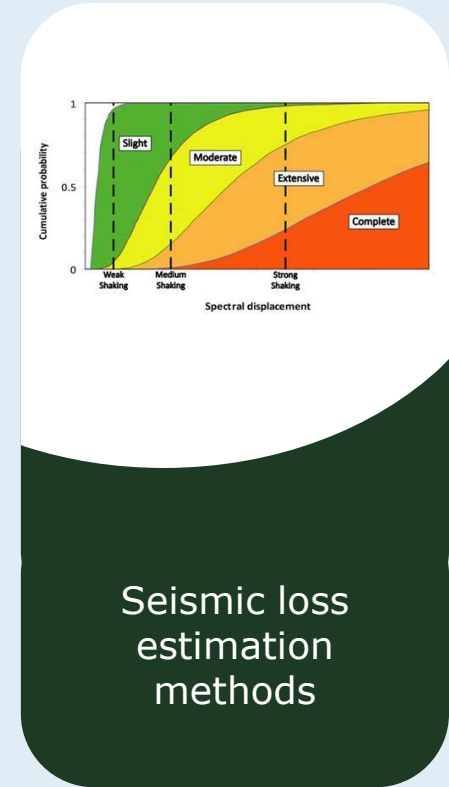
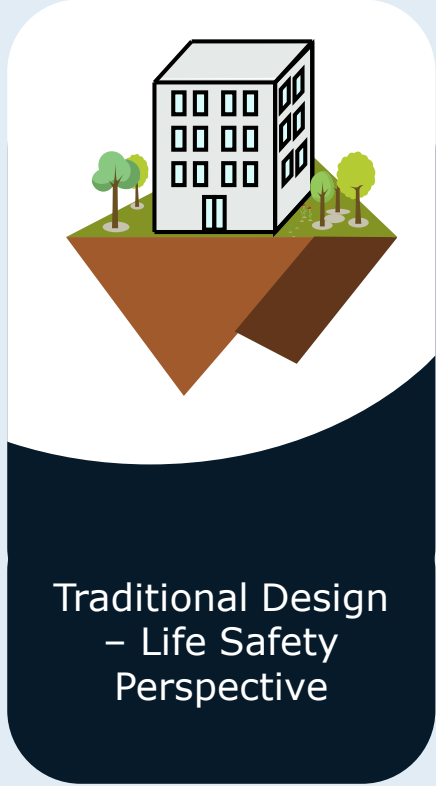
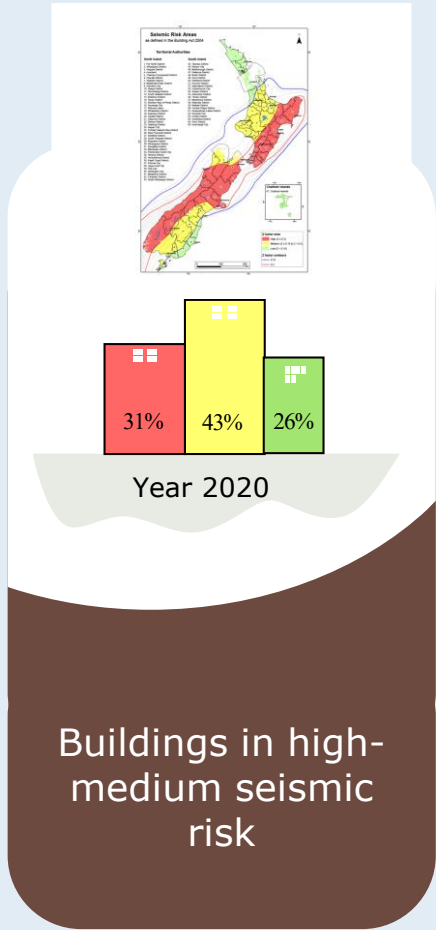
20%

