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Build Back Better and Long-Term Housing Recovery: Assessing Community Housing Resilience and the Role of Insurance Post Disaster

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Abstract: The purpose of this research is to better understand community housing resilience and the role of insurance using a Build Back Better Long-term Recovery Housing framework to analyze approaches and effects on long-term housing rebuilding and recovery. A comparative case study approach is taken to assess insurance policies and outcomes following Hurricane Katrina in New Orleans and the Canterbury earthquake sequence in Christchurch, New Zealand, both affluent urban communities with strong insurance markets. Framed within the context of "Build Back Better", the community housing and insurance resilience assessment is based on five key indicators; governance, community resources, risk reduction, housing rebuilding funding (funding and speed of funding), and time compression (built environment and periods of recovery time). Public and private insurance schemes for both case studies are identified and are considered together with analysis of insurance claims and other sources of financial support. The findings and results show that recovery is the result of highly interdependent Build Back Better processes. The data suggests that insurance and governance systems greatly influences the onset and overall speed of recovery (time compression), thereby performing a major role in long-term recovery. This research provides an original contribution to disaster recovery knowledge by analyzing insurance claims from two well-documented natural disasters. Additionally, the paper proposes for the singular definition of community housing resilience.

Keywords: risk reduction; governance; housing rebuilding; post-disaster reconstruction; time compression; Hurricane Katrina; Christchurch earthquakes

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1. Introduction

Disasters are seen as opportunities to rebuild physical, social, environmental and economic systems for a future more resilient to disasters [1]. The notion of "Build Back Better" (BBB) was developed following the Indian Ocean tsunami recovery as a holistic concept and pathway for post-disaster reconstruction, that involves guiding principles focused on the physical, social and economic environment [2]. The UNISDR [3] defines BBB as "the use of the recovery, rehabilitation and reconstruction phases after a disaster to increase the resilience of nations and communities through integrating disaster-risk-reduction measures into the restoration of physical infrastructure and societal systems, and into the revitalization of livelihoods, economies, and the environment." Build Back Better (BBB) comprises of approaches for disaster recovery, rehabilitation and reconstruction processes that are meant to improve resilience by integrating disaster-risk-reduction measures, restoring physical infrastructure and societal systems, as well as revitalizing livelihoods, economies and the environment [4]. However, BBB has no clear definition for housing recovery and lacks a people-centered housing recovery approach [5]. Vahanvati and Rafliana [6], further highlight how BBB largely ignores the lack of choices, opportunities or capabilities amid housing reconstruction processes. BBB theoretical research frameworks attempt to simplify the understanding and meaning of BBB concepts [7]. However, existing BBB theoretical

research frameworks and approaches for rebuilding lack an understanding of a community's needs and priorities, resulting in more post-disaster vulnerabilities [8]. Vulnerability is defined as the attributes of those affected related to their ability to anticipate, cope, resist, manage and recover from natural hazards [9]. Vulnerability is both a biophysical and social response [10]. Increasing exposure and vulnerabilities to disasters is becoming more important to the field of post-disaster and BBB research because it is related to both uneven economic development and declining infrastructure [11–13]. The number of houses rebuilt is used an indicator often for recovery but may not adequately reflect a reduction in vulnerabilities [14].

The term 'resilience' is often used to discuss a community's ability to withstand disasters [15]. Resilience is commonly identified as a property of a range of systems, that are able to remain stable when facing shocks and stresses, recover following an event, and adapt to new circumstances [16]. Disaster housing and resilience strategies largely focus on using BBB approaches to rebuild housing after disasters [17]. BBB disaster housing and resilience strategies may involve assisting households to obtain more affordable homes and mortgages, promoting disaster insurance policies, investing in new building technologies, and seeking to reduce overall vulnerabilities and risks to future disasters. Although disaster housing and resilience may have similar desired outcomes for post-disaster housing reconstruction, they each have unique approaches and characteristics. Housing resilience is largely concerned with the loss of housing related to a disaster event, and the long-term impacts on communities [18,19]. In disasters, housing resilience is linked to investments in both physical systems (e.g., infrastructure, material, labor) and social systems (e.g., governance, policies, institutions), to withstand related shocks and stresses in an effort to support overall community resilience [20]. Housing resilience related to disasters is commonly addressed post-disaster by attempting to overcome underlying vulnerabilities and implement risk reduction strategies. This takes place with efforts focusing on addressing pre-disaster building and housing risks [18]. Community resilience is defined as "a community or region's capability to prepare for, respond to, and recover from significant multi-hazard threats with minimum damage to public safety and health, the economy, and national security" [21].

Most resilience strategies largely focus on using BBB approaches for housing rebuilding [17]. Core elements of the resilient strategy include whose resilience is being built (context), shocks and stresses (disturbances), ability to manage shocks/stresses (capacity to respond), and build back better (reaction) [22]. Resilience focused on housing is largely concerned with housing losses and long-term impacts on communities [18]. In disasters, resilience is then linked to investments in both physical systems (e.g., infrastructure, material, labor) and social systems (e.g., governance, policies, institutions) needed to withstand related shocks and stresses [20]. Resilience focused on post-disaster housing attempts to overcome underlying vulnerabilities and promote sustainability by addressing pre-disaster building and housing risks [18].

Increasing resilience through BBB is not well conceived [6], especially for disaster housing resilience strategies [19]. This is in part due to the multiple ways 'build back better' is interpreted and applied. Moatty [23] identifies overlapping and interrelated scopes of BBB using three pillars: (1) structural disaster-risk reduction that aims to reduce exposure of activities, goods and people while simultaneously increasing the resilience of buildings and infrastructure; (2) implementation and monitoring of reconstruction actions focused on governance and adapting rules and regulations; and (3) the development of social capital for different scales and market diversification. The three pillars demonstrate just how BBB can have multiple meanings as it relates to making something more sustainable, equitable for livelihoods or reducing vulnerabilities, adaptable to changing environments, limited to one-time interventions for housing, or making it safer and better than before [6,23–26].

Some of the most complex aspects of post-disaster recovery are housing issues [19,27]. Long-term housing recovery has been identified as the most important factor contributing to overall community recovery post-disaster [12,28,29]. Long-term housing recovery

(e.g. large-scale projects) is one of the least studied and understood aspects of disaster management [30,31]. Managing long-term recovery involves the combined forces of activities within a particular place (built environment) and specified periods of time (short- to long-term), known as time compression. The effects of time compression on recovery vary in relation to systems of recovery and wide-ranging time scales. Housing production is one example, due to the time-compressed scale of capital depletion and capital replacement [32]. This may be due to a range of housing issues from assessing housing damage, arranging demolitions, ordering rebuild and repairs (post-demolition or with no required demolitions to reduce overall costs and waste management), accessing funding sources (private, public or insurance), finding temporary housing during repairs, managing legal disputes or land buyouts, permitting for repairs or occupancy, or having to purchase a new home.

Managing long-term housing recovery is largely dependent on the financial resources needed for repairs or new construction [33]. The issue of post-disaster finance and economics is generally overlooked in the literature [34–38]. It is commonly believed that the uptake of disaster insurance provides a reliable means for assisting and funding recovery. Disaster insurance schemes cover costs against premiums incurred from extreme weather and natural disaster events. Disaster insurance provides a pay-out by the insurer that entitles the policy holder a fixed amount [39]. Disaster insurance contributions are more than just financial loss payouts, largely due to their ability to reduce disaster risk through risk research, models, analysis, understanding and managing risk, and supporting the mobilization of reconstruction resources [40]. Existing disaster financial recovery funding paradigms, such as insurance, are no longer adequate, as they are confronted as to how and in what ways to transform, in an effort to integrate disaster resilience to protect homes, assets and properties [19,41]. This is further supported with recent report findings promoting financial resilience for disaster insurance [19,42–48]. Insurance and public funding are vital in managing household recovery, specifically in earthquake and flood disaster communities due to accessible comprehensive financial coverage and available research on household recovery [29]. Thus, the tension between speed and deliberation becomes one of the focal points in managing long-term housing recovery, whereby disaster insurance is uniquely situated to facilitate or impede this process. Nonetheless, insurers have encountered numerous challenges and setbacks with recent major disasters. These events highlight the problems related to unprecedented losses, underwriting risks, lack of available capital for writing new insurance or reinsurance policies, claims-management processes, and insurance and reinsurance insolvencies [41]. The scale of disaster insurance coverage appears to be one of the biggest challenges for markets with existing and well-established disasters insurance policies. This may in large part be due to policyholder's expectations that their insurance policy should allow them to finance housing recovery [45]. Almost no research exists demonstrating empirical relationships between disaster insurance and recovery [49]. Ultimately, the challenge of having insurance or other forms of financing recovery, such as government-sponsored home buy-outs, for managing disaster housing losses place a heavy burden on post-disaster recovery [19,50]. Therefore, there is a need to better quantify the relationship between insurance, disaster recovery and housing resilience [42].

Presently, we know little about how disasters impact communities and in which way communities respond to their effects [51–53]. Most existing studies research focuses on community resilience as it relates to physical infrastructure, largely ignoring social and economic systems [54]. Community resilience is closely linked to aspects of post-disaster recovery, such as the control of land and policies in place or how community resources are managed [55,56]. However, there is still a lack of knowledge about systems and how they affect communities of recovery spatially and temporally [54]. Furthermore, Koliou et al. [54] stress the importance of the need for community resilience frameworks to study post-disaster recovery and the resilience trajectories of communities and decision-making. This is necessary for optimizing and prioritizing sustainable rebuilding and reducing vulnerabilities. Therefore, this paper devises a conceptual "Build Back Better" Long-term Housing Recovery framework (BBB-LHR) to assess long-term housing recovery and

reconstruction approaches and the role of insurance for community resilience. The paper focuses on how two different communities managed long-term disaster housing recovery and reconstruction. The first community, Broadmoor (New Orleans, LA, USA) dealt with the aftermath of Hurricane Katrina. The second community, Avonside (Christchurch, New Zealand) experienced the 2010/2011 Canterbury (Christchurch) earthquake sequence. In each community, local responses, housing recovery, and disaster insurance processes are different, reflecting specific community resilience approaches. The two communities for the case studies were chosen given the enormity of disaster recovery efforts undertaken, and are cited as the top 10 costliest insured catastrophic events between 1970 and 2019 by Swiss Re [57]. Both cases also had significant and sizeable amounts of housing losses, the number of households managing housing rebuilding, and faced subsequent disaster events (11 Hurricane events since Hurricane Katrina in New Orleans, including Hurricane Rita less than 1 month after Katrina [58], and over 15,000 aftershocks since the first Canterbury earthquake [59]), as well as the likelihood of future disasters. Lastly, each community presents a different approach (community-led versus top-down) to managing post-disaster housing recovery. This allows for the potential to contribute new insights to the literature on post-disaster housing reconstruction, how two different insured markets handled housing rebuilding, provide more broad comparisons to support long-term recovery methods of analysis, and lessons that are transferrable.

