GEOG 402
Sustainable and Resilient Cities

Valuing Sensitive Infrastructure in a Medium Coastal Hazard Zone: A Case Study from Woolston, Christchurch

---

Isabella Jensen, Florence Mckenzie, Jorja Mulholland

University of Canterbury
30th May 2025

Jensen, I., Mckenzie, F., Mulholland, J. (2025). Valuing Sensitive Infrastructure in a Medium Coastal Hazard Zone: A Case Study from Woolston, Christchurch. As part of the GEOG402 Sustainable and Resilient Cities course, University of Canterbury, 2025

Table of Contents

Acknowledgements:

We would like to acknowledge the contribution and support of the following individuals and groups in completing this report: Holly Gardiner, Anita Hansbury, Emily Stevens**,** Karen Banwell, Jillian Frater, and members of the Woolston community.

1.0. Abstract

Coastal hazard exposure is increasing in Ōtautahi Christchurch due to sea-level rise and land subsidence. While high-risk areas have received considerable attention, less is known about how communities in medium-risk areas value local sensitive infrastructure. This study explores how residents of Woolston, a low-lying suburb within a medium coastal hazard zone, perceive and value facilities such as schools, medical centres, and aged care facilities. Data was collected through a combination of online and in-person, surveys and interviews. Findings show that residents place strong value on these services, not only for practical access, but for their role in supporting wellbeing, social connection, and equity. Relocation of facilities was widely viewed as potentially harmful, particularly for vulnerable groups. The results emphasise the need for inclusive, socially responsive adaptation planning that addresses not just physical exposure, but also the social foundation that underpins community resilience.

2.0. Introduction & Research Aims

Coastal hazard exposure is intensifying in Ōtautahi Christchurch due to ongoing land subsidence and sea-level rise, increasing the frequency and severity of flooding events (Paulik et al., 2019). Low-lying suburbs across Christchurch are increasingly exposed to climate-related hazards. Woolston, for example, is situated largely within a medium coastal hazard zone: an area projected to experience moderate to high flooding and storm surges within the next 50 to 100 years (Christchurch City Council [CCC], 2021). Despite advances in hazard mapping and technical assessments, translating this knowledge into policy remains difficult. Strategies such as managed retreat or restrictions on new development remain politically and socially challenging, especially in areas where strong community ties and essential services intersect with hazard risk (CCC, 2021; Ministry for the Environment [MfE], 2024).

Sensitive infrastructure, including schools, libraries, aged care facilities, community centres, and medical services, play a critical role in daily life and significantly contribute to social wellbeing and resilience. In hazard-prone environments, the presence, accessibility, and perceived importance of such infrastructure can shape how the community responds to risks, and should inform coastal adaption decisions (Latham & Layton, 2019; Mouratidis, 2017; Zahnow, 2024). While extensive research has been conducted in high-risk areas, medium-risk zones like Woolston have not yet been the focus of active planning.

This study examines how Woolston residents perceive and value their local sensitive infrastructure in relation to coastal hazards. By focusing on a medium-risk location, the research aims to inform Christchurch City Council's decisions on whether future development of sensitive infrastructure is appropriate, or whether long-term managed retreat should be prioritised. Findings will be provided to the council to ensure that community values and perspectives are incorporated into ongoing coastal adaptation planning. In this report, the term 'sensitive infrastructure' is used as defined by Christchurch City Council as infrastructure that supports vulnerable populations, such as, medical centres, schools, and aged care facilities. While this term guides the primary data collection and analysis, existing literature more commonly refers to 'social infrastructure,' a broader concept encompassing facilities, spaces, and services that promote social connection and community wellbeing. Given the shared focus of these terms, social infrastructure is used throughout the literature review as a proxy to explore relevant themes.

3.0. Background & Context

3.1. New Zealand Sea Level Rise

Sea-level rise (SLR) is a significant and severe consequence of climate change, with projections for Aotearoa New Zealand indicating a rise of 0.2-0.3 m by 2050, and between 0.4-1.2 m by 2100 (MfE, 2024). Despite these estimates, the exact rate and scale of SLR remains uncertain due to complex interactions within earth's systems, such as ice sheet stability and ocean heating. This uncertainty complicates land-use planning. While scientific understanding of these systems is growing, socio-political uncertainty persists regarding the rate of global emission reductions. In Aotearoa, SLR intensifies existing coastal hazards including flooding, erosion, and salinisation of freshwater systems (MfE, 2024). These hazards can occur as both slow-onset processes, such as progressive inundation and shoreline retreat, and as rapid-onset events like storm surges and flash flooding (Dawe, 2008; MfE, 2024). As a result, communities face compounding and cascading risks. National guidance emphasises the need for adaptive planning that accounts for a range of future scenarios. Key priorities include integrating risk assessments with community's priorities, infrastructure vulnerability, and long-term resilience goals (MfE, 2024).

3.2. Effects of Sea Level Rise on Christchurch

Ōtautahi Christchurch is one of Aotearoa's most exposed cities to coastal hazards, with approximately 25,000 properties at risk over the next 120 years (CCC, 2022). The city faces

three major hazards that are intensified by climate change: coastal flooding, coastal erosion, and rising ground water. Coastal flooding can occur even on calm days during high tides, while erosion and groundwater rise increasingly threaten land and infrastructure stability (CCC, 2022). Alongside the major destructive hazards there are also many hazards that are subtle or unseen, such as rising groundwater, yet their long-term effects can be significant. With over $1 billion of local government infrastructure in Canterbury at risk, a majority of which is in Christchurch, these challenges require forward-thinking and adaptative solutions (Simonson & Hall, 2019). The replacement value of buildings potentially exposed to 1 m of sea level rise in Christchurch is estimated to be $6.7 billion, primarily in residential areas (Paulik et al., 2019). In response, Christchurch City Council is implementing a phased, community-led approach to adaptation planning, beginning with areas most likely to experience short-term impacts (CCC, 2022).

3.3. Christchurch City Council's Plan Change 12

To address the growing risks posed by sea-level rise and coastal hazards, Christchurch City Council (CCC) is currently developing Plan Change 12 (PC12). This builds on the existing 2022 Coastal Adaptation Framework, which aligns with the New Zealand Coastal Policy Statement 2010, and the 2017 Ministry for the Environment's Coastal Hazards and Climate Change Guidance for Local Government (Bell et al., 2017; Department of Conservation [DoC], 2010). PC12 outlines long-term planning for climate resilience by updating the district plan to avoid exposing new developments to hazards such as coastal flooding, erosion, rising ground water, and tsunami. It takes a risk-based approach, supporting development in low-risk areas while proposing restrictions in medium to high-risk areas, aiming to minimise future vulnerability to people, property, and infrastructure.