Contribution of buildings' sector

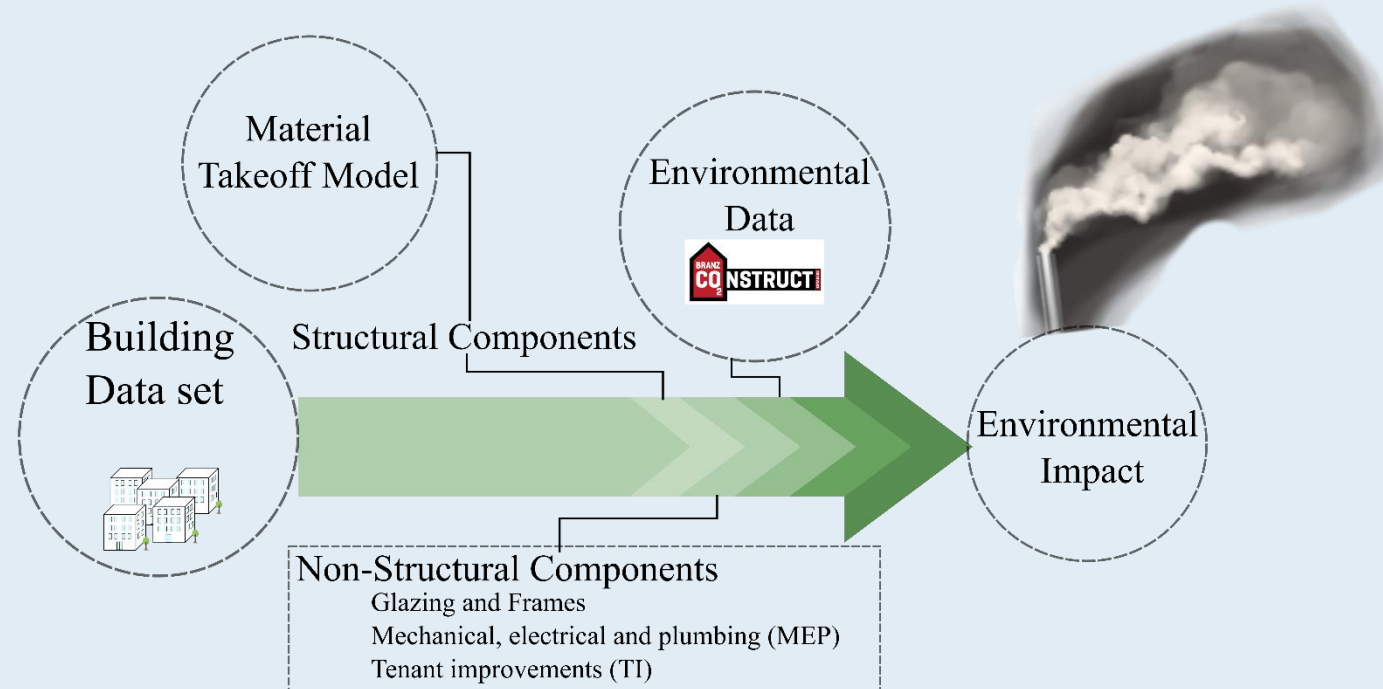


Life Cycle Assessment (LCA)

# Hazard Loss

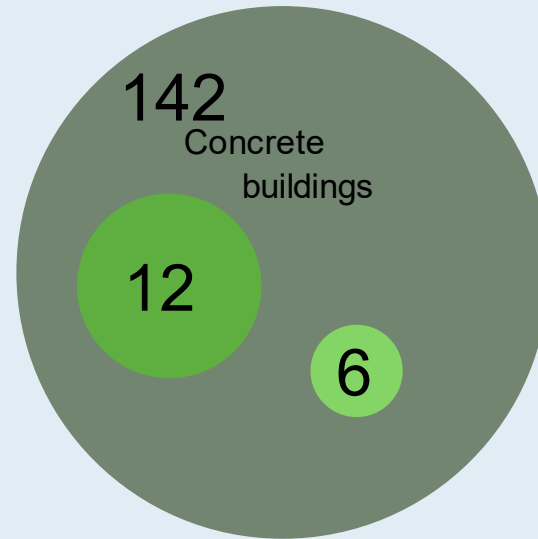


## The Environmental Impact of Demolitions in the 2010/2011 Canterbury Earthquake Sequence – Case Study



### Demolished Building Data Set

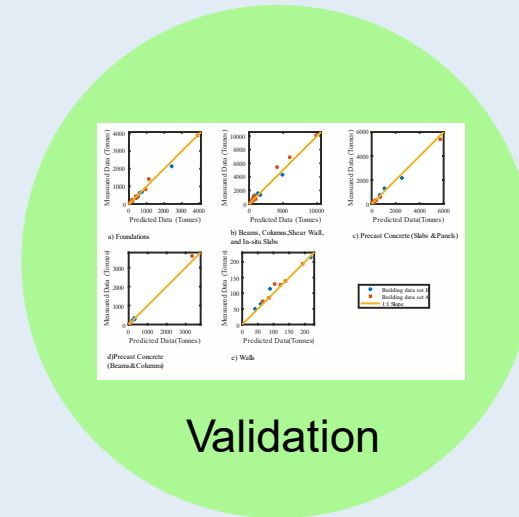
- Located within Christchurch CBD
- RC Buildings
- +3 storeys