2. Methodology

The purpose of this paper is to understand community housing resilience and the role of insurance using a BBB Long-term Housing Recovery framework (BBB-LHR) to analyze approaches and effects on long-term housing rebuilding and recovery (Table 1). A long-term housing recovery conceptual framework is designed to analyze two events with different housing buy-outs and insurance strategies as thresholds for community housing resilience. The BBB-LHR framework is informed by the Sendai Framework for Disaster Risk Reduction (SFDRR) [4] and the Mannakkara and Wilkinson BBB Framework [60]. The Sendai Framework [4] and the Mannakkara and Wilkinson BBB Framework [7,24,60] to date are the two most prevalent models. The Sendai Framework is largely recognized for its international application, for its understanding and prioritizing of disaster risk, strengthening disaster-risk governance, investments for disaster-risk reduction (DRR) initiatives, and integrating BBB principles through the fourth priority action [4]. Mannakkara and Wilkinson's BBB framework was developed to provide a set of indicators for DRR, community recovery and effective implementation to establish best practices and guidelines [60]. The SFDRR and the Mannakkara and Wilkinson BBB Framework have helped evolve and simplify BBB, however they both lack ways to measure or assess disaster impacts and recovery for housing resilience [5,7,8,23,24]. The BBB-LHR framework presented here derives meaning from its community-centered focus and approach to housing recovery. It takes into account community participation, stakeholder equity, transparency, risk reduction and future sustainability. These principles are supported and aligned with the SFDRR and the Mannakkara and Wilkinson BBB Framework. The lack of missing indicators needed to measure BBB formed the basis for the conceptual BBB-LHR framework [24]. Although it may be easier to measure physical metrics, such as total number of homes rebuilt or demolished, they do not accurately depict or calculate total community housing resilience. Ideally, BBB indicators should integrate elements, such as both structural and non-structural attributes, governance aspects related to policies, legislation, or ethical and corruption impacts, the roles of stakeholders, and the capacity for building back better [24]. Thus, the BBB-LHR framework uses five indicators to assess long-term recovery and impacts of the disaster, insurance and recovery efforts:

1. *Governance* is framed using a disaster governance term defined as a set of interrelated frameworks and processes for policies, organizations, institutions and practices within the traditional five disaster phases (disaster response, recovery, reconstruction, mitigation, and preparedness) organized at multiple scales (geographical and social) in order

to anticipate, cope with, resist and recover [61,62]. Viewing disasters through the lens of governance requires a more inclusive approach, accounting for broader societal contexts that shape disaster management [62]. Disaster governance is an emerging concept in the disasters literature that considers the various stakeholders and actors at different scales in disaster management (mitigation, preparation, response and recovery) [62,63]. This is an important factor as it affects how and how fast recovery can take place.

2. *Community resources* available for recovery are evaluated, since an effort to improve both social and economic housing conditions and to support livelihoods and regenerate local economies are interconnected to overall long-term community sustainability and resilience. This considers the community resources related between governments, insurance and other various stakeholders engaged for the housing rebuilding process, such as public–private partnerships, service providers providing local and regional resources needed for temporary or alternative housing during reconstruction, relocation services and rebuilding support services.
3. *Risk reduction* assesses the processes in place to improve a community's overall physical housing resilience to natural hazards. This is done by reviewing structural and land-use planning of the disaster housing recovery process. We know from existing disaster housing studies that people tend to rebuild in the same location and in the same way. This most often occurs despite local and national governments, planners and others promoting structural and land-use changes in an effort to reduce vulnerabilities [64–69]. From a narrow or limited housing rebuilding perspective, BBB could easily be seen as a one-time structural change needed for housing reconstruction versus long-lasting systemic changes [6]. By examining the risk-reduction elements, it is possible to reveal the outcomes of post-disaster housing reconstruction interventions embedded amongst other indicators (e.g., governance systems, stakeholder roles and responsibilities, total available reconstruction funding sources, management of recovery policies and planning, and the time compression phenomena of compressed period of time that involve intensive activities) to assess overall community housing resilience.
4. *Housing rebuilding funding* identifies all possible and potential private and public financing sources. This also includes the set of policies and processes overseeing the use of funds, such as insurance claims management and payouts. The role of resilience in disaster recovery financing is largely neglected [19,46]. Most disaster recovery financing is focused on early recovery efforts [70], rather than supporting disaster-resilient recovery [19,71,72]. Housing resilience requires more than just rebuilding or coping from a disaster [19].
5. Olshansky et al. [32] argue that time compression provides the key to understanding post-disaster recovery. The concepts of time compression and housing recovery is informed by the work of Olshansky et al. [32]. *Time compression* relates to the processes of housing recovery that occur over time unlike compressed time periods, or confined to limited spaces of the disaster impacts [12,27,32,73,74]. Time compression phenomena have important effects on post-disaster housing recovery [74]. Consequently, time compression affects flows of information and financing needed for housing recovery. Different funding sources (e.g., insurance, government relief, grants, private financing, loans) flow and move at different rates on separate time paths, affecting individual household recovery and reconstruction. Processes that involve different governance levels further complicate these time path dependencies, and slow or accelerate overall housing resilience and disaster recovery. The tension between speed (rebuilding as quickly as possible) and deliberation (slowing down to redevelop new housing resilient plans) becomes the focus and objective for understanding time compression impacts. For time compression, three scenarios are considered and applied: (1) only the *most* urgent housing disaster recovery efforts are initiated, followed up with action items requiring more deliberate and focused attention; (2) *more* attention is given to governance and increased planning capacity to facilitate the housing disaster recovery

process; and (3) a decentralization approach creates multiple opportunities for simultaneous recovery planning and decision making. Recovery phenomena can be observed as symptoms of time compression [32]. The three scenarios were chosen based on how recovery phenomena can be observed as symptoms of time compression. By focusing on the most urgent and necessary actions taken, coupled together with a critical approach taken of governance and planning processes, it is then possible to observe the spatial shifts that compress unequally in time. Those focused within the space of the disaster seek access simultaneously to scarce resources [32]. Therefore, we may uncover a series of power dynamics at different scales competing for or trying to control resources, fractured interactions between stakeholders (e.g., residents and government institutions), worsened inequities to access resources, ruptured flows and systems of information (e.g., misinformation, misconceptions, fake news or conspiracy theories), failures of bureaucratic systems, and increased political and community activism when we observe recovery phenomena as symptoms of time compression [32]. Thus, time compression can provide insights into understanding post-disaster long-term housing recovery by identifying ways to adapt housing recovery planning and resources, and best practices for more effective housing rebuilding.

Table 1. Build Back Better Long-term Housing Recovery Framework (BBB-LHR). Adapted from Refs. [38,41].

Build Back Better Long-Term Housing Recovery Framework				
Time Compression	**Housing Rebuilding Funding**	**Risk Reduction**	**Community Resources**	**Governance**
Time compression relates to the processes of recovery that occur over time unlike compressed time periods or confined to limited spaces of the disaster impacts which affects flows of information and financing needed for housing recovery	Identifies all possible and potential private and public financing sources, as well the set of policies and processes overseeing the use of funds, such as insurance claims management and payouts	Assesses the processes in place to improve a community's overall physical housing resilience to natural hazards by reviewing structural and land-use planning	Considers the community resources related between governments, insurance and other various stakeholders engaged for the housing rebuilding process, such as public–private partnerships, service providers providing local and regional resources needed for temporary or alternative housing during reconstruction, relocation services, and rebuilding support services	A set of interrelated frameworks and processes for policies, organizations, institutions, and practices within the traditional five disaster phases (disaster response, recovery, reconstruction, mitigation and preparedness) organized at multiple scales (geographical and social) in order to anticipate, cope with, resist and recover

This paper uses a multiple-case study approach [75] to allow for an in-depth investigation. The focus is on documenting and evidencing the housing rebuilding as a measure for community recovery, BBB discourses of the recovery process to understand the overall impacts and interdependencies, timelines of recovery to assess time compression, the managing and financing of recovery to gauge the role of insurance in the recovery process and the eventual housing resilience outcomes.

The case studies were collected using multiple data sources including interviews, news reports, official government policy documents, city assessor records, property records, physical property assessments for each community case study, community internal records and documents, news and media reports, and government disaster property damage assessments. The author conducted a total of 227 semi-structured interviews with stakeholders in New Orleans over a 3-year period (2015–2018) and 138 interviews in Christchurch (2016–2019). The interviews were with representatives of diverse organizations and interests including (but not limited to) residents, indigenous members of Tribal Nations, local and national government officials, religious leaders, news and media officials, academics, historians, non-profit agencies, health and wellness representatives, environmental planning specialists, members of the tourism, economic and construction sectors, experts tasked

with recovery efforts, local planning, government buy-out programs, disaster mitigation policy planning, insurance policy planning, or urban planning, as well as resilience specialists. Initial interviews included stakeholders based on one of two conditions (1) that they were a resident of the affected community and disaster, or (2) on the basis of their expertise or direct contact with community residents or involvement with the disaster recovery process. This was followed by interviews with second round of stakeholders as well as recommendations made by the first round of interviewees. Interviewees were asked to discuss the disaster housing recovery process, their reflections on long-term recovery, and the role of insurance. Furthermore, this research was designed in accordance with the German Research Foundation (DFG) Good Research Practice Code and the European Code of Conduct for Research Integrity [76,77].

2.1. 2005 Hurricane Katrina

On 29 August 2005, Hurricane Katrina struck the US Gulf Coast, killing more than 1200 people and causing an estimated USD 125 billion in damages and USD 60 billion in insurance losses, with more than 1.7 million claims across six states [78–80]. A federal government disaster declaration was issued for relief and recovery efforts with more than USD 110 billion in funding. The Federal Emergency Management Agency (FEMA) coordinates all federal government disaster mitigation, relief and recovery efforts [74]. The State of Louisiana established the Louisiana Disaster Recovery Fund under the Governor's office to organize state-wide recovery initiatives [74]. The City of New Orleans, with the aid of the city's chief administrative officer, set up emergency operations and became the hub for federal, state and city recovery activities [74]. Homeowners are able to access disaster recovery funding in the private and public sectors through insurance, direct aid, disbursements, tax breaks, tax credits and subsidies [81]. Flood insurance available for residents and businesses is provided with the National Flood Insurance Program (NFIP), a public–private partnership established by Congress. NFIP provides coverage up to USD 250,000 for the home building, and up to USD 100,000 for contents. Private flood insurance is available as excess coverage, over and above basic policies for homeowners, but is not allowed for NFIP policyholders [82]. The community of Broadmoor will be examined as part of this case study located in New Orleans. Broadmoor flooded between 5 and 8 feet because of Hurricane Katrina and over 90% of homes were damaged. Broadmoor consists of 365 acres made up of mainly single- and two-family residential homes, and 12 acres of commercial land. In 2000, Broadmoor had approximately 2915 occupied housing units with less than 10% vacancy [83].