A defining feature of PC12 is its emphasis on community engagement. The council continues to seek and integrate public input as the plan evolves. This report contributes to that process by investigating how residents of Woolston, a suburb identified as medium-risk, value their local sensitive infrastructure. The term refers to facilities that serve vulnerable populations, such as schools, medical centres, and aged care homes. By exploring community perspectives on the importance and accessibility of these services, this research evaluates whether ongoing development of such infrastructure is appropriate given escalating coastal hazard risks.

3.4. Location of Study: Woolston

The suburb of Woolston (Figure 1) is located southeast of Christchurch's central city, near the coast, and was selected as the case study site due to its exposure to medium-risk coastal hazards. As of the 2018 Census, Woolston had a population of approximately 8,400 residents and a median age of 37.6 years, indicating a demographically diverse population that includes young adults, working individuals, and older residents, all of which are likely to hold differing views on infrastructure needs and hazard risk (Stats NZ, n.d.). As shown in Figure 2, most of Woolston lies within the medium-risk coastal hazard management area, as defined by CCC. This classification is based on projected flood depths under two SLR scenarios aligned with the Ministry for the Environment's Coastal Hazard Guidance (Bell et al., 2017). The first scenario involves flood depths between 50 cm and 1.1 m at 60 cm SLR (projected for 2080), while the second involves depths greater than 1.1 m at 1.2 m of SLR (projected for 2130). The 50-year scenario carries higher certainty; however, the 100-year projection, while more uncertain, remains critical for long-term planning (CCC, 2021). PC12 focuses on proactive adaptation in these medium-risk areas, where hazards are not yet immediate but are expected to intensify. Given these factors, Woolston was chosen as a study site, with the perspectives of its residents intended to inform future land-use planning in light of emerging risk.

Figure 1: Location of Woolston Suburb, displaying proximity to the coast (Source: Google Earth Pro, 2025).

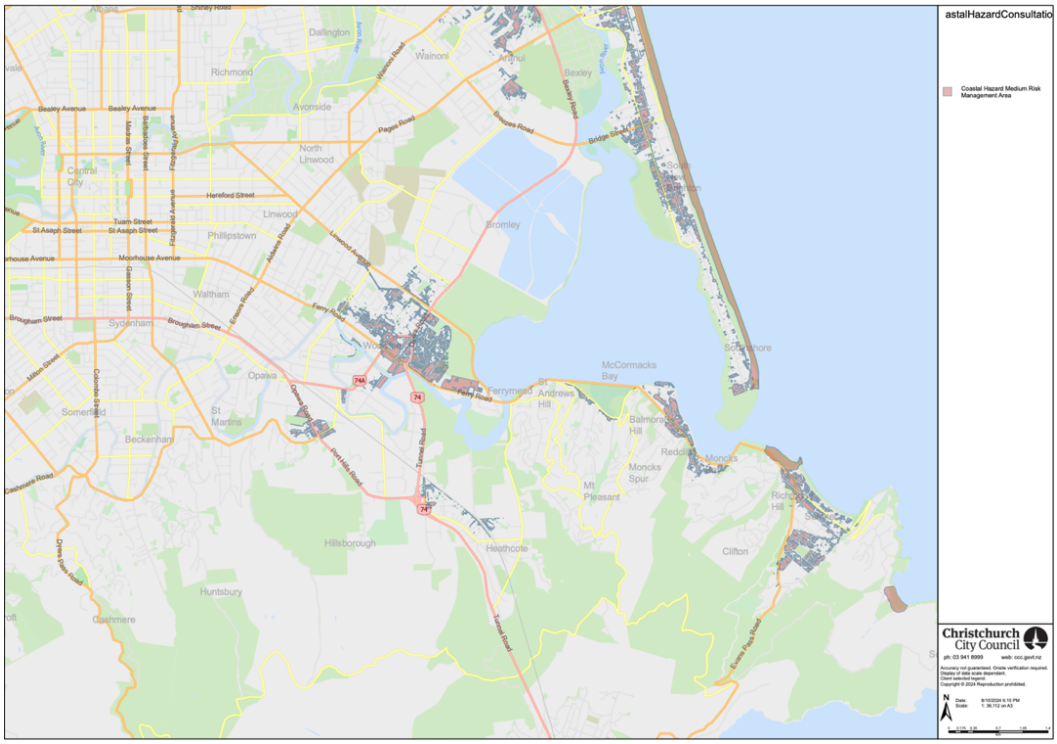

Figure 2: Map of southeastern Christchurch showing medium coastal hazard risk management areas (Source: Christchurch City Council, 2024).

4.0. Literature Review

4.1. Governance, Policy, and Land Use Planning

Protecting communities from coastal hazards is identified by the Christchurch City Council (CCC) as a key issue to be addressed through district plan changes (CCC, 2022). The Resource Management Act 1991 (RMA) assigns regional and territorial councils' responsibility for the "avoidance or mitigation of natural hazards" (Resource Management Act, 1991, ss 30–31). Under Policies 24 and 25 of the New Zealand Coastal Policy Statement (NZCPS), councils are required to assess coastal hazard risks and avoid redevelopment in areas where these risks may intensify (DoC, 2010).

Land use change is widely recognised as one of the most effective tools for reducing natural hazard vulnerability (Beban & Gunnell, 2019). However, applying the NZCPS and RMA has proven challenging due to the absence of a consistent national framework (DoC, 2017; MfE, 2024). The current development of a National Policy Statement (NPS) for Natural Hazards seeks to address this gap. In its submission, CCC emphasised the need for clearer national direction on avoiding new development in high-risk areas, and improved definitions of risk (CCC, 2023).

While the RMA remains the primary legally binding policy for natural hazard planning, its limitations have led to the development of additional guidance, such as the Coastal Adaptation Framework (MfE, 2017 & 2024). However, this framework is non-binding, it

provides strategic direction without legal obligation. Despite this, CCC is actively aligning its planning efforts with the framework's principles, particularly in areas highly vulnerable to coastal hazards. This reflects a proactive, locally tailored commitment to implement adaptation in the absence of formal enforcement (CCC, 2022).

A review of Christchurch's earthquake recovery highlighted red zoning as a notable example of using land use policy to withdraw populations from high-risk areas (Saunders & Becker, 2015). However, the process was criticised for undermining wellbeing by limiting community input and decision-making power. In contrast, where land use rules in "green zones" were modified to enable adaptive measures, communities experienced greater resilience and more stable wellbeing (Saunders & Becker, 2015).

Beban and Gunnell (2019) further argue for integrating social vulnerability into land use planning. They propose a definition for "vulnerable activities" based on how sensitive certain land uses are to natural hazards. However, Grace et al. (2019) caution that this approach is constrained by existing use rights and long-standing neoliberal assumptions around private property. As a result, councils often focus on limiting new development, particularly for sensitive infrastructure, rather than revisiting existing uses.

Ultimately, the literature suggests that in using land use tools to reduce exposure to coastal hazards, councils must critically assess both the effectiveness and equity of their interventions. Adaptation decisions should balance hazard avoidance with broader considerations of community wellbeing (Archie et al., 2024).

