

Using Tertiary School Building Performance to Define Post-Disaster Functional Timeframes for Community Recovery and Resilience

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Introduction -

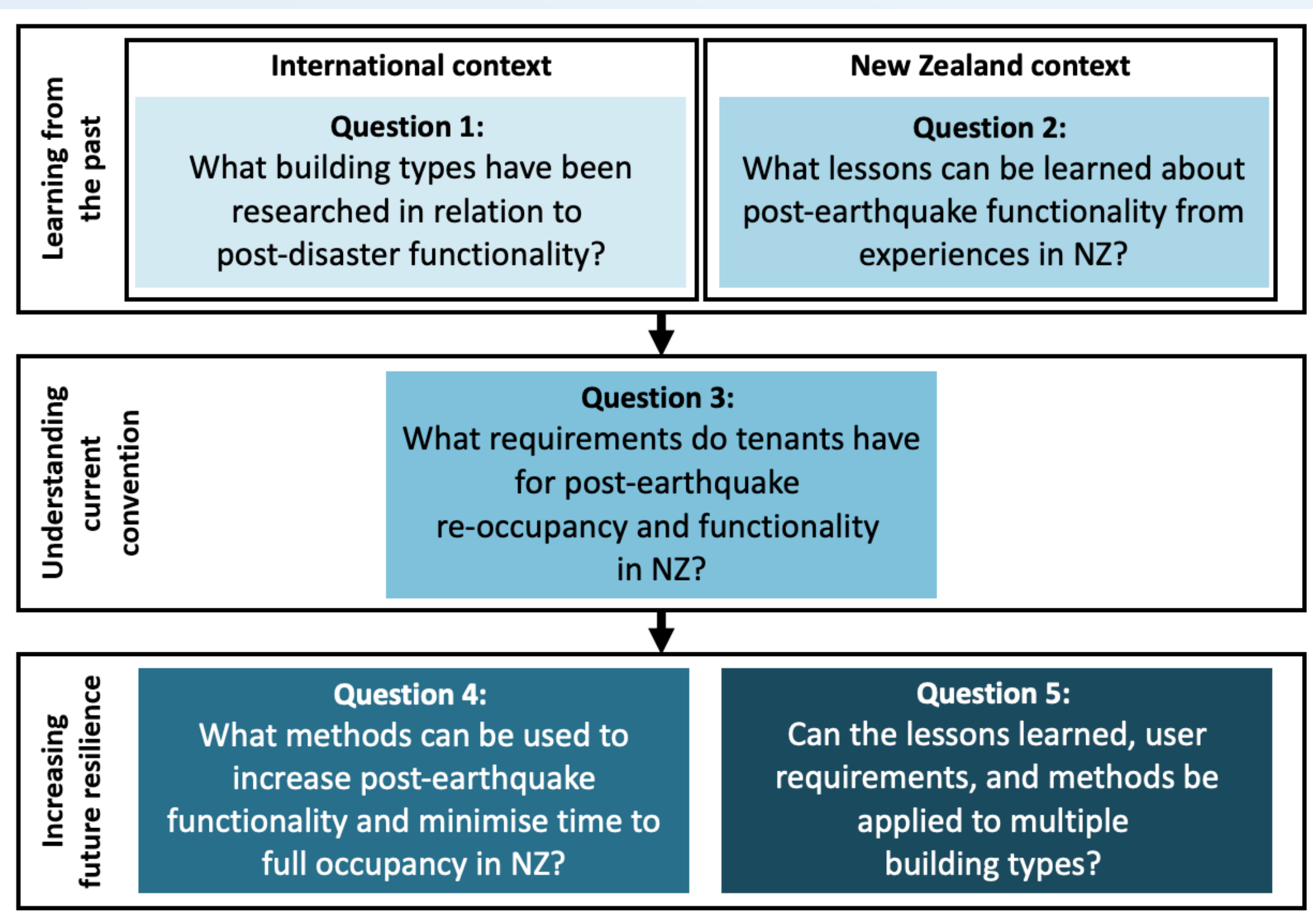
Building damage resulting from earthquake events can lead to extensive losses for communities, including direct losses, such as casualties and expenditure for repairs, and indirect losses, such as lost productivity and decreased well-being. Current building codes are focused on achieving life safety standards, meaning no deaths occur; however, there are no requirements for the building to be repairable or functional, thus increasing recovery times for impacted communities. Increasing post-earthquake building functionality—that is, the ability of the building to provide its intended service—has become a topic of interest over the last two decades.

Functionality states beyond life safety have been defined: re-occupancy, where the building can be used safely for shelter; functional recovery, where the building can perform a basic level of service; and full functionality, where the building is returned to its pre-earthquake state.