2.2. 2010/11 Canterbury Earthquake Sequence

The Canterbury (Christchurch) earthquake sequence is the term commonly used to refer to the earthquakes between 2010 and 2011. The most severe of these events took place on 22 February 2011, when an earthquake of magnitude 6.3 struck Christchurch. The Canterbury earthquake sequence is the fifth largest insurance event in the world [84]. Over 100,000 residential houses were damaged, requiring repairs or rebuilding, of which 7000 homes were classified as "red zoned" (requiring total demolition) through government buy-outs [85]. The Earthquake Commission (EQC) provides natural disaster insurance for residential buildings, contents and land. Anyone having private insurance in NZ for their home or contents has automatic coverage with EQC up to NZD 100,000 plus GST (tax) for a home and the land immediately surrounding it, and NZD 20,000 plus GST for contents [86]. The community of Avonside is used for the Christchurch case study, a suburb located 2.5 km east of the Central Business District. Avonside had approximately 3200 residents in 1320 dwellings with 36% homeownership, 60% rentals and 4% in trust. In 2013, Avonside reported a 43% decrease in population and a 55% loss of occupied dwellings (726) with no available social housing. Avonside borders the Ōtākaro/Avon River. The Ōtākaro/Avon River Corridor lands consist mainly of poorly consolidated silts highly susceptible to earthquake damages. The area suffered significant damage to land and properties. Huge

areas of land in Avonside were affected by liquefaction due to the releasing of groundwater in the soil, which is compressed and pressure releases silt and sand and also causes sinking up to 10 cm once the shakes subside along with subsidence [87].

3. Findings and Results

The indicators investigate the five key dimensions of community long-term housing resilience using data collected from the primary and secondary data sources, interviews, the housing and insurance database collected and analyzed for each case study.

Indicator 1: Governance

After Hurricane Katrina, there was much confusion and uncertainty regarding overall recovery due to the conflicting statements about funding sources, roles and responsibilities made by local, state and national government officials [88]. This was clearly evident 3 years after Hurricane Katrina, at which point the city of New Orleans had already participated in five different recovery plans, and had not chosen a single plan to move forward with [89]. In the controversial Bring Back New Orleans recovery plan, Broadmoor was identified as one of six districts in which residents would need to prove their ability to bring back their neighborhood or face relocation [90].

The Broadmoor Improvement Association (BIA), a community-based initiative, played a leading role in managing the recovery process in Broadmoor. The BIA sought to address the needs of the residents by building consensus by creating the Broadmoor Redevelopment Plan (BRP) that was a long-term (10 years) community vision plan to identify housing programs and mechanisms assisting under and uninsured homeowners [83]. This approach was in direct contestation with city, state and federal government recovery efforts. Broadmoor's BRP planning approach aimed to self-manage their overall disaster and housing recovery efforts. BIA connected and linked to local, state and federal government processes to assist homeowners and households with direct rebuilding and relocation efforts. Frequent and regular internal assessments (surveys, interviews and community meetings) within the first 3 years of the aftermath provided direct feedback of the most critical resources needing attention, such as access to utilities, property access from the city government, and assistance filing relevant funding claims paperwork. Field observations, including attendance at BIA board meetings, and interactions with residents participating in events or programs (2015–2018) confirmed that much of this process continued well after the ten-year anniversary of Katrina, and was seen as an effort to address overall community resilience. However, the general disaster and housing recovery process for New Orleans was largely confusing, unorganized or unstructured with competing institutions and policies overlapping or undermining one another. Additionally, the lack of a transparent and accountable insurance claims process for both NFIP and private insurance policyholders provided further delays to the rebuilding process. Such sentiments were reflected as one respondent noted, "when the whole green dot thing happened we really thought we were going lose our homes, so we had to fight back. But after the city and the mayor (Ray Nagin) did away with the plan there never really seemed to be a plan and a lot of fighting." Another reflected upon the frenzy of the 10-year anniversary festivities and celebrations organized by the City of New Orleans: "I know they are planning this whole thing, K10, it's all over the city, K10 this and that, and I get it all, but really I have PTSD about it all, I'm having panic attacks again. They are bringing all 3 Presidents and want this big party. Whatever. I don't want to celebrate, what am I celebrating for? Then everyone will forget about us again after they leave. If we hadn't did what we did and fought back, we would have lost our homes. We are like this poster child for Katrina recovery, resilience, resilience this and that, (I'm) so sick of that word, and everyone wants to come and take pictures and green dot this and that, but I am sick of the green dot. We are not a green dot you know? We still have problems. People need jobs and there are other problems like safety, health and wellness".

There were no disaster recovery strategies in place prior to the Christchurch earthquakes [91]. A special government agency, Canterbury Earthquake Recovery Authority

(CERA), was established to manage recovery and rebuilding overseeing the Christchurch Recovery plan ("Blueprint") as a 5-year *ad hoc* and short-term organization [92]. The Blueprint was seen as a top-down plan for Christchurch's central city that focused on national government priorities, involving reconstruction of critical public and economic infrastructure [93]. Effective April 2016, CERA was dissolved and reformed ("Regenerate Christchurch") to manage on-going recovery and rebuilding efforts [94].

There was a top-down governance process with little autonomy given to the local city council, communities or households beyond managing insurance claims directly with the Earthquake Commission (EQC) (New Zealand natural disaster insurance). Specifically, Māori community members were not part of the disaster housing rebuilding plans designed by CERA, and often were some of the most vulnerable residents. Māori are often not directly represented in most disaster reporting, yet are geographically represented in some of the poorest areas of Christchurch [95]. Māori were also disproportionately affected with inadequate access to basic resources and assistance programs provided by government agencies [96]. CERA conducted a series of health and wellness surveys which showed an alarming pattern of Māori suffering some of the worst effects of well-being [97]. Furthermore, a significant Māori population had their residential land identified as red zone properties by CERA [97]. One Māori respondent noted "Māori were less involved than they wanted to be in recovery. Gerry Brownlee (Minister of CERA) cut them out, but we have Regenerate representatives in council, Regenerate will have a seat, we are a stakeholder". Another noted whether or not the Māori would become part of the governance process handling red zone properties by asking "will the red zone be shared or sold back to them first?" This issue is centered around previous governance conflicts between Māori justice settlements that gave the Māori first priority and the option to repurchase any government assets being sold from their treaty agreement [98]. The post-disaster recovery brought up many forms of justice issues between the Māori, central government, the past and the future of Christchurch. This event, much like Hurricane Katrina, tested the general capacity of the financial and insurance institutions in place for housing rebuilding. It is difficult to untangle the complicated claims management process due to multiple reoccurring events, which may have resulted in multiple claims filings. It is apparent and evidenced by EQC and other governance stakeholders that the systems and processes were not capable of handling such a large disaster event. A respondent commented on the conflicting power or control held and negotiated between Christchurch City Council and Canterbury Earthquake Recovery Authority (CERA), "outside of the central city CERA has no authority or jurisdiction for zoning plans or requirements for rebuilding, this is all held with Christchurch City Council". Another respondent also criticized the Christchurch post-disaster governance process by saying, "Christchurch City Council must consult everything by law. Central government created CERA to avoid this, Council never had the power or ability in running the recovery. Council was good at running the city, they didn't attract the power because there is no power." "Council had been sacked and central government or other politicians didn't want to sack Christchurch City Council, which should have been done, there was not effective leadership and good best practices or policies being implemented," claimed by another respondent. Others considered the scale of CERA's rebuilding efforts by considering how much "new building was more than the facilities of Christchurch needed like the Town Hall, Convention Center, but the city center was failing because it is being hollowed out and forcing people to move out. Gerry Brownlee (Minister of CERA) is trying to revitalize the city center responding to the old money and representing his constituents but it may never work out". This was in part due to the lack of available physical resources (e.g., claims adjustors, rebuilding labor and materials), and weak internal systems in place for general disaster management [99]. Unlike Broadmoor, Avonside did not take up activist approaches to navigate the housing governance rebuilding process. Greater Christchurch residents did challenge EQC claims management settlements, and Crown settlements for red-zone properties (requiring government buy-out and total demolition) through lawsuits and appeals. Governance is inextricably linked to other systems and processes of long-term housing rebuilding and resilience, namely accessing funding, identifying and utilizing avail-

able resources for rebuilding, reducing risk and vulnerabilities from the disaster and aftermath, and, most importantly, influences the entire time compression direction and movement.

Indicator 2: Community resources

In both cases (see Figure 1) we find a relatively low priority given to the role communities should take in the initial or long-term recovery planning and management processes. In the case of Broadmoor, the Broadmoor Improvement Association (BIA) took an active role, initially resisting and challenging the recovery planning process, and then became a model for engaging community stakeholders for housing rebuilding. This then became the most effective conduit for community residents to self-organize, communicate and make key decisions that would determine the future of rebuilding, as well as the fate of their neighborhood. BIA benefited from numerous public–private partnerships (e.g., religious organizations, non-profits, FEMA, city agencies, grants, foundations) assisting in various housing and rebuilding recovery efforts. BIA was able to effectively function as a central organization hub, allowing them to identify residents needing the most critical resources, and then connecting them with appropriate resources. This continues to be the model BIA works under to address ongoing long-term recovery efforts to enable residents to return home. One resident, who had lived in Broadmoor for almost 20 years at the 10 year anniversary, said, "We still have a lot work to do. When we sat down and came up with our community vision plan we choose to make it, us, better than before. Everyone talks about how we are resilient, Broadmoor is resilient, Resilient Broadmoor, okay but that's how we had to market ourselves. We didn't know how to figure it out but we didn't trust anybody either. So many people came and said they wanted to give us help but none of them really thought we could do it on our own. We came up with the BIA Plan and then we figured out how to partner with people, like the Clinton Foundation. It was hard, a lot of meetings, a lot of knocking on doors, figuring out what we needed and talking to everyone. We still have a lot of work to do, like figuring out affordable housing and all the blighted property we have here".