4.2. Community Resilience, Social Infrastructure, and Accessibility

Social infrastructure, a term used in the literature to describe community spaces, services, and facilities that enable social connection, is consistently identified as essential to community wellbeing and resilience in the face of coastal hazards (Latham & Layton, 2019; Zahnow, 2024). In this context, resilience is defined as a community's ability to absorb, resist, recover from, and adapt to hazards (Wang et al., 2023). While this report focuses on sensitive infrastructure, as outlined by CCC, it aligns closely with the broader concept of social infrastructure. Both emphasise the importance of accessible services and spaces in supporting community cohesion and wellbeing. Accessibility is particularly critical, as it underpins both immediate hazard response, alongside long-term resilience. Without accessible social infrastructure, vulnerable groups, such as the young, elderly, disabled, and economically disadvantaged, have a reduced capacity to withstand hazards and maintain quality of life (Archie et al., 2024; Latham & Layton, 2019).

Accessibility is multi-dimensional, encompassing physical (proximity, transport), social (inclusivity), and economic (affordability) factors (Geurs & Van Wee, 2023; Wang et al., 2023). Local Christchurch data, such as the *Life in Christchurch Survey* and the 2018 Census, reinforce these findings. While many Christchurch residents rely on private vehicles for commuting, a significant proportion of younger, older, and disabled residents depend on public transport for daily travel (CCC, n.d.; Stats NZ, n.d.). These groups may face increased barriers if social infrastructure is relocated inland as a part of retreat strategies, highlighting the risk of increased inequity if accessibility is not integrated into adaption planning.

4.3. Lessons from Case Studies and Broader Research

New Zealand case studies further emphasis the need to integrate accessibility into adaption strategies. In Hawke's Bay, a proactive, community-informed approach prioritised both risk reduction and the preservation of social infrastructure, leading to public trust and increased resilience. In contrast, the Coromandel initially relied on reactive, structural measures that created accessibility challenges. A later shift toward inclusive, risk-based planning only occurred as a reactive measure to a major storm event (Schneider et al., 2020). These examples highlight the importance of accessible climate information, ongoing community engagement, and public trust in adaptation efforts.

While accessibility is undoubtedly an important concept in coastal adaptation, New Zealand research by Archie et al. (2024) reveals an important perspective. Through modelling different adaptation strategies, they found that focusing solely on maintaining accessibility can unintentionally increase vulnerability to other hazards or allow risk exposure to persist. A balanced approach that incorporates both risk aversion and accessibility was identified as the most effective, though it involves inevitable trade-offs.

International literature has determined similar conclusions, emphasising that successful adaptation must be tailored to local social, and economic contexts to avoid maladaptation and inequitable results (de Almeida & Mostafavi, 2016; Woodruff et al., 2020). The case of Victoria, Australia, illustrates the consequences of rigid, top-down planning that overlooked economic accessibility and led to costly inequitable outcomes (Macintosh, 2012).

Collectively, the literature demonstrates that sustainable coastal adaptation requires the integration of physical, social, and economic considerations, a multidimensional approach that will be essential for Christchurch's ongoing resilience efforts.

5.0. Methods

5.1. Survey

A survey was conducted to explore how Woolston residents' value local infrastructure in the context of coastal hazards. It aimed to assess the role these facilities play in daily life and the potential impacts of their relocation. The survey was developed and distributed using the Qualtrics platform (Appendix A), selected for its efficiency, accessibility, and low implementation cost.

The survey consisted of eight questions designed to gather data on key research components, including participant demographics, perceived importance of specific facilities, proximity to those facilities, and the expected impacts of potential relocation. Given the subjective nature of 'value,' previous research has noted that valuation studies often infer participants preferences rather than capturing them directly (Warren et al., 2010). To address this, participants were asked to identify which aspects of local infrastructure they regularly use. Numerical response options were provided to facilitate quantitative analysis, while also allowing participants to mention additional facilities they considered important. As the official boundaries of Woolston are inconsistent, respondents were encouraged to self-identify as Woolston residents based on their own understanding of the community.

5.2. Data Collection

Following ethics approval by the delegated course coordinators by the University Ethics Committee and the community partner, the survey was distributed using a combination of in-person interviews and online dissemination.

On April 16, 2025, in-person interviews were conducted in key public locations across Woolston, including the main street, community hubs, and shopping areas. To expand participation, the survey was also shared in the 'Woolston Neighbourhood, Christchurch, NZ' Facebook group. The online post included a brief explanation of the research and a link to participate. Data collection continued for two weeks following this release.

This mixed-method approach enabled the capture of a diverse sample and enhanced both the reliability and generalisability of the results by reaching individuals who may not have been present in public spaces during interviews.

5.3. Data Analysis

All survey responses were collated in Microsoft Excel for data processing and analysis. Responses were cleaned and grouped to support the categorisation of open-ended answers and enable numerical analysis. Key results were presented in the form of tables and graphs, allowing for clear visual comparisons between variables and themes.

For contextual comparison, data was also drawn from the *Life in Christchurch Neighbourhoods Survey,* an external dataset retrieved from the Christchurch City Council database (CCC, 2024).

5.4. Life in Christchurch Neighbourhood Survey

The *Life in Christchurch Survey* is an annual initiative conducted by the Christchurch City Council to gather residents' perspectives on their local communities (CCC, 2024). Each year, it focuses on different themes related to community life and wellbeing. In 2024, the survey addressed neighbourhood's perceptions, experiences, and adaptive capacity in the face of change.

The survey used a snowball sampling method, encouraging participants to share the link within their communities. This approach broadened the surveys reach, resulting in a robust sample of 5,420 respondents in 2024. Topics covered included neighbourhood characteristics, sense of community, favourite places, areas for improvement, and responses to hazard adaptation. Although Woolston is geographically located between the Heathcote and Cashmere areas, this study uses data from the Heathcote community, gathered within the *Life in Christchurch Survey*, as a proxy for Woolston due to the lack of specific information to Woolston.

6.0. Results

6.1. Demographics

A total of 26 responses were collected from Woolston residents through the primary survey, including 11 in-person interviews and 15 online submissions. Responses were relatively balanced across age groups, although some variation was noted (Table 1). The 25-34 age group is notably over-represented at 29%, while the 45-54 age group is under-represented at four percent.

Table 1: Percentage and count of participants in each age category.

Age Category (Years)	Percentage	Count
18-24	13%	3
25-34	29%	7
35-44	20%	5
45-54	4%	1
55-64	20%	5
64 +	13%	3

Table 2 presents the length of residency among participants. Most had either lived in Woolston for less than 1 year (32%) or more than 10 years (36%), indicating a concentration of both new and long-term residents. No respondents reported living in Woolston for 6-10 years.

Table 2: Timed lived in Woolston suburb by percentage and count.