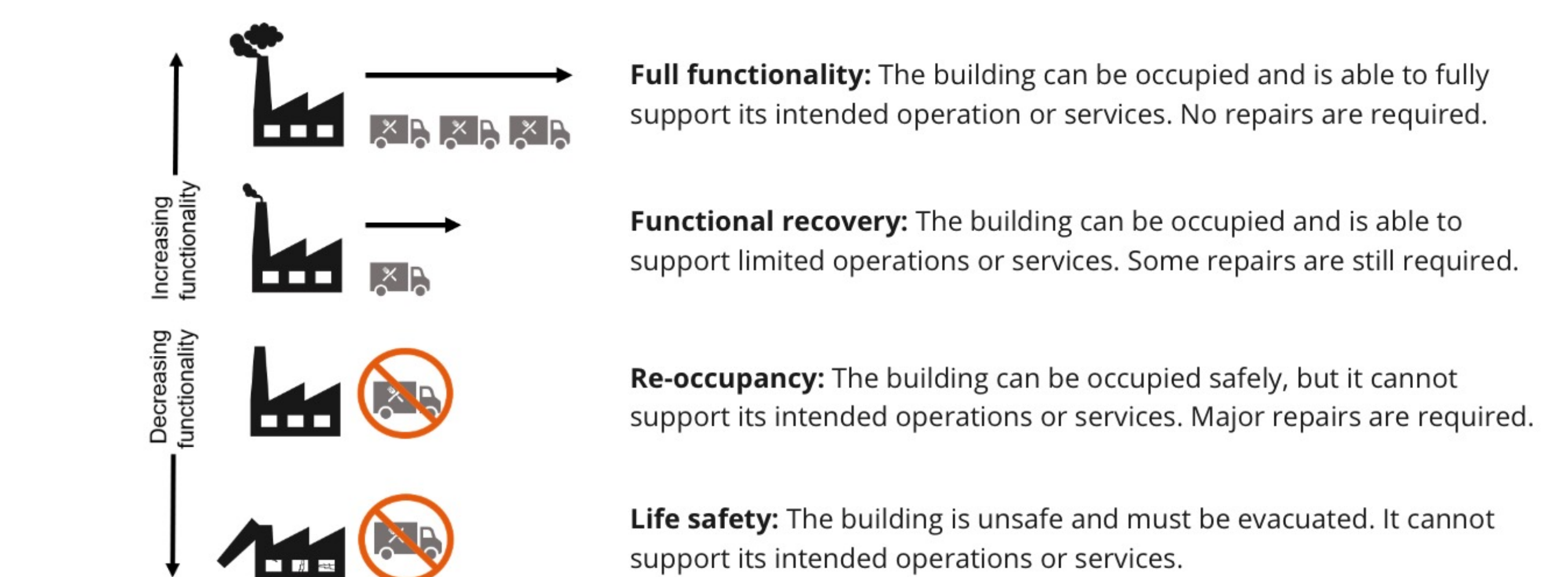
Due to the disruptions caused by the 2010/2011 Canterbury earthquake sequence, New Zealand government organisations have expressed an increased interest in moving beyond the current life safety codes to increase resilience. However, no substantial research has been performed on what is required to achieve higher functionality states in a New Zealand context.

New Zealand tertiary education institutions were chosen as a case study, as their facilities offer similar functions to other buildings in the community (e.g., libraries, office buildings, cafes, auditoriums). Research objectives include learning from institutions that experienced the 2010/2011 Canterbury earthquake sequence, understanding the requirements and needs of institutions nationwide, and, after the framework is developed, investigating its applicability to other buildings. These objectives are presented along with other research information, including required resources, timelines, risks, and ethics information.

The Study -



Functionality states



Components to consider

- Structural components
- Non-structural components
- Architectural components
- Utilities
- Contents
- Furniture
- Personnel

Survey – Addressing Question 3: What requirements do tenants have for post-earthquake re-occupancy and functionality in NZ?

The survey asks participants (building users) to identify the space’s intended function, users of that space, damage thresholds for continued use, and utility requirements.

Workshop – Additional workshops with Facility Managers and Administrators will address functional requirements from an owner’s perspective.

Initial Results – The first version of the survey was run in early 2023. This survey only had a few participants complete it, but they provided useful feedback for improving the survey length and clarifying the questions. Some of the results from this survey specific to lecture halls are shown below.

University facilities

- Lecture halls
- Halls of residence
- Classrooms
- Computer labs
- Dry labs
- Wet labs
- Library
- Study areas
- Specialist areas

What is the function of these spaces for each functionality state?

What components are required to support these functions?

Lecture halls

Functionality state definitions

- **Full functionality:** The building can be occupied and is able to fully support its intended operation or services. No repairs are required.
- **Functional recovery:** The building can be occupied and is able to support limited operations or services. Some repairs are still required.
- **Re-occupancy:** The building can be occupied safely, but it cannot support its intended operations or services. Major repairs are required.
- **Life safety:** The building is unsafe and must be evacuated. It cannot support its intended operations or services.

Components to consider

- Structural components
- Non-structural components
- Architectural components
- Utilities
- Contents
- Furniture
- Personnel

What is this space's function? Who uses this space?

Students Staff Clubs

What components are required for full functionality (i.e., function under business as usual)?

All Primary Components should be operational Structural components Architectural components Utilities Furnishings personal & human resources

What types of activities should be able to occur during functional recovery?

Lectures Meetings & workshops

What components are required to support functional recovery?

Essential components for the building Utilities (electricity and natural gas) Security Systems Architectural features and lifts not required

What components are required for re-occupancy?

All Structural Components require to bear live loads Furnishings and architectural features not required

Ongoing work – A new version of the survey is currently running to collect opinions on the functional requirements of Tertiary Educational facilities. The results will be used to create a mechanism for understanding and quantifying functionality for higher education and buildings with similar uses or occupancies.

Have Your Say



Take Our Survey