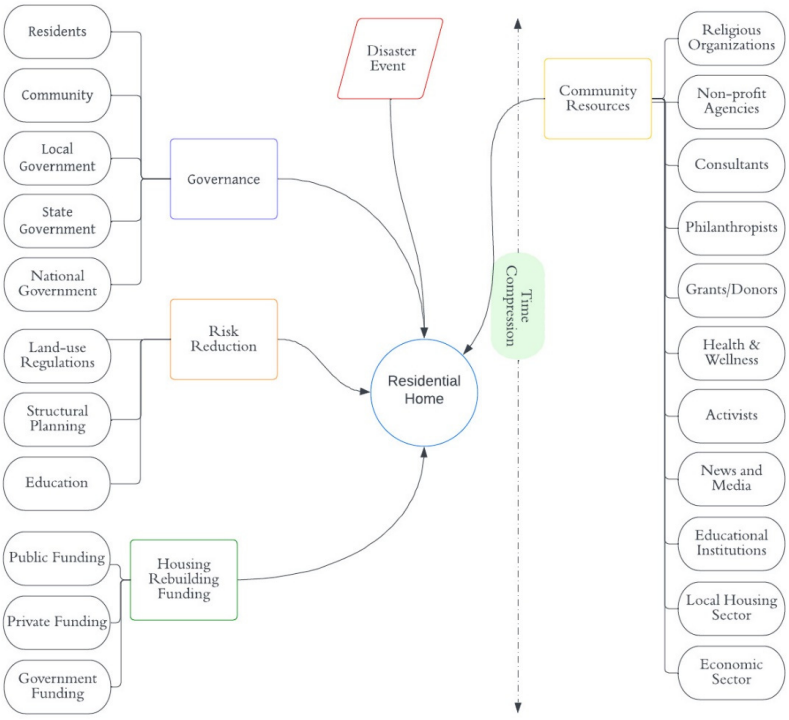

Figure 1. Diagram of stakeholders, community resources and interactions.

In comparison, in Avonside, no central neighborhood organization existed before or after the earthquakes. Most households instead worked directly with Earthquake Commission (EQC) and insurers to resolve existing claims, as well as managing formal disputes

made against Crown red zone settlements. Interviewed residents pointed to the establishment of Canterbury Earthquake Recovery Authority (CERA) and the City Council's consequent lack of authority, as a main reason for little community activism in the rebuilding processes. Residents also questioned the lack of long-term housing recovery planning by CERA as well the short-sighted decision to only have CERA function for five-years given the enormity of the actual recovery process. Canterbury Communities Earthquake Recovery Network (CanCERN) was one agency born out of the necessity for residents to find alternative ways to mediate insurance claims between EQC, insurers, reinsurers and residents. CanCERN originally intended to represent earthquake-affected Christchurch community groups, but, under the leadership of Leanne Curtis (the founder), quickly evolved into an organization to assist homeowners and insurers resolve insurance claims. Interviews with Curtis (April 2016, December 2018) revealed how the organization was established, CanCERN's challenges, housing rebuilding governance processes and future disaster housing rebuilding. Curtis discussed the importance of CanCERN simply acting and functioning as an intermediary between both parties seeking to find acceptable resolutions, so that homeowners could complete housing renovations and reconstruction. Curtis highlighted the unique position of CanCERN: its informal role in managing insurance claim settlements and disputes, and its navigation of uncharted territory in the overall disaster recovery process and CERA management. Curtis observed a constant tension among stakeholders due to the lack of recognition by institutions, such as EQC, CERA and insurers that organizations, such as CanCERN, were vital in managing general housing recovery and resilience planning needed by the central government. CanCERN was formed to serve as a short-term community resource for residents, and formally ceased operations in 2015.

Indicator 3: Risk reduction

Generally, land-use planning and regulations in New Orleans consisted of higher standards for homes elevated above ground level and potential flood zones to reduce general flood risks. Some mitigation funding was tied to incentives to make flood-resistant housing modifications (e.g., to heights, setbacks, shape or building forms), which resulted in some homeowners receiving buy-outs or additional retrofitting funds. Critical repairs were deemed necessary for adequate levee protection and defense against future disasters. One of the more notable negative aspects of Hurricane Katrina recovery planning and management processes was the excessive planning fatigue experienced by residents. Comprehensive zoning plans developed from the Master Plan were not accepted for review prior to 2010 (5 years after the disaster event) and not approved until 2015, taking a total of 10 years. This slow pacing of comprehensive zoning highlighted the on-going conflicts and issues between homeowners and various stakeholders impacted by such changes [100]. One respondent described lack of appropriate planning for recovery rebuilding by asking to "look at the Lower 9th Ward, it's been ten-years and still looks like just after Katrina in most places. They spent a lot of money of some of those Brad Pitt homes but they only built like three. They were supposed to have these sustainable green homes but they have a lot of issues and ran out of money. They cost too much because people can't afford them and some lost their homes because of it. The homes (Broadmoor) have to be built now raised for floods. You can't get a permit here unless it is".

A respondent commented in Christchurch on how "connections of identity that play out in the construction of community and their ideas of recovery, the connection to land is a huge part of why decisions are made". The majority of Avonside housing losses were the result of historic poor land-use decisions [101]. In contrast, Christchurch experienced huge areas of land affected by liquefaction. Most rebuilding data noted the limited availability of scientific and technical earthquake analysis due to the lack of geotechnical information and high costs associated with on-going liquefaction property assessments. Therefore, most rebuilding is seen as problematic for reducing vulnerabilities and inadequate for strengthening housing resilience to disasters given the high levels of risk and uncertainty of future earthquake events. However, many housing plans were not developed concurrently

with the Blueprint or other policy planning. This was in large part because these policies focused directly on Christchurch central city short-term rebuilding efforts and economic development and not suburban housing [85]. The re-zoning of approximately 7,000 residential homes unsuitable for repairs and classified as "red zone" for government/Canterbury Earthquake Recovery Authority (CERA) buy-outs is another hallmark of the earthquake-recovery governance, risk reduction and housing rebuilding finance measures undertaken. Many residents disputed the CERA settlement red zone process due to many losing equity or the lack of available affordable housing elsewhere. This resulted in some homeowners becoming 'socio-economically disenfranchised' because they were unable or unwilling to participate in the rebuilding process [102]. Thus, the red zone imposed penalties for many homeowners wanting to rebuild, constrained available resources and capacities to rebuild or find alternative housing, and forced many to migrate [85].

Indicator 4: Housing rebuilding funding

"Did you get housing back?' asked a respondent commenting on the long-term housing recovery of New Orleans. In the case of Broadmoor (see Table 2), it is estimated that as little as 30% of homes in Louisiana had flood insurance at the time of the disaster [103]. The average National Flood Insurance Program (NFIP) homeowner received USD 100,000 per claim [104]. Hurricane Katrina created numerous logistical and coverage challenges for insurers due to the lack of response plans for extensive flooding, the number of claims, lawsuits and demands by disaster victims [105]. The aftermath exposed large financial debts for NFIP and private insurers unable to cope with repetitive flood losses and payouts, forcing some into insolvency less than a year later [106]. The claims process also revealed disconnects between coverages, leaving many homeowners uninsured for claims or limited coverage due to policy term inconsistencies and exclusions [106]. NFIP reported that over 95% of claims were closed within 9 months with few complaints. However, the claims settlement process did not allow for appeals or disputes, resulting in new NFIP policy and claims management reforms [45,106]. The Louisiana Homeowners Assistance Program (HAP) received funding from the U.S. Congress in December 2005 to develop the Road Home Program (Road) providing assistance with repairs or buy-outs [107]. The program was largely criticized for its lack of long-term effective disaster recovery by residents in interviews. One respondent described it as, "I don't think Federal Emergency Management Agency (FEMA) ever really wanted to approve people at Roads. Hardly anyone got approved and they always seemed to be losing people's files. Like they would just disappear and tell you that you gotta resubmit everything, or they didn't know where the paperwork was. How does that happen? Unless you really don't want to approve anyone." Another respondent commented on how insurance overall was lacking and continues to fall short by stating "most people didn't have flood insurance and if you did, it was really difficult to get anything and took forever...some people here had to sue but most people can't do that . . . BIA came up with a plan to try and help everyone since most people didn't have insurance . . . at first we were supposed to get these FEMA trailers but the whole process was horrible and stressful, calling trying to figure out where your trailer was . . . . but nothing has changed, people here still don't have flood insurance and no one is doing anything about it like FEMA or the banks because they don't care".

Table 2. Housing rebuilding funding sources for case studies.

Case Study	Public Funding Sources	Private Insurance	Government Insurance
Broadmoor (New Orleans, LA, USA)	FEMA, HAP (Road home buy-out program), HUD, FHA, USDA, USDT, SBA, non-profit and non-governmental agencies	Flood insurance, household contents	NFIP for homes designated in flood zones with a mortgage
Avonside (Christchurch, NZ)	CERA red zone settlement	Household contents, disasters insurance	EQCover

"Most people are not knowledgeable of the insurance process and how EQC works" a respondent interview from Earthquake Commission (EQC) said. Another respondent commented that "reinsurers are portrayed as the bad guys by EQC and insurers." New Zealanders have long expected this scheme to provide insurance for full coverage of repair or replacement (see Table 2). Any claims exceeding these amounts (known as overcap claims) would be transferred to the homeowner's private insurer [86]. In 2016, despite having most EQC claims settled by late 2015, many homes had been demolished or were awaiting repairs, indicating recovery was far from complete [108] as conceived by CERA's 5 year recovery plan. As of 2018, private insurers received an average of two overcap claims from earthquake damages per day from EQC [86]. In total, there were 14 events that generated EQC claim filings for homeowners (over 100,000 homes) resulting in numerous delays and disputes in the claims settlement process [86,109]. Given the limited robustness of the disaster insurance program directed by EQC, no additional public funding aside from the red zone buy-out program was made available. One respondent noted that "Christchurch and central government did not utilize other charity or alternative funding sources for their recovery. It just wasn't seen as the vehicle to tap for funding." Many legal issues arose relating to such red zone properties regarding insurance contracts, court case rulings, policy compensation, and appropriate relocation and rebuilding compensation [86].