YEARS	PERCENTAGE OF PARTICIPANTS	COUNT
Less than 1 year	32%	8
1-3 years	27%	6
3-6 years	5%	1
6-10 years	0%	0
10+ years	36%	7

6.2. Facility Importance Ratings

Figure 3 shows participants ratings of the importance of various community facilities. Schools, medical centres, and community centres were most frequently rated as 'extremely important,' each receiving eight votes. Community centres stood out further, receiving the highest number of 'very important' ratings (12 respondents), reinforcing their value to residents. In contrast, retirement homes and care facilities were rated lower in importance, especially by participants outside the typical user age groups. Similarly, respondents

without children often rated schools and preschools as less important, highlighting how life stage influences perceived infrastructure value.

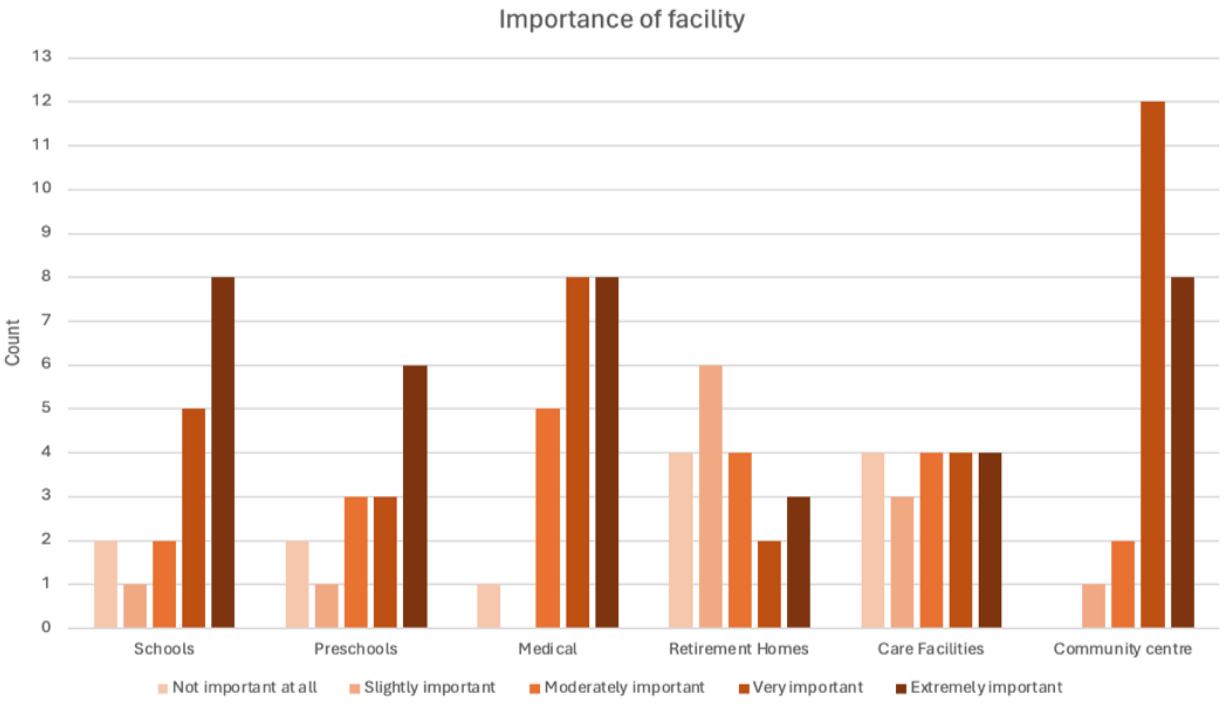

Figure 3: Perceived importance of facilities, as rated by respondents on a scale from 'Not important' to 'Extremely important'.

6.3. Willingness to Travel and Modes of Transport

Figure 4 outlines how far participants would be willing to travel if facilities were relocated outside of Woolston. The most common response across all facility types was 0-10 minutes. Few participants were willing to travel 20-40 minutes, and only two respondents said they would travel up to one hour for retirement homes or care facilities.

Only one participant reported being willing to travel over an hour for schools, medical services, and community centres. This could reflect that some individuals already travel these distances for services, even if alternatives exist locally.

Table 3 summarises participants main transport modes. The car was the most frequently used method with 52%. Active modes of transport such as walking and biking/scootering had a recorded use of 21% and 17% respectively. Only seven percent of participants selected catching the bus as their mode of transport, suggesting limited reliance on public transport.

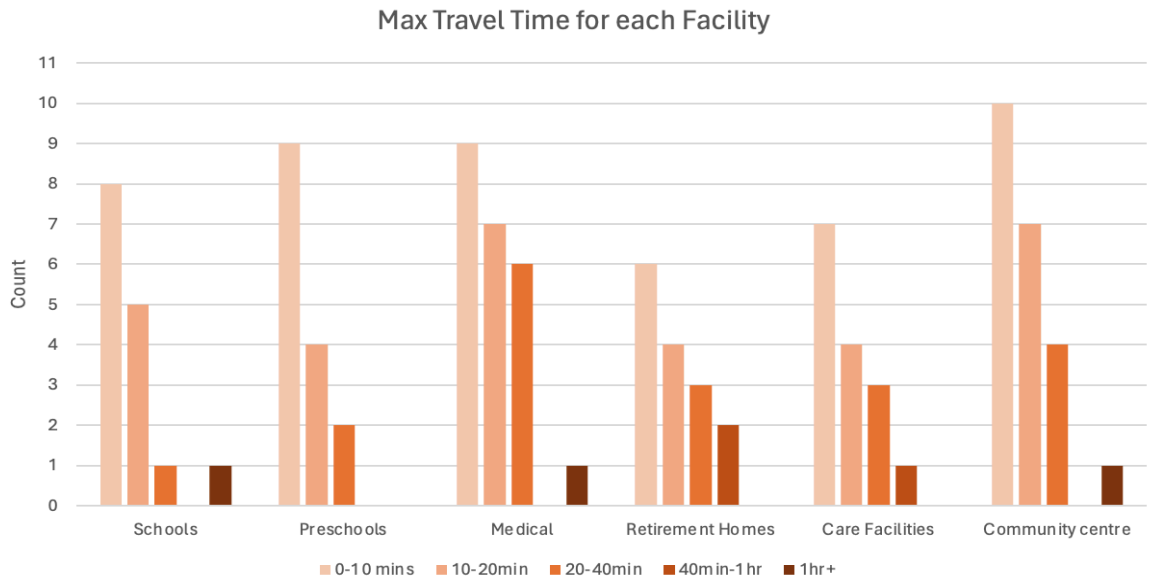

Figure 4: Maximum travel time participants are willing to commute to a facility if relocated.

Table 3: Main modes of transport used by participants (percentage).

Mode of transport	Percentage of use
Car	52%
Walk	21%
Bike / Scooter	17%
Bus	7%
Other	3%

6.4. Impacts and Perceived Consequences of Relocation

As illustrated in Figure 5, community centres and medical services were identified as the most impactful facilities to lose. In contrast, only four participants reported that relocation of schools would affect them, and just one noted an impact from preschool relocation. No participants indicated they would be affected by the removal of care facilities or retirement homes.