Take-off model

### Components:

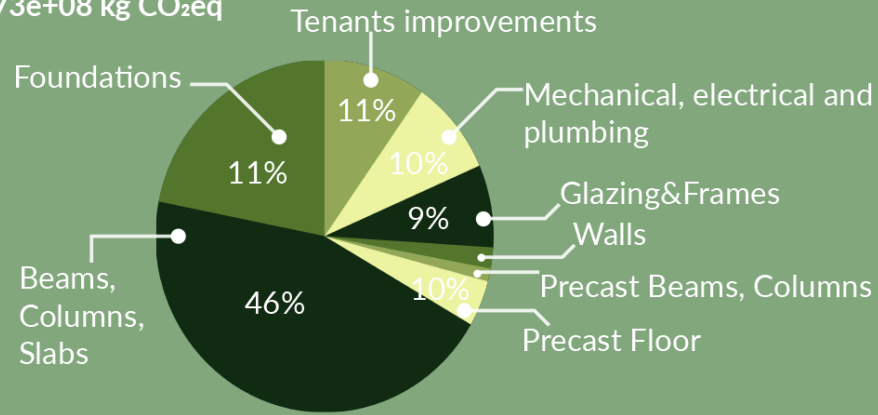
- Foundations
- Beams, columns and shear walls
- Precast components
- Floor systems
- Walls



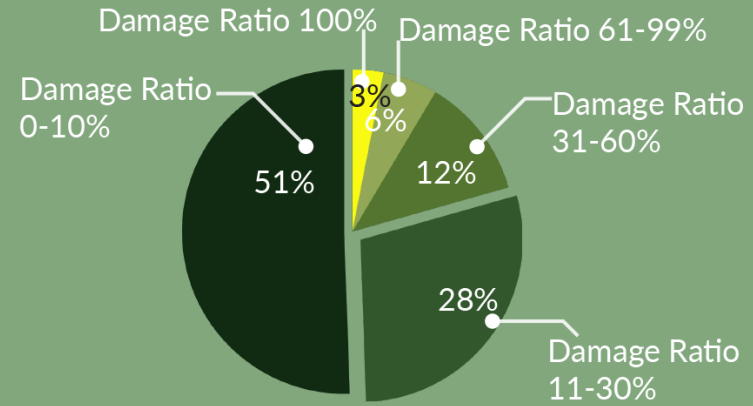
Validation



Embodied carbon (A1-A3)  
2.73e+08 kg CO<sub>2</sub>eq



Structural and Non-Structural Components



Total Embodied Carbon and Energy

- 1
- 2
- 3
- 4

# Redesign for Higher Performance using PBEE (Performance Based Earthquake Engineering)

Redesign buildings for a seismic higher performance



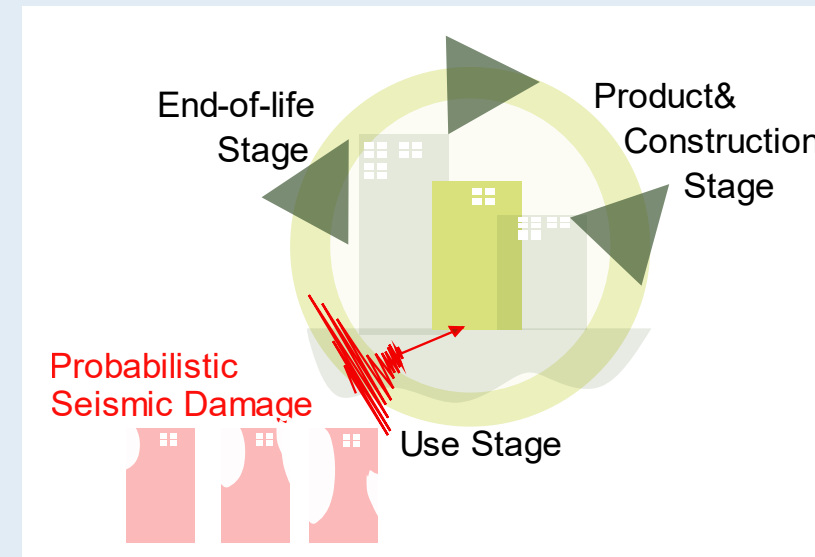
Current Standard

Above Current Standard

Low Damage Design

## Environmental Impact Assessment

- Estimate structural and non-structural response using probabilistic tools. (Fragilities Curves from PACT and SLAT)
- Environmental impact assessment



- 1
- 2
- 3
- 4