The Crown-sponsored red-zone government buy-out program may be one of the more effective measures against long-term disaster risk and vulnerabilities communities face when determining acceptable housing resilience standards. Theoretically, households were able to use settlements to find more suitable housing under the premise of a buy-out. However, most homeowners did not receive acceptable compensation in a relatively quick payout time, and so were unable to make repairs or relocate, being left with large levels of home equity losses [102]. This resulted in many households unable to cope with the total financial disparities, and disaster housing inequalities in finding alternative or substitute housing. "The smaller repairs were completed first, part of the PR to show how successful recovery was coming along because they did not hire enough qualified people (EQC) to conduct the claims process" revealed by one resident and many others commenting on how they believed EQC was not adequately equipped to deal with the enormity and scale of the insurance claims or red zone settlements handling. Another noted, "well I don't want to say too much because I am suing the Crown over my settlement offer but I know they just expected people to just accept whatever they were offered but my house is worth more and I won't settle, so I am suing and waiting." One respondent reflected on how "my mother basically became a millionaire from the insurance payments. I mean that shouldn't be the case but she is entitled to that money. We started the repairs and then we had the next earthquake and it damaged everything. So we filed another claim and she got paid again. It sounds awful but it isn't like she cheated the system." Contrasted with another respondent, "I still have a lot of damage from the earthquakes, look see here, here, here or there. The insurance only paid for some structural repairs and they said the rest is cosmetic or not their responsibility, but I am a single mum and can't work full-time so I don't have the money. I inherited my house from my mum so I don't have anywhere else to go or anyone to help me. I don't know, maybe I should have asked for more but I don't know how or who I could have asked. I don't know because look at my neighbors and how much they have gotten and how their houses look." Another commented, "it's been five years and homeowner repairs have been a nightmare and still going on. Everyone wants to complain but no one wants to change anything." Another noted, "I wish there was more attention paid to the poor of Christchurch, recovery mostly suits the average person, they receive the most benefit. Who is advocating for those least represented and the minorities, because they are the ones that suffer the most".

The initial Broadmoor housing database contained 2335 properties comprised of single or multi-dwellings, and commercial buildings. This was adjusted to reflect properties designated by official City Broadmoor boundaries. It is assumed that 80% of homeowners for the calculations did not have any type of flood or disaster insurance. Based on the flood

damage assessment reports from the City of New Orleans, the weighted damage average was 39% of the 2005 home values. This resulted in USD 74,242 in average flood household losses, and an average of USD 61,203 in uninsured losses per property in Broadmoor. The Road program states that 873 properties received compensation totaling USD 86,302,735 in Broadmoor. These figures are then compared to land records data obtained from the City of New Orleans and the BIA housing database applicable to Option 2 and 3. Data was not available to cross reference properties under Option 1. A total of 36 properties (less than 2% of all properties) were identified to have received a Road buyout (Option 2 or 3) averaging USD 110,841 per household, totaling USD 3,990,258 between the periods from 2007 to 2015. It is difficult to assess the Road settlements against published figures without having more property details. Instead, the numbers provide insight into how long the application process took for those known (36) properties, whereby a majority of the settlements occurred in 2007 (10) and 2008 (16). Interviews with residents discussed the cumbersome process of having any sort of knowledge or understanding of the application process, let alone being approved.

For the insurance claims dataset for Avonside, it is assumed, based on the events having the most significant damage, that there was an average of two filing claims made among the five earthquakes (4 September 2010, 26 December 2010, 22 February 2011, 13 June 2011 and 23 December 2011) associated with EQC claims filings [110]. Therefore, each red zone household is assumed to have had one EQC claim settlement from the first event, a Crown settlement resulting from the third event, and no additional claims (Muir-Wood, 2012). Red zone properties are considered to be fully insured for the third event or Crown settlement due to the CERA ruling compensating homeowners regardless of having insurance [111].

The following assumptions were used to calculate the projected total EQC insurance claims payout for the expected average of two claims per property. The first claim supposes an estimated NZD 58,462 in total per household losses and all residential homes received the median EQC payment (NZD 37,479), noting this payment excludes overcap claims [84]. Among EQC claims filed, it is estimated that the median damage per insured dwelling is between NZD 10,000 to 100,000 for Green Zone TC2 properties and 50% of the Capital Value 2007 rate for Green Zone TC3 properties because damages exceeded NZD 100,000. Therefore, the second claim assumes all TC2 properties are projected to have received NZD 100,000 and TC3 received 50% of the Capital Value 2007 rate for the analysis. The second claim is tied to the third event where those classified as red zone received the Crown settlement (NZD 292,996) and the remaining properties received the median EQC payment (excluding overcap claims). It is also assumed that claim deductibles are satisfied and not combined with the total accounting for insured calculations. Most residents communicated in interviews an expectation that EQC claims and payouts should not leave homeowners inundated with large financial losses for either insurance claim settlements or red zone settlement offers. EQC average claims payouts contrasts starkly with those of Broadmoor residents who sought what appears to be minimal flood damage compensations allowable under the insurance market terms in the US (see Indicator 4).

Indicator 5: Time compression

"The thing you lose in disasters is time, time you don't get back" said a respondent commenting on the 10-year anniversary of Hurricane Katrina. The time compression findings describe the various phenomena and activities during periods of recovery times. These results are a culmination of all previous indicators and are also interdependent. Electrical permits related to Hurricane damages were resolved on a short-term basis (1–2 years), while mechanical repairs carried on for many more years (3 or more years). Although electrical service is an essential service to make a home livable, the need for a fully mechanically sound construction is less critical as long as basic safety levels are obtained. This shows that total recovery consists of various individual time scales leading to different levels of recovery progression. As expected, the number of permits for demolitions and new construction over the 10-year time frame shift between the onset of demolition and

new construction of about 1 year. Interestingly, a much larger number of houses were demolished and never rebuilt. From the author's inventory, from the 1972 residential properties in 2005, only 1816 were renovated or under repair in 2015, resulting in a total loss of about 8% of properties. For the few NFIP-covered properties, 95% of claims were closed within 9 months, whereas with the Roads buy-out program, there was a delay of around 1–2 years that was spread over an extended period of time. It is important to stress that both only mark the first step towards recovery, as, permitting, reconstruction and inspection are yet to follow. Projected timelines from payouts to rebuilding then can be interpreted with estimated insured and housing losses to assess overall community housing recovery. In contrast, community recovery shows a slower but more steady pathway, resulting in 82% of properties rebuilt or under construction in 2009 [88]. "They always talked about it like it would only take a few years to rebuild but I never believed it, and look, so many people still have the X (FEMA marking) and it's been ten-years" a respondent from Broadmoor.

EQC established a claims-handling process split up into a number of sequential steps for Avonside. These processes (e.g., filing of a claim, followed by housing assessments and claims settlements) were spread out over a period of time ranging from days or months to years. Initial delays were caused due to incomplete or delayed filing of claims. These delays may result in up to an additional 6-month processing time. Several general observations can be made concerning the development of housing recovery based on EQC published claims data. In the first 3 years of recovery, the number of settlements are low and increase slowly. This is due to delays in filing claims, the discovery of additional previously undiscovered damages, and the ramp-up time needed for the insurance-management systems. This period is followed by 3 years of significant reduction of claims at a high pace. Lastly, there are years when low remaining number of claims diminish at a much slower rate, likely due to litigations and complexities. It was evident based on numerous interviews with stakeholders varying from residents, to planners and experts, that the time compression of housing recovery was grossly distorted amongst different processes in time (recovery phenomena). One respondent noted how governance was highly political in setting the stage for developing an actual long-term post-disaster process by citing how "recovery plans were put into place with the exception of a five-year timeline horizon, but it's not realistic. Had the community been briefed that it would have taken longer, five to ten-years, then confidence would have been lost and many wouldn't have stayed or committed to the rebuilding efforts. This was done for PR currency, politics were involved."

4. Discussion

The case studies address three post-disaster community housing rebuilding aspects: (1) resources and systems needed for interventions; (2) the need to address the root causes of vulnerability (pre- and post-disaster); and (3) the importance of time compression.

The similarities between the two case studies suggest that integrating BBB into housing recovery are largely the same across geographic and socioeconomic environments. In order to build back better, communities need to be able to prioritize their demands based on their own assessments and standards. This may include issues related to sustainable livelihoods, housing, health and wellness, civic engagement and governance. The results also demonstrate how disaster housing and resilience have similar desired post-disaster housing reconstruction outcomes, but each has a unique set of approaches and characteristics [18,19].

Although housing resilience post-disaster attempts to reduce vulnerabilities and promote sustainability [18], often communities are not considered part of the formal governance systems to manage such processes. Both community case studies were formally excluded from any post-disaster policy-making, yet Broadmoor residents vehemently contested this when faced with the prospect of losing their homes to city redevelopment plans.

Time compression helps provide insight into understanding post-disaster recovery [32]. Time compression phenomena have important effects on managing resources effectively, such as housing recovery financing, the implementation and management of governance

processes and how judiciously pre- and post-disasters are addressed. Both case studies demonstrate how recovery phenomena (i.e., delayed insurance claims settlements or home buy-outs, delayed recovery planning, lack of trust in stakeholders, lack of misinformation or mishandling rapidly changing policies, and household competing for various resources) is observed as symptoms of time compression. We see a series of power dynamics at different scales competing to first manage which recovery policy is adopted; the Green Dot in Broadmoor versus City Council and CERA in Christchurch. This later expands into how and when housing recovery financing is managed when residents challenge the lack of insurance in Broadmoor, versus the insufficient financial recourse for multiple earthquake claims and damages in Avonside.

The divergences between the two cases need to also be carefully examined to balance the context of how community housing resilience is conceptualized and operationalized. Avonside did not explicitly choose or express the need to become an active governance stakeholder through a formal vis-à-vis community structure or entity, the same as Broadmoor. Avonside and greater Christchurch residents and stakeholders articulated instead a priority as to how EQC would manage a nearly fully insured housing market. This then became the sole focus of attention for Avonside residents over the tensions between who is compensated, at what rate is one compensated, how much is one compensated, and what forms of checks and balances exist for internal controls. These also represent the nuanced BBB separations that ignores the lack of choices, housing reconstruction resources, power dynamics between stakeholders and a lack of understanding of a community's vulnerability, needs and priorities [6–8].

A Build Back Better Long-term Housing Recovery (BBB-LHR) framework assessing five indicators was developed and applied to two case studies to assess long-term community housing recovery. The BBB-LHR framework addresses the lack of existing research demonstrating empirical relationships between disaster insurance and recovery [49]. In the first case, Broadmoor residents sought to rebuild their community by challenging the traditional disaster recovery governance process through collaboration focused on BBB approaches. While this approach was quite successful, it remained a local effort that was not aligned with other recovery processes throughout New Orleans. In contrast, for the second case study resolute consequences for risk reduction were put into place in Christchurch for areas prone to substantial future damages. The implementation of these red zones, resulted in a considerably high displacement of Avonside residents. This again left the most vulnerable with the short-term impacts of facing long-term security issues related to livelihoods, personal security, financial security, emotional security, health and wellness. While this further delayed housing recovery as a whole, it most likely will result in fewer future disaster damages that meet long-term BBB principles and overall long-term housing recovery.