Figure 6 displays the perceived consequences of facility relocation. The most frequently selected impacts were increased transport costs, followed by a negative effect on personal wellbeing. A reduction in community connections was also frequently cited as a significant consequence. Five participants reported they would consider relocating out of Woolston if key facilities were removed. Only two participants noted that such relocation would reduce

proximity to family and friends, while another two selected ‘other.’ Several participants chose multiple, if not all, of the listed impact options, reflecting the compounding nature of these consequences.

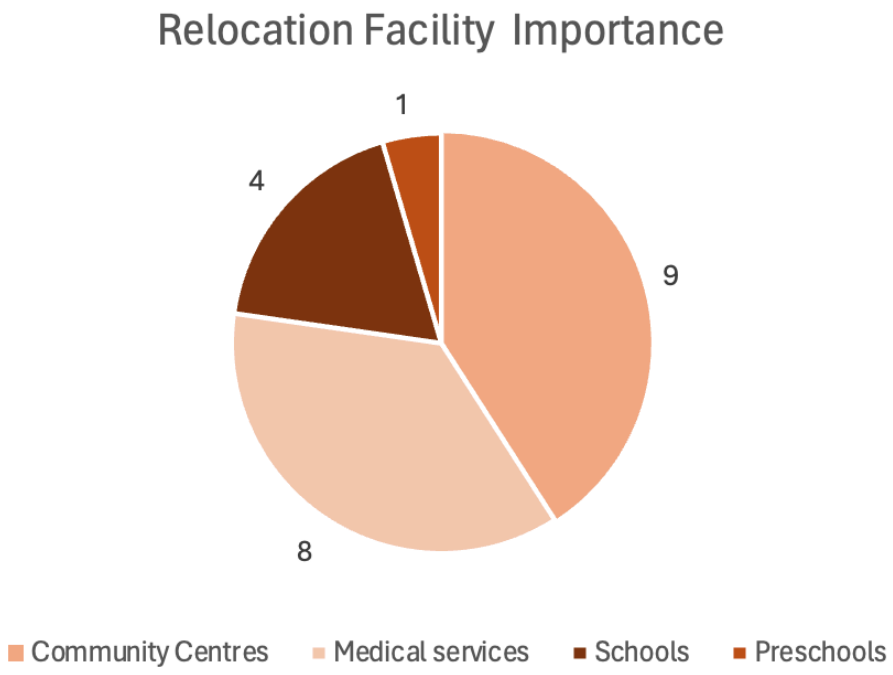

Figure 5: Most important facilities as identified by participants.

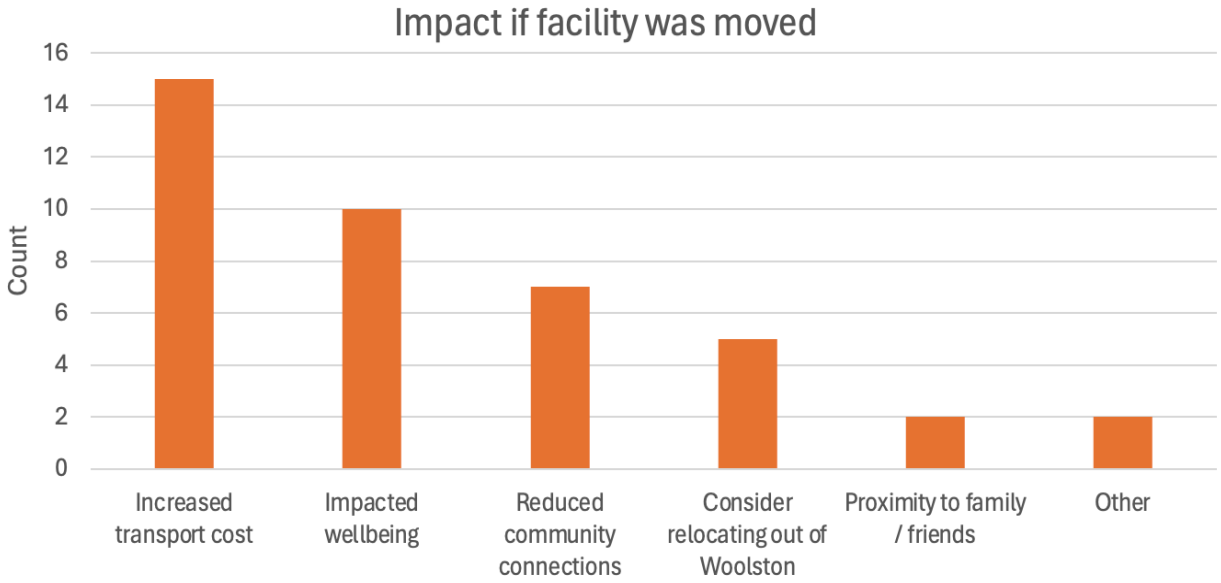

Figure 6: Reported impacts on participants if key facilities were relocated.

7.0. Discussion

7.1. Key Findings

The purpose of this study was to understand how residents of Woolston perceive and value their sensitive infrastructure in the context of increasing coastal hazard risk. Survey results highlight that residents place high importance on community centres, medical services, and education facilities (Figures 3 & 5). These facilities were also seen as having the greatest negative impact if relocated out of hazardous zones. All infrastructure types were rated as highly important overall, emphasising their central role in supporting residents' daily needs and wellbeing (Figure 3). While a small number of respondents were willing to travel over an hour to access certain services, most preferred facilities to remain within a 10-minute travel radius (Figure 4). Relocating facilities would therefore have wide-ranging consequences. The most frequently recorded concerns were increased transport costs, negative effects on wellbeing, and reduced community connections. Notably, several participants said that they might consider relocating out of Woolston entirely (Figure 6), highlighting the link between local access to facilities and place attachment.

These findings reinforce that sensitive infrastructure is not only functional but strongly ingrained in community identity and cohesion. The results align with the findings of the *Life in Christchurch Neighbourhood Survey,* which reported that 35% of residents valued proximity to local facilities as the best part of their neighbourhood, followed by 15% who cited community connection (CCC, 2024).

7.2. Consequences of Infrastructure Relocation

Social infrastructure plays a critical role in supporting community wellbeing and enhancing connections between residents (Latham & Layton, 2019). Its removal, particularly under managed retreat scenarios, risks disrupting daily routines, displacing relationships, and decreasing social cohesion. As Christchurch City Council considers plan changes to reduce exposure to coastal hazards, some communities may face the loss or relocation of key infrastructure to which they are deeply connected. To ensure such changes do not exacerbate existing vulnerabilities, adaptation strategies must be socially informed.