While each of these indicators is based on a unique set of resources and processes, they are often interdependent. For example, total available private–public funding sources for housing repairs may require a new set of policies and governance structures to be in place, accounting for new risk-reduction measures (e.g., building codes, geotechnical assessments, new technology adaptation). Time compression varies amongst complex recovery processes. The onset of recovery and BBB initiatives are highly dependent on governance and insurance claims processes. This is due to both requiring procedural systems and guidelines, as well as when resources are available (e.g., insurance settlements) to commence repairs or relocate. From the data collected and examined, insurance claims processing takes at least 1 year and in most cases between 2 to 5 years for total payouts. Therefore, in most cases, short-term recovery is already inhibited initially when accessing funding for necessary repairs. Specifically, low-income housing residents may not be able to sustain their livelihoods and out-of-pocket costs for repairs or disaster-risk improvements simultaneously. An early insurance payout is therefore a necessary prerequisite to enable long-term recovery. From the community housing recovery efforts led by BIA, it can be assumed that having access to recovery funding earlier would have initiated housing rebuilding earlier with the potential to reduce overall recovery times for residents. The

results suggest that insurance plays a crucial role in overall community recovery, as it (along with other factors) critically influences the possible onset of repairs in the early years of recovery. The case studies affirms the issue of having and using insurance for managing disaster losses places a heavy burden on recovery [50]. The ultimate test of how well a disaster insurance policy functions is how well it responds to a claim, which then allows a policyholder (homeowner) to proceed with housing rebuilding. Massive catastrophes, such as Hurricane Katrina and the Canterbury earthquake sequence, exposed significant weaknesses in the insurance claims management process. Both cases highlight how the inability to reach damaged homes in a timely manner, the total number of losses, overall monitoring and oversight of claims management, and policy notifications for claimants all contributed to delays in the claims management process. The insurance sector has many issues to address, such as risk modeling, maintaining adequate capital reserves, reinsurance contracts, liquidity and claims management. Munich RE [112] calls attention to the need for proactive and optimal claims management systems to finalize payouts, given the enormity of claim losses and logistics (e.g., infrastructure, communication systems, lags in claims reporting, managing claims disputes and resolutions, and adequate staffing for adjusters). The scale of disaster insurance coverage appears to be one of the biggest challenges for markets with existing and well-established disaster insurance policies. This may in large part be due to policyholder's expectations that their insurance cover should allow them adequate funds to facilitate housing recovery financing. However, recent disaster events in well-established markets have placed insurance policy coverage issues and terms at the center of debate. For example, in Australia, exclusions after flood events and financial losses resulted in community backlash against insurers and financial distress for many insured homeowners [45]. This may be perceived as a structural intervention needed for housing resilience, involving new insurance standards and financial regulations, in conjunction with progressive capital investments, scientific data and analysis, public policies and governance. Larger issues related to existing insurance coverage then become a priority concern for communities with either under or over insurance policies managing community housing recovery [45,49,113–116]. The question of long-term recovery is directly linked to individual households having to make significant BBB financial decisions (rebuild, relocate or buy-out) shortly after a disaster. This also demonstrates how recovery phenomena is a function of time compression [32]. Examining the extent of individual household costs among the case studies provided estimates of individual household losses for each case study and, therefore, personal liability in the absence of a quick insurance settlement process. The greatest losses were experienced in Broadmoor. These losses also correlate to underlying vulnerabilities that ignore pre-disaster building and housing risks [18]. Christchurch appears to have the slowest funding speed of recovery in a market that is considered fully insured. The EQC claims settlement process took, overall, 7 years to be completed with a few remaining settlements still being managed presently. However, the speed of recovery and personal liability do not necessarily correlate to a factor of completed new construction or housing repairs. The data only goes as far to tell us how long the initial reconstruction phase would have been delayed, assuming large amounts of funding sources needed to be acquired prior to any major repairs being undertaken. This supports the views of residents who stated that most major repairs, as well as investments for disaster-risk improvements against future disasters could not be facilitated without some major investment from a bank, insurance, government program or private fund. Furthermore, this reveals the effects of housing rebuilding funding (recovery phenomena) on time compression [32], and the lack of a people-centered BBB housing recovery approach [5].

Governance is one of the most important factors for housing resilience, whereas insurance claims typically come only with a small set of requirements (e.g., improving resilience through flood reduction measures). Therefore, time compression for community housing needs to take into account the various speed of claims processes, after which, permitting, construction and inspection processes become dominant. With each having

their own timeline and being dependent on each other, significant delays can occur due to the limited nature of factors such as labor, building materials, etc.

The tension between disaster insurance and housing recovery continues to highlight the importance of having financial resilience for BBB approaches. The lack of effective disaster recovery policies, and insurance claims management contributes to community long-term housing risks and vulnerabilities, undermining community resilience. Despite the BBB intentions of reducing risk and vulnerabilities to improve resilience, these results support the finding that housing recovery and resilience are more than a function of total investments. Instead, community housing resilience is interconnected to the inclusion of community governance, overall recovery policy planning, property site selection and other reconstruction efforts together with total financial investments (private–public investments and insurance).

5. Conclusions

This paper examined two case studies in order to better understand the role of insurance in long-term housing recovery and rebuilding post-disaster. The conceptual framework applied a Build Back Better Long-term Housing Recovery (BBB-LHR) framework using five indicators that support and assess overall community housing resilience. Public and private insurance schemes along with other available funding sources were examined to understand the dynamics between the role of insurance and community housing resilience. Each case demonstrated that traditional disaster governance systems were not designed or capable to address long-term housing rebuilding and recovery, and largely relied on the assumption that disaster insurance was capable of handling overall recovery. In both cases the insurance process was hindered by challenging claims processes and government-sponsored buy-out programs. The time compression is a temporal representation of all the combined BBB-LHR framework indicators (governance, community resources, risk reduction and housing rebuilding funding). In both cases, successive events or extreme events placed considerable burdens on complex (local, state, national) institutional systems that are often disruptive in a nonlinear recovery process. Many residents rely on the use of insurance to reduce risks to build back better. However, even with insurance such disasters are a major challenge for communities to rebuild or make repairs focused on Build Back Better approaches. The temporal analysis reveals a disconnect between the insurance and buy-out claims-management systems, and the governance systems implemented, the latter being largely focused on short-term housing recovery measures. Regardless of how the financing or insurance scheme was employed, the most significant factor appears to be the rate (time compression) at which households were able to successfully access and implement financial resources that is focused on long-term (beyond 5 years) housing solutions for long-term housing recovery. Moreover, the BBB-LHR utilizes community housing qualitative data (e.g., interviews, physical housing assessments, and observations) for each indicator, which affirms how "Build Back Better" and resilience in large part overlooks the complexity of long-term post-disaster recovery, especially as it relates to urban, environmental and social issues. The BBB-LHR framework, together with the case study data, also supports the need for a more nuanced mix-methods approach to applying and implementing BBB principles for post-disaster housing recovery.

This paper adds to the limited long-term housing and community housing resilience literature. Furthermore, this paper adopts a critical approach to both the concept and processes to BBB and the role of insurance in relation to long-term housing rebuilding. This paper proposes for the use of a singular definition of community housing resilience: a community's ability to maintain, repair or adapt its housing system, by addressing underlying vulnerabilities that are linked to physical systems, social systems and recovery financing investments when facing shocks and stresses. Understanding and implementing concepts of Build Back Better, disaster resilience and community housing resilience is integral to improving overall resilience. This requires careful examination of governance systems, community resources, risk-reduction measures, possible housing rebuilding funding, and

a comprehensive understanding of how time compression impacts recovery phenomena. Thus, this forms the basis for the conceptual design of the BBB Long-term Housing Recovery framework and assessment for community housing resilience and the role of insurance. Based on the findings of this paper, the author offers the following suggestions for future research. Future studies could focus on post-disaster long-term community housing recovery using the BBB-LHR framework. This paper used two case studies from the United States and New Zealand notwithstanding robust insurance markets in order to examine post-disaster housing resilience. Investigating post-disaster housing reconstruction rebuilding as comparative studies may also provide insight on similar or different BBB- and insurance-related factors that affect the recovery processes and outcomes. Furthermore, future research, such as the role of insurance and governance frameworks, has the potential to incorporate new knowledge and better understand post-disaster community housing recovery, provide insightful lessons learned, foster public engagement, and incorporate community housing resilience strategies that inevitably address the on-going paradox of choosing to 'build back faster' or 'build back better.'

One of the limitations surrounding the analysis of long-term disaster housing recovery pertains to the lack of available data, how data is collected and how data is handled. This greatly impacts the project design and its limitations related to issues such as, examining household insurance payouts, estimating household damages, property assessments pre and post-disaster, homeowners versus renters managing housing recovery, and access to key policies and planning regulations throughout the post-disaster recovery process. These were some of the challenges and limitations of designing the two case studies presented in this paper. Specifically, in the case of Avonside, many residents were fearful of discussing actual claim settlements for red zone properties due to on-going court cases or settled cases against the Crown for financial redress. The lack of public insurance settlement data prohibits a level of analysis to examine the individual and total community housing losses, as well as an ability to see how the time compression recovery phenomena manifests. With the case of Broadmoor, there was a high level of corruption and abuse of power that had been in large part documented, but many others that were not. Moreover, many residents in both cases relocated or abandoned their properties due to being more socially and economically vulnerable. Poorer residents often do not have access or the means to navigate a highly political and socio-economic systems embedded within their own personal disaster recovery trauma. The personal disaster recovery trauma is also another ethical research consideration necessary for investigating long-term housing. Many residents, as well as stakeholders connected with the recovery process (past or on-going) often are conflicted over the many experiences and emotions from the disaster. For some, the experience is still on-going with no foreseeable solution, they are ridden with guilt, remorse or feelings of shame. Each lived disaster experience is part of the recovery process. However, these lived experiences provide insight and understanding for community housing resilience. Therefore, a level of sensitivity and respect is necessary for their lived experiences. This may result in some results needing to be excluded to protect the anonymity of others, or to not interfere with on-going conflicts (legal or otherwise).