Although participants rated all facilities as important, community centres and medical services were most commonly identified as essential to retain locally. Fewer participants expressed concern over the loss of schools, preschools, or care facilities, which may reflect their current patterns of use in Woolston rather than a true measure of their long-term community value. Experience shows that schools can serve broader social roles. Following the Christchurch earthquakes, the closure of nearby Phillipstown School provoked public

backlash, with many residents arguing that the school was a vital community hub in a lower socio-economic area (Boshier, 2017). For many communities, especially those with fewer resources, such facilities operate as 'third places,' and shared environments that support social ties and local resilience (Beal, 2024).

The most common concern associated with relocating facilities was increased transport costs, followed by negative impacts on wellbeing, and reduced community connection. Although many participants said they would be willing to travel up to an hour, proximity still matters, especially in communities with limited transport options. Some respondents indicated that removal of services could prompt them to consider moving out of Woolston. This reinforces the importance of ensuring that any retreat or relocation efforts are not solely focused on physical distance but also consider the broader social and economic implications for residents.

7.3. Importance of Social Cohesion in Community Resilience

The findings from Woolston highlight the crucial role accessible sensitive infrastructure plays in everyday wellbeing and broader community resilience. When residents are connected to one another through shared spaces and services, they are more likely to recover quickly and effectively from hazard events. These results align with post-disaster research from Christchurch, which found that communities with strong pre-existing social networks, such as Lyttelton, were better able to self-organise and respond following the 2010 and 2011 earthquakes (Cretney, 2016; Thornley et al., 2014). Despite Lyttelton's geographic isolation, its active local organisations and infrastructure enabled residents to mobilise support and adapt quickly.

This example illustrates that resilience is not solely a result of physical infrastructure or location, but it is deeply ingrained in the strength of social networks. If key facilities are removed from Woolston, there is a risk of weakening these ties. International research has shown that effective managed retreat must include "social cohesion-oriented initiatives and practices," to help rebuild a sense of place and belonging (Sina et al., 2019). Should managed retreat become necessary, it is critical that efforts are made to preserve or re-establish sensitive infrastructure as a part of an equitable and effective adaptation strategy.

7.4. Attachment to Place and Community

Another key insight from this study is the strong attachment residents have to both their local facilities and the wider Woolston neighbourhood. Community infrastructure contributes not only to practical service access but also to a sense of place and identity.

Notably, 19% of respondents (five individuals) indicated they would consider moving away from Woolston if critical infrastructure were relocated (Figure 6), indicating a high level of place attachment among residents.

This finding aligns with existing literature, particularly in relation to older populations. Anton and Lawrence (2014) describe place attachment, the emotional bond to a familiar environment, among older adults as "an extension of self," with the potential for significant emotional and practical disruption if key local facilities are lost. Although those aged 65 and over comprised 13% of survey respondents, they were more likely to indicate being negatively impacted by infrastructure removal, particularly due to increased costs and reduced walkable access.

Senior citizens make up around 15% of Woolston's total population (Stats NZ, n.d.), so their perspectives appear only slightly under-represented in this study. Nonetheless, it is important that future planning processes actively include older residents, as they may face increased vulnerability to both the physical and social impacts of infrastructure relocation.

7.5. Sustainable Planning for Long-Term Resilience

Building long-term resilience in hazard-prone areas like Woolston requires integrated planning approaches that address both environmental and social dimensions of risk. This study aligns with several of the United Nations Sustainable Development Goals (United Nations, 2015), including Goal 3: Good Health and Wellbeing, Goal 11: Sustainable Cities and Communities, and Goal 13: Climate Action. These goals emphasise the importance of adaptive, inclusive, and sustainable urban developments.

Despite increasing exposure to hazards, 91% of residents in the Heathcote area indicated in the *Life in Christchurch Survey* that they wish to remain in their neighbourhood (CCC, 2024). This not only reflects a strong attachment to place but highlights the importance of planning strategies that preserve community liveability while reducing risk.

Maintaining access to valued social infrastructure is essential to achieving this balance. Decisions around managed retreat must consider more than just geographic risk, they must also protect the social foundations that support resilient connections, and adaptive communities.

8.0. Recommendations and Limitations

8.1. Recommendations

The results of this study clearly show that Woolston residents place high value on local community facilities. Future planning around these services must be transparent, and guided by meaningful community consultation, beginning early and continuing throughout the entire decision-making process. Engagement with local Ngāi Tahu is also essential to ensure that cultural values and mātauranga Māori are recognised and respected.

If relocating facilities is proposed as a way to reduce exposure to coastal hazards, planners must prioritise accessibility. Transport availability and affordability were identified as key concerns, particularly for vulnerable groups. Without careful planning, relocation could exacerbate existing inequalities and create new barriers to essential services.

Relocating infrastructure out of hazard-prone areas may reduce physical risk, but it does not inherently reduce social vulnerability. The loss of familiar and accessible spaces can weaken community cohesion, increase social isolation, and reduce residents' sense of place. For risk reduction strategies to be effective, they must take a holistic approach, addressing not just environmental and structural risks, but also the social, emotional, and economic dimensions of community wellbeing.

8.2. Limitations

While this survey provided valuable insights into how Woolston residents value their local infrastructure, there are several limitations that affect the demographic accuracy and reliability of the findings. The survey received only 26 responses, which limits the ability to generalise the results across the wider Woolston community. A sample of this size increases the risk of under-representing key demographic groups. Additionally, in-person interviews were conducted during the school holiday period, potentially excluding parents or caregivers with young children who may have been less available.

The survey also relied on a self-selection process, where individuals chose to participate. This method may have introduced response bias by favouring individuals with stronger opinions, higher levels of community engagement, or greater availability. Furthermore, online distribution likely excluded individuals with limited access to technology. As a result, certain groups within the community may be under-represented in the data, shaping findings in a way that does not fully reflect the diversity of experiences and perspectives in Woolston.

8.3. Further Research

Future research could build on this study by incorporating more diverse and in-depth community perspectives through methods such as focus groups and semi-structured interviews. This would allow for a deeper understanding of how different groups perceive and value local facilities. Engaging with a broader demographic, such as youth, elderly residents, and people from different ethnic backgrounds, would help to capture experiences and priorities that may have been under-represented in the current survey.

Expanding this research to include other Christchurch suburbs exposed to similar coastal and flood hazards would allow for comparative analysis, revealing broader patterns in how communities value social infrastructure across the city. Conducting research over a longer time frame and with fewer time or resource constraints would also improve participation rates, and the depth of insights gathered. Future work could also explore how risk tolerance varies based on the accessibility and availability of local infrastructure.

Beyond relocation strategies, further research could investigate alternative approaches to long-term resilience, such as co-designed adaptation planning, innovative building designs, or changes to land use planning. This would move beyond framing relocation as the only option and instead consider how place-based adaptation can support both physical safety and social wellbeing.