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References

1. Twigg, J. *Characteristics of a Disaster-Resilient Community: A Guidance Note*; Department for International Development (DFID): London, UK, 2007.
2. Clinton, W.J. Key Propositions for Building Back Better: Lessons Learned from Tsunami Recovery. Office of the Secretary-General's Special Envoy for Tsunami Recovery (SETR), December 2006. Available online: http://www.preventionweb.net/files/2054_VL108301.pdf (accessed on 17 July 2013).
3. UNISDR. *Terminology on Disaster Risk Reduction*; UNISDR: Geneva, Switzerland, 2017.
4. UNISDR. *Sendai Framework for Disaster Risk Reduction*; United Nations International Strategy for Disaster Reduction (UNISDR): Geneva, Switzerland, 2015.
5. Maly, E. Building back better with people centered housing recovery. *Int. J. Disaster Risk Reduct.* **2018**, *29*, 84–93. [CrossRef]
6. Vahanvati, M.; Rafliana, I. Reliability of Build Back Better at enhancing resilience of communities. *Int. J. Disaster Resil. Built Environ.* **2019**, *10*, 208–221. [CrossRef]
7. Dube, E. The build-back-better concept as a disaster risk reduction strategy for positive reconstruction and sustainable development in Zimbabwe: A literature study. *Int. J. Disaster Risk Reduct.* **2020**, *43*, 101401. [CrossRef]
8. Su, Y.; Le Dé, L. Whose views matter in post-disaster recovery? A case study of "build back better" in Tacloban City after Typhoon Haiyan. *Int. J. Disaster Risk Reduct.* **2020**, *51*, 101786. [CrossRef]
9. Wisner, B.; Blaikie, P.; Cannon, T.; Davis, I. *At Risk: Natural Hazards, People's Vulnerability and Disasters*; Routledge: Abingdon, UK, 2014.
10. Liverman, D. Vulnerability, resilience, and the collapse of society. In *Understanding Global Environmental Change: The Contributions of Risk Analysis and Management*; Clark University: Worcester, MA, USA, 1990; pp. 27–44.
11. Pelling, M. *The Vulnerability of Cities: Natural Disasters and Social Resilience*; Routledge: Abingdon, UK, 2012.
12. Ganapati, N.E.; Mukherji, A. Out of sync: World Bank funding for housing recovery, postdisaster planning, and participation. *Nat. Hazards Rev.* **2014**, *15*, 58–73. [CrossRef]
13. Khasalamwa, S. Is 'build back better'a response to vulnerability? Analysis of the post-tsunami humanitarian interventions in Sri Lanka. *Nor. J. Geogr.* **2009**, *63*, 73–88.
14. Boano, C. Housing anxiety and multiple geographies in post-tsunami Sri Lanka. *Disasters* **2009**, *33*, 762–785. [CrossRef]
15. Harrison, C.G.; Williams, P.R. A systems approach to natural disaster resilience. *Simul. Model. Pract. Theory* **2016**, *65*, 11–31. [CrossRef]
16. Tiernan, A.; Drennan, L.; Nalau, J.; Onyango, E.; Morrissey, L.; Mackey, B. A review of themes in disaster resilience literature and international practice since 2012. *Policy Des. Pract.* **2019**, *2*, 53–74. [CrossRef]
17. World Bank. *Global Program for Resilient Housing*; World Bank: Washington, DC, USA, 2019.
18. Ahmed, I. Housing and resilience: Case studies from the Cook Islands. *Int. J. Disaster Resil. Built Environ.* **2016**, *7*, 489–500. [CrossRef]
19. Zavareh, S.; Winder, G.M. Dynamic economic resilience scenarios for measuring long-term community housing recovery. *Environ. Hazards* **2021**, 1–20. [CrossRef]
20. Hassler, U.; Kohler, N. Resilience in the built environment. *Build. Res. Inf.* **2014**, *42*, 119–129. [CrossRef]
21. Colten, C.E.; Kates, R.W.; Laska, S.B. Three years after Katrina: Lessons for community resilience. *Environ. Sci. Policy Sustain. Dev.* **2008**, *50*, 36–47. [CrossRef]
22. Hofmann, S.Z. 100 Resilient Cities program and the role of the Sendai framework and disaster risk reduction for resilient cities. *Prog. Disaster Sci.* **2021**, *11*, 100189. [CrossRef]
23. Moatty, A. Resilience and post-disaster recovery: A critical reassessment of anticipatory strategies,'build back better'and capacity building. *Disaster Prev. Manag.* **2020**, *29*, 515–521. [CrossRef]
24. Fernandez, G.; Ahmed, I. "Build back better" approach to disaster recovery: Research trends since 2006. *Prog. Disaster Sci.* **2019**, *1*, 100003. [CrossRef]
25. Kim, K.; Olshansky, R.B. *The Theory and Practice of Building Back Better*; Taylor & Francis: Abingdon, UK, 2014; pp. 289–292.
26. Lyons, M. Building back better: The large-scale impact of small-scale approaches to reconstruction. *World Dev.* **2009**, *37*, 385–398. [CrossRef]
27. Sapat, A.; Esnard, A.-M. *Coming Home after Disaster: Multiple Dimensions of Housing Recovery*; Routledge: Abingdon, UK, 2016.
28. Comerio, M.C. *Disaster Hits Home: New Policy for Urban Housing Recovery*; University of California Press: Berkeley, CA, USA, 1998.
29. Peacock, W.G.; Dash, N.; Zhang, Y. Sheltering and housing recovery following disaster. In *Handbook of Disaster Research*; Springer: Berlin/Heidelberg, Germany, 2007; pp. 258–274.
30. Schwab, J.; Topping, K.C.; Eadie, C.C.; Deyle, R.E.; Smith, R.A. *Planning for Post-Disaster Recovery and Reconstruction*; American Planning Association: Chicago, IL, USA, 1998.
31. Peacock, W.G.; Van Zandt, S.; Zhang, Y.; Highfield, W.E. Inequities in long-term housing recovery after disasters. *J. Am. Plan. Assoc.* **2014**, *80*, 356–371. [CrossRef]
32. Olshansky, R.B.; Hopkins, L.D.; Johnson, L.A. Disaster and recovery: Processes compressed in time. *Nat. Hazards Rev.* **2012**, *13*, 173–178. [CrossRef]
33. Lindell, M.K. Disaster studies. *Curr. Sociol.* **2013**, *61*, 797–825. [CrossRef]
34. Chang, S.E.; Rose, A.Z. Towards a Theory of Economic Recovery from Disasters. *Int. J. Mass Emerg. Disasters* **2012**, *30*, 171–181.

35. Eadie, C. Earthquake Case Study: Loma Prieta in Santa Cruz and Watsonville, California. *Plan. Post-Disaster Recovery Reconstr.* **1998**, *483*, 281–310.
36. Ellson, R.W.; Milliman, J.W.; Roberts, R.B. Measuring the regional economic effects of earthquakes and earthquake predictions. *J. Reg. Sci.* **1984**, *24*, 559–579. [CrossRef]
37. Friesema, H.P. *Aftermath: Communities after Natural Disaster*; SAGE Publications, Inc.: Newcastle, UK, 1979.
38. Olshansky, R.; Chang, S. Planning for disaster recovery: Emerging research needs and challenges. *Prog. Plan.* **2009**, *72*, 200–209.
39. UNDP. *Disaster Risk Insurance*; UNDP: New York, NY, USA, 2017.
40. UNEP. *Harnessing the Full Potential of the Insurance Industry in Disaster Risk Management*; UNEP: Nairobi, Kenya, 2014.
41. Douglas, R. *Integrating Natural Disaster Risks and Resilience into the Financial System*; Willis Research Network: London, UK, 2014.
42. Carpenter, O.; Platt, S.; Evan, T.; Mahdavian, F.; Coburn, A. *Optimising Disaster Recovery: The Role of Insurance Capital in Improving Economic Resilience*; University of Cambridge: Cambridge, UK, 2020.
43. Levine, S. *Assessing Resilience: Why Quantification Misses the Point*; Overseas Development Institute: London, UK, 2014.
44. Lloyds. *Innovative Finance for Resilient Infrastructure*; Lloyds: Birmingham, UK, 2018.
45. OECD. *Disaster Risk Financing: A Global Survey of Practices and Challenges*; OECD: Paris, France, 2015.
46. Slavíková, L.; Hartmann, T.; Thaler, T. Paradoxes of financial schemes for resilient flood recovery of households. *Wiley Interdiscip. Rev. Water* **2021**, *8*, e1497. [CrossRef]
47. Smith, B.; Brown, D.; Dodman, D. *Reconfiguring Urban Adaptation Finance*; IIED: London, UK, 2014.
48. Weingärtner, L.; Simonet, C.; Caravani, A. *Disaster Risk Insurance and the Triple Dividend of Resilience*; Overseas Development Institute: London, UK, 2017.
49. Kousky, C. The role of natural disaster insurance in recovery and risk reduction. *Annu. Rev. Resour. Econ.* **2019**, *11*, 399–418. [CrossRef]
50. Porrini, D.; Schwarze, R. Insurance models and European climate change policies: An assessment. *Eur. J. Law Econ.* **2014**, *38*, 7–28. [CrossRef]
51. Parés, M.; Blanco, I.; Fernández, C. Facing the great recession in deprived urban areas: How civic capacity contributes to neighborhood resilience. *City Community* **2018**, *17*, 65–86. [CrossRef]
52. Pares, M.; Marti-Costa, M.; Blanco, I. Geographies of governance: How place matters in urban regeneration policies. *Urban Stud.* **2014**, *51*, 3250–3267. [CrossRef]
53. Van Zandt, S.; Peacock, W.G.; Henry, D.W.; Grover, H.; Highfield, W.E.; Brody, S.D. Mapping social vulnerability to enhance housing and neighborhood resilience. *Hous. Policy Debate* **2012**, *22*, 29–55. [CrossRef]
54. Koliou, M.; van de Lindt, J.W.; McAllister, T.P.; Ellingwood, B.R.; Dillard, M.; Cutler, H. State of the research in community resilience: Progress and challenges. *Sustain. Resilient Infrastruct.* **2020**, *5*, 131–151. [CrossRef] [PubMed]
55. Sherrieb, K.; Norris, F.H.; Galea, S. Measuring capacities for community resilience. *Soc. Indic. Res.* **2010**, *99*, 227–247. [CrossRef]
56. Skerratt, S. Enhancing the analysis of rural community resilience: Evidence from community land ownership. *J. Rural. Stud.* **2013**, *31*, 36–46. [CrossRef]
57. Bevere, L. *Natural Catastrophes in Times of Economic Accumulation and Climate Change*; Swiss RE Institute: Zürich, Switzerland, 2020; p. 2.
58. Discher, A.J.A.E. What Hurricanes Have Hit Louisiana in Recorded History? How Strong Were They? Here's a List. *The Times-Picayune*, 29 August 2021.
59. GeoNet. *A Decade on: Canterbury Aftershocks*; GeoNet: Wellington, New Zealand, 2020.
60. Mannakkara, S.; Wilkinson, S. Build back better principles for post-disaster structural improvements. *Struct. Surv.* **2013**, *31*, 314–327. [CrossRef]
61. Gall, M.; Nguyen, K.H.; Cutter, S.L. Integrated research on disaster risk: Is it really integrated? *Int. J. Disaster Risk Reduct.* **2015**, *12*, 255–267. [CrossRef]
62. Tierney, K. Disaster governance: Social, political, and economic dimensions. *Annu. Rev. Environ. Resour.* **2012**, *37*, 341–363. [CrossRef]
63. Alegado, J.E.B. Post-Haiyan: Alternatives for Disaster Management Law and Governance in the Philippines. In *Post-Disaster Governance in Southeast Asia*; Springer: Berlin/Heidelberg, Germany, 2022; pp. 39–62.
64. Arnold, C. *Reconstruction after Earthquakes: Issues, Urban Design, and Case Studies*; Building Systems Development: Hong Kong, China, 1993.
65. Campanella, T.J. Urban resilience and the recovery of New Orleans. *J. Am. Plan. Assoc.* **2006**, *72*, 141–146. [CrossRef]
66. Francaviglia, R.V. Xenia rebuilds: Effects of predisaster conditioning on postdisaster redevelopment. *J. Am. Inst. Plan.* **1978**, *44*, 13–24. [CrossRef]
67. Green, R.; Miles, S.; Gulacsik, G.; Levy, J. *Business Recovery Related to High-Frequency Natural Hazard Events*; Natural Hazards Center: Boulder, CO, USA, 2008.
68. Haas, J.E.; Kates, R.W.; Bowden, M.J. Reconstruction following disaster. In *Reconstruction Following Disaster*; The Massachusetts Institute of Technology: Cambridge, MA, USA, 1977.
69. Oliver-Smith, A. Successes and failures in post-disaster resettlement. *Disasters* **1991**, *15*, 12–23. [CrossRef]
70. Thomalla, F.; Lebel, L.; Boyland, M.; Marks, D.; Kimkong, H.; Tan, S.B.; Nugroho, A. Long-term recovery narratives following major disasters in Southeast Asia. *Reg. Environ. Ch.* **2018**, *18*, 1211–1222. [CrossRef]

71. Sandink, D.; Kovacs, P.; Oulahen, G.; Shrubsole, D. Public relief and insurance for residential flood losses in Canada: Current status and commentary. *Can. Water Resour. J.* **2016**, *41*, 220–237. [CrossRef]
72. Slavíková, L.; Hartmann, T.; Thaler, T. *Financial Schemes for Resilient Flood Recovery*; Taylor & Francis: Abingdon, UK, 2020; pp. 223–227.
73. Mukherji, A. Post-disaster housing recovery. In *Oxford Research Encyclopedia of Natural Hazard Science*; Oxford University Press: Oxford, UK, 2017.
74. Johnson, L.A.; Olshansky, R.B. *After Great Disasters: An in-Depth Analysis of How Six Countries Managed Community Recovery*; Lincoln Institute of Land Policy Cambridge: Cambridge, MA, USA, 2017.
75. Yin, R.K. *Case Study Research and Applications: Design and Methods*; Sage Publications: Thousand Oaks, CA, USA, 2017.
76. DFG. *Good Research Practice Code*; DFG: Kwun Tong, Hong Kong, 2019.
77. ALLEA. *The European Code of Conduct for Research Integrity—Revised Edition*; All European Academies (ALLEA): Berlin, Germany, 2017.
78. Allianz, A.G.C.S. *Hurricane Katrina 10: Catastrophe Management and Global Windstorm Peril Review*; Allianz Global Corporate & Specialty: Unterföhring, Germany, 2015.
79. Dolfman, M.L.; Wasser, S.F.; Bergman, B. The effects of Hurricane Katrina on the New Orleans economy. *Mon. Lab. Rev.* **2007**, *130*, 3.
80. *III. Hurricane Katrina Fact File*; Insurance Information Institute: New York, NY, USA, 2010.
81. Kunreuther, H. Has the time come for comprehensive natural disaster insurance? *Risk Disaster Lessons Hurric. Katrina* **2006**, *175*, 175.
82. Kunreuther, H.; Dinan, J. Flood insurance purchase decision. In *CIPR Study: Flood Risk and Insurance*; NAIC & The Center for Insurance Policy and Research: Kansas City, MO, USA, 2017.
83. BIA. *The Broadmoor Plan: The Redevelopment Plan for Broadmoor*; BIA: Colorado Springs, CO, USA, 2006.
84. Deloitte. *Four Years On: Insurance and the Canterbury Earthquakes*; Deloitte: London, UK, 2015.
85. Winder, G.; Hofmann, S.-Z. *The Challenges Posed by UN-Habitat's Rural-Urban Linkages in a Sustainability Transition Agenda: The Case of the Christchurch, New Zealand Rebuild*; Routledge: Abingdon, UK, 2020.
86. Insurance Council of New Zealand. *Canterbury Earthquakes*; Insurance Council of New Zealand: Wellington, New Zealand, 2019.
87. IPENZ. *Liquefaction*; IPENZ: Wellington, New Zealand, 2011.
88. Storr, V.H.; Haeffele-Balch, S. Post-disaster community recovery in heterogeneous, loosely connected communities. *Rev. Soc. Econ.* **2012**, *70*, 295–314. [CrossRef]
89. Olshansky, R.B.; Johnson, L.A.; Horne, J.; Nee, B. Longer view: Planning for the rebuilding of New Orleans. *J. Am. Plan. Assoc.* **2008**, *74*, 273–287. [CrossRef]
90. Donze, F.; Russell, G. 4 Months to Decide: Nagin Panel Says Hardest Hit Areas Must Prove Viability. *The Times-Picayune*, 11 January 2006.
91. Gjerde, M.; de Sylva, S. Governance and recovery: Comparing recent disaster recoveries in Sri Lanka and New Zealand. *Procedia Eng.* **2018**, *212*, 527–534. [CrossRef]
92. Blundell, S. Resisting erasure. In *Once in a Lifetime: City-Building after Disaster in Christchurch*; Freerange Press: Christchurch, New Zealand, 2014; pp. 45–51.
93. Brand, D.; Nicholson, H. Public space and recovery: Learning from post-earthquake Christchurch. *J. Urban Des.* **2016**, *21*, 159–176. [CrossRef]
94. Wright, M. Five Years of Cera: Success or Failure? *Stuff*, 15 April 2016.
95. Yanicki, S. *East Side Stories: Cases of Quake-Related Innovation*; Report for Ministry of Social Development; University of Canterbury: Christchurch, New Zealand, 2013.
96. Kenney, C.; Phibbs, S. Shakes, rattles and roll outs: The untold story of Māori engagement with community recovery, social resilience and urban sustainability in Christchurch, New Zealand. *Procedia Econ. Financ.* **2014**, *18*, 754–762. [CrossRef]
97. Lambert, S.J. Indigenous Peoples and urban disaster: Māori responses to the 2010-12 Christchurch earthquakes. *Australas. J. Disaster Trauma Stud.* **2014**, *18*, 39–48.
98. *Ngāi Tahu Claims Settlement Act 1998*; New Zealand Government: Wellington, New Zealand, 1998.
99. McCloud, K.; Blundell, S.; Sutton, R.; MacFie, R.; Sheppard, D.; Franklin, G. *Once in a Lifetime: City-Building after Disaster in Christchurch*; Freerange Press: Christchurch, New Zealand, 2014.
100. Collins, R.A. *No More "Planning by Surprise": City Planning in New Orleans Ten Years after Katrina*; The Data Center: New Orleans, LA, USA, 2015.
101. Adeniyi, O.; Perera, S.; Collins, A. Review of finance and investment in disaster resilience in the built environment. *Int. J. Strateg. Prop. Manag.* **2016**, *20*, 224–238. [CrossRef]
102. Miles, S.A. *The Christchurch Fiasco: The Insurance Aftershock and Its Implications for New Zealand and Beyond*; Dunmore Publishing: Auckland, New Zealand, 2012.
103. King, R.O. *Hurricane Katrina: Insurance Losses and National Capacities for Financing Disaster Risks*; Congressional Research Service, the Library of Congress: Washington, DC, USA, 2005.
104. Michel-Kerjan, E.; Taglioni, G. Insuring Hurricanes: Perspectives, Gaps, and Opportunities after 2017. *McKinsey Insights*, 20 December 2017.
105. Eaton, L.; Treaster, J.B. Insurers Bear Brunt of Anger in New Orleans. *The New York Times*, 3 September 2007.

106. Linnerooth-Bayer, J.; Mechler, R.; Hochrainer-Stigler, S. Insurance against losses from natural disasters in developing countries: Evidence, gaps and the way forward. *J. Integr. Disaster Risk Manag.* **2011**, *1*, 13. [CrossRef]
107. *The Homeowner Assistance Program Situation & Pipeline Report #491 June 2019*; Louisiana Office of Community Development: New Orleans, LA, USA, 2019.
108. Hall, C.M.; Malinen, S.; Vosslamber, R.; Wordsworth, R. *Business and Post-Disaster Management: Business, Organisational and Consumer Resilience and the Christchurch Earthquakes*; Routledge: Abingdon, UK, 2016.
109. Cowan, H.; Dunne, B.; Griffiths, A. Planning for loss or complexity? The New Zealand earthquake commission, the story so far. *Consorseguros* **2016**, *5*, 1–17.
110. Muir-Woods, R. 7. The Christchurch Earthquakes of 2010 and 2011. In *Geneva Reports*; No. 93; The Geneva Association: Geneva, Switzerland, 2012.
111. CERA. *Residential Red Zone Offer Recovery Plan July 2015*; PUB328.1507; CERA: Oxford, UK, 2015.
112. Beilharz, H.-J.; Rauch, B.; Wallner, C. *Economic Consequences of Natural Catastrophes: Emerging and Developing Economies Particularly Affected-Insurance Cover is Essential*; Position Paper; Munich RE: Munich, Germany, 2013.
113. Botzen, W.; Kunreuther, H.; Michel-Kerjan, E. Protecting against disaster risks: Why insurance and prevention may be complements. *J. Risk Uncertain.* **2019**, *59*, 151–169. [CrossRef]
114. Cai, J.; Song, C. Do disaster experience and knowledge affect insurance take-up decisions? *J. Dev. Econ.* **2017**, *124*, 83–94. [CrossRef]
115. Mumo, R.; Watt, R. Residential insurance market responses after earthquake: A survey of Christchurch dwellers. *Int. J. Disaster Risk Reduct.* **2019**, *40*, 101166. [CrossRef]
116. Robinson, P.J.; Botzen, W.W. Determinants of probability neglect and risk attitudes for disaster risk: An online experimental study of flood insurance demand among homeowners. *Risk Anal.* **2019**, *39*, 2514–2527. [CrossRef]