Collaboration with Ngāi Tahu and other iwi/hapū organisations is also essential. Future research could explore how managed retreat affects cultural identity, wellbeing, and the role of marae in community resilience. Marae often serve as vital hubs during emergencies, not only for Māori, but the wider community, and many continue to face challenges from natural and coastal hazards (Bailey-Winiata et al., 2023). Their experiences, together with mātauranga Māori perspectives on environmental change and historical adaptation, offer critical insights for future adaptation planning.

9.0. Conclusion

While managed retreat of sensitive infrastructure may become necessary to reduce exposure to coastal hazards, it must be approached with a comprehensive understanding of its social consequences. This study has shown that Woolston residents place significant value on their local facilities, not only for practical access to services, but for the essential role these spaces play in supporting wellbeing, accessibility, and community connection.

Relocating or removing such infrastructure risks increasing transport costs, weakening community cohesion, and reducing access for vulnerable groups.

Planning decisions must therefore prioritise inclusive, meaningful engagement with the community, particularly under-represented groups such as parents, elderly residents, and those with limited mobility. Collaboration with mana whenua, including Ngāi Tahu, is also essential to ensure cultural values and mātauranga Māori are meaningfully integrated into adaptation planning.

Resilience to coastal hazards requires more than structural interventions. A holistic approach, that considers social cohesion, a sense of belonging, and equitable access to essential services, is critical. The findings from Woolston offer valuable insight for Christchurch City Council as it develops Plan Change 12, particularly in recognising how communities value proximity to services and the need to carefully manage sensitive infrastructure in hazard-prone areas.

Sensitive infrastructure plays a vital role in supporting resilience. These facilities enable connection, support, and shared experiences, factors that contribute to stronger social networks and overall resilience. Evidence from past disasters shows that communities with strong social cohesion are better equipped to adapt and recover. As such, protecting and maintaining these connections must be central to any long-term adaptation strategy.

Credit Author Statement:

Isabella: Conceptualisation, Methodology, Investigation, Writing - Original Draft, Visualisation.

Florence: Conceptualisation, Methodology, Formal analysis, Investigation, Data Curation, Writing - Original Draft, Visualisation.

Jorja: Conceptualisation, Methodology, Investigation, Writing - Original Draft, Writing - Review & Editing, Visualisation.

References:

Anton, C., & Lawrence, C. (2014). Home is where the heart is: The effect of place of residence on place attachment and community participation. *Journal of Environmental Psychology, 40*, 451–461.

Archie, S., Hardaway, K., Peer, R., Fleming, J., & Logan, T. (2024). Strategic retreat: Balancing risk and societal goals in land-use planning. *Environmental Science & Policy, 163*, 103960. https://doi.org/10.1016/j.envsci.2024.103960

Bailey-Winiata, A., Gallop, S., Hikuroa, D., & White, I. (2023). The role of coastal marae in natural hazard response and climate change adaptation. *New Zealand Coastal Society, Special Publication, 5*, 41–44.

Beal, J. (2024). What are third places and why do they matter? *Albert Shanker Institute*. https://www.shankerinstitute.org/blog/what-are-third-places-and-why-do-they-matter

Beban, J. G., & Gunnell, S. (2019). Incorporating social vulnerability into land use planning and local government processes for managing natural hazards and climate change in New Zealand. *UrbanEdge Planning Ltd*.

Bell, R., Lawrence, J., Allan, S., Blackett, P., & Stephens, S. (2017). *Coastal hazards and climate change: Guidance for local government* (ME 1341). Ministry for the Environment.

Boshier, P. (2017). *Disclosure: An investigation into the Ministry of Education's engagement processes for school closures and mergers*. Office of the Ombudsman. https://www.ombudsman.parliament.nz/sites/default/files/2019-03/Disclosure.pdf

Christchurch City Council. (2021). *Flooding and erosion risk classification fact sheet*. https://ccc.govt.nz/assets/Documents/The-Council/Plans-Strategies-Policies-Bylaws/Plans/district-plan/Proposed-changes/2021/PC12-Coastal-Hazards/Fact-sheet-flooding-and-erosion-risk-classification.pdf

Christchurch City Council. (2022). *Coastal adaptation framework*. https://ccc.govt.nz/assets/Documents/Environment/Coast/CoastalAdaptationFramework0522.pdf

Christchurch City Council. (2023). *Christchurch City Council submission on the Proposed National Policy Statement for Natural Hazard Decision-making 2023*. https://www.ccc.govt.nz/assets/Documents/The-Council/Request-information/2023/Proposed-National-Policy-Statement-for-Natural-Hazard-Decision-making-2023.pdf

Christchurch City Council. (n.d.). *Life in Christchurch*. https://ccc.govt.nz/the-council/how-the-council-works/reporting-and-monitoring/life-in-christchurch

Christchurch City Council. (2024). *Life in Christchurch 2024 neighbourhoods survey*. https://www.ccc.govt.nz/assets/Images/The-Council/Life-in-Christchurch/Life-in-Christchurch-Neighbourhoods-2024-Report-11.02.2025.pdf

Cretney, R. M. (2016). Local responses to disaster: The value of community-led post-disaster response action in a resilience framework. *Disaster Prevention and Management, 25*(1), 27–40.

Dawe, I. (2008). *Sea level rise – A New Zealand context*. Greater Wellington Regional Council.

De Almeida, B. A., & Mostafavi, A. (2016). Resilience of infrastructure systems to sea-level rise in coastal areas: Impacts, adaptation measures, and implementation challenges. *Sustainability, 8*(11), 1115. https://doi.org/10.3390/su8111115

Department of Conservation. (2010). *New Zealand Coastal Policy Statement 2010*.

Department of Conservation. (2017). *Review of the effect of the NZCPS 2010 on RMA decision-making. Part 1 – Overview and key findings*. https://www.coastalrestorationtrust.org.nz/site/assets/files/1189/review-of-effect-of-nzcps-2010-on-rma-part-one.pdf

Geurs, K., & van Wee, B. (2023). Accessibility: Perspectives, measures and applications. In B. van Wee, J. A. Annema, D. Bannister, & B. Pudane (Eds.), *The transport system and transport policy: An introduction* (2nd ed., pp. 178–199). Edward Elgar.

Google Earth Pro. (2025). *Version v7.3.6.9345* [Computer software]. Retrieved May 15, 2025, from https://www.google.com/earth/about/versions/#earth-pro

Grace, E. S., France-Hudson, B. T., & Kilvington, M. J. (2019). *Reducing risk through the management of existing uses: Tensions under the RMA* (GNS Science Report

2019/55). GNS Science. https://www.gns.cri.nz/assets/bucket/SR2019-55-AD-Reducing-risk-through-the-management-of-existing-uses-tensions_FINAL.pdf

Latham, A., & Layton, J. (2019). Social infrastructure and the public life of cities: Studying urban sociality and public spaces. *Geography Compass, 13*(7). https://doi.org/10.1111/gec3.12444

Macintosh, A. (2012). Coastal climate hazards and urban planning: How planning responses can lead to maladaptation. *Mitigation and Adaptation Strategies for Global Change, 18*(7), 1035–1055. https://doi.org/10.1007/s11027-012-9406-2

Ministry for the Environment. (2024). *Coastal hazards and climate change: Guidance for local government* (ME 1805). https://environment.govt.nz/assets/publications/Coastal-hazards-and-climate-change-guidance-2024-ME-1805.pdf

Ministry for the Environment. (2023). *Proposed National Policy Statement for Natural Hazard Decision-making: Discussion document* (ME 1801). https://environment.govt.nz/assets/publications/RMA/Proposed-National-Policy-Statement-for-Natural-Hazard-Decision-making-Discussion-document.pdf

Mouratidis, K. (2018). Rethinking how built environments influence subjective wellbeing: A new conceptual framework. *Journal of Urbanism: International Research on Placemaking and Sustainability, 11*(1), 24–40. https://doi.org/10.1080/17549175.2017.1310749

Parliamentary Commissioner for the Environment. (2015). *Preparing New Zealand for rising seas: Certainty and uncertainty*. https://pce.parliament.nz/media/fgwje5fb/preparing-nz-for-rising-seas-web-small.pdf

Paulik, R., Stephens, S., Wadhwa, S., Bell, R., & Blackett, P. (2019). *Coastal flooding exposure under future sea-level rise for New Zealand*. NIWA & Deep South Challenge.

Resource Management Act 1991, ss 30–31 (NZ).

Saunders, W., & Becker, J. (2015). A discussion of resilience and sustainability: Land use planning recovery from the Canterbury earthquake sequence, New Zealand. *International Journal of Disaster Risk Reduction, 14*, 73–81.

Schneider, P., Lawrence, J., Glavovic, B., Ryan, E., & Blackett, P. (2020). A rising tide of adaptation action: Comparing two coastal regions of Aotearoa-New Zealand. *Climate Risk Management, 30*, 100244. https://doi.org/10.1016/j.crm.2020.100244

Simonson, T., & Hall, G. (2019). *Vulnerable: The quantum of local government infrastructure exposed to sea level rise*. Local Government New Zealand.

Sina, D., Chang-Richards, A. Y., Wilkinson, S., & Potangaroa, R. (2019). What does the future hold for relocated communities post-disaster? Factors affecting livelihood resilience. *International Journal of Disaster Risk Reduction, 34*, 173–183.

Stats NZ. (n.d.). *2018 Census*. https://www.stats.govt.nz/2018-census/

Tapsell, P. (2002). Marae and tribal identity in urban Aotearoa/New Zealand. *Pacific Studies, 25*.

Thornley, L., Ball, J., Signal, L., Lawson-Te Aho, K., & Rawson, E. (2015). Building community resilience: Learning from the Canterbury earthquakes. *Kotuitui: New Zealand Journal of Social Sciences Online, 10*(1), 23–35.

United Nations. (2015). *Sustainable development goals: 17 goals to transform our world*. https://sdgs.un.org/goals

Wang, C., Chen, N., & Olwert, C. (2023). Investigating accessibility resilience of emergency and lifesaving facilities under natural hazards. *Natural Hazards, 120*(2), 1785–1807. https://doi.org/10.1007/s11069-023-06272-8

Warren, C., McGraw, P., & Van Boven, L. (2011). Values and preferences: Defining preference construction. *Cognitive Science, 2*, 193–205. https://leeds-faculty.colorado.edu/mcgrawp/pdf/warren.mcgraw.vanboven.2011.pdf

Woodruff, S. C., Mullin, M., & Roy, M. (2020). Is coastal adaptation a public good? The financing implications of good characteristics in coastal adaptation. *Journal of Environmental Planning and Management, 63*(12), 2082–2101. https://doi.org/10.1080/09640568.2019.17036

Zahnow, R. (2024). Social infrastructure, social cohesion and subjective wellbeing. *Wellbeing, Space and Society, 7*, 100210. https://doi.org/10.1016/j.wss.2024.100210

Appendix:

Appendix A

Survey Questions

Thank you for your interest in this survey. The purpose of this survey is to understand how people use and value community facilities. Your participation is voluntary, and you may choose to skip any question or stop the survey at any time. All responses will remain confidential and will only be used for research and analysis purposes.

The purpose of this survey is to understand how people use and value their community facilities and to understand how close people would like to/need to be to these services. The findings will be used to inform our research project, seeking to understand what community facilities are most important for people in their day to day lives. We want to know how far people are prepared to walk/travel to facilities if they needed to be located further away to avoid the risk of harm to people in case of a coastal hazard event, e.g. severe storm flooding or a tsunami

Please select your age group

- ◯ 18 - 24
- ◯ 25 - 34
- ◯ 35 - 44
- ◯ 45 - 54
- ◯ 55 - 64
- ◯ 64 +
- ◯ Prefer not to say

How long have you lived in / around Woolston

- ◯ Less than 1 year
- ◯ 1-3 years
- ◯ 3-6 years
- ◯ 6-10 years
- ◯ 10+ years

What does your Woolston household look like?

- ◯ Partner
- ◯ Living alone
- ◯ Flatmates
- ◯ Family + children
- ◯ Family nearby
- ◯ Other

How important do you consider these facilities?

	Not Applicable	Not at all important	Slightly important	Moderately important	Very important	Extremely important
Schools	○	○	○	○	○	○
Preschools	○	○	○	○	○	○
Medical services (Hospital, GPs, Dentist)	○	○	○	○	○	○
Retirement Homes / Village	○	○	○	○	○	○
Care facilities (hospice and assisted living)	○	○	○	○	○	○
Community centres (libraries, recreation centres)	○	○	○	○	○	○

Thinking of all the facilities in Q4, of those that you visit how do you most often travel to them?

- ☐ Car
- ☐ Bike / scooter
- ☐ Bus
- ☐ Walk
- ☐ Other

If the facilities were moved, how far would you travel for them?

	Not Applicable	0-10 mins	10-20min	20-40min	40min-1hr	1hr +
Schools	○	○	○	○	○	○
Preschools	○	○	○	○	○	○
Medical services (Hospital, GPs, Dentist)	○	○	○	○	○	○
Retirement Homes / Village	○	○	○	○	○	○
Care facilities (hospice and assisted living)	○	○	○	○	○	○
Community centres (libraries, recreation centres)	○	○	○	○	○	○

Out of these facilities what would be most impactful for you if it was moved

- ◯ Schools
- ◯ Preschools
- ◯ Medical services
- ◯ Retirement home
- ◯ Care facilities
- ◯ Community Centres

Thinking about the facility you value the most, how would removing it from your suburb impact your life?

- ☐ Increased transport cost
- ☐ Proximity to family / friends
- ☐ Consider relocating within Woolston
- ☐ Consider relocating out of Woolston
- ☐ Reduced community connections
- ☐ Impacted wellbeing
- ☐ Other