

# Disaster Risk Reduction in New Zealand

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Status Report 2020



Asian Disaster  
Preparedness Center



UNDRR

UN Office for Disaster Risk Reduction

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## About this report

The disaster risk reduction (DRR) status report provides a snapshot of the state of DRR in New Zealand under the four priorities of the Sendai Framework for Disaster Risk Reduction 2015-2030. It also highlights progress and challenges associated with ensuring coherence among the key global frameworks at the national level; and makes recommendations for strengthening overall disaster risk management (DRM) governance by government institutions and stakeholders at national and local levels.

As this report is based on information available as of the end of the year 2019, an update on the COVID-19 impact, response and recovery using a risk-informed approach by countries is provided at the beginning of this report. This report has been prepared by the Asian Disaster Preparedness Center (ADPC) on behalf of the United Nations Office for Disaster Risk Reduction (UNDRR) through country consultations and a desk review of key documents, including legal instruments and DRR policies, plans, strategies and frameworks, etc.

The report has benefited from inputs and review of the draft report by the National Emergency Management Agency (Te Rākau Whakamarumaru) New Zealand. In addition, the Christchurch City Council, Joint Centre for Disaster Research of the Massey University, Resilient Organizations Ltd and Tonkin + Taylor were consulted. The list of people and agencies met is enclosed at the end of this report. UNDRR and ADPC acknowledges the government, international organizations and stakeholder representatives who contributed their valuable input and feedback on this report.

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UNDRR (2020). Disaster Risk Reduction in New Zealand: Status Report 2020. Bangkok, Thailand, United Nations Office for Disaster Risk Reduction (UNDRR), Regional Office for Asia and the Pacific

# New Zealand's Response to COVID-19 and Disaster Risk Reduction

The first confirmed COVID-19 case in New Zealand was reported on February 28, 2020. On March 25, 2020, New Zealand moved to Alert Level 4 restrictions after domestic transmission of the virus was found. The Minister of Civil Defence declared the state of emergency and implemented strong containment measures, including the closure of all non-essential businesses, cancellation of all events and gatherings, and closure of schools. The aim is to ensure the health system capacity is not exceeded through strengthening public health measures and supporting the enforcement of COVID-19 interventions to reduce and eliminate sustained and intensive transmission of the disease. New Zealand moved to Alert Level 1 on June 8, lifting restrictions on personal movements, gathering, workplaces, and services. The border closure and quarantine requirement remain in place. Following the emergence of new COVID-19 cases, Auckland returned to Alert Level 3 restrictions on August 12. Auckland joined the rest of New Zealand at Alert Level 1 on October 7, 2020. People are no longer required to wear masks in public, though masks are encouraged, and people must continue to keep records of locations they visit.

After contracting by 9.5 percent quarter over quarter in Q2, 2020 (expenditure side), New Zealand's economy began to recover quickly, with growth of 15.7 percent quarter over quarter in Q3, 2020. The government has announced fiscal measures amounting to a total of NZ\$ 62.1 billion (20.6 percent of GDP) through FY2024-25. The total amount includes the COVID-19 Response and Recovery Fund, of which NZ\$ 10.3 billion have been set aside as contingency for a possible resurgence. The New Zealand government also planning to provide loans of up to NZ\$ 100,000 to small businesses that employ 50 or less employees until the end of 2023.

The National Emergency Management Agency (NEMA), on behalf of Hon. Peeni Henare, Minister of Civil Defence exercised all its duties for the COVID-19 response including the support to Epidemic Response Committee. This committee was established on 25 March 2020 to consider and report to the House on matters relating to the Government's management of the COVID-19 epidemic.

Following the compounding impact of both COVID-19 and the Whakaari/White Island volcanic eruption, New Zealand has strengthened disaster preparedness efforts. The NEMA conducted a research between June-July 2020 to understand the state of preparedness for a disaster amongst individuals and households in New Zealand. More than 52 percent of New Zealanders confirmed that they have prepared themselves or their household for a disaster that has risen in 2020. Nearly nine in ten New Zealanders have taken at least one action to be prepared for an emergency – they're most likely to have emergency supplies available, such as spare food, toilet paper, torch, spare batteries, etc. A quarter of New Zealanders are fully prepared at home.

Most New Zealanders continue to know what actions they should take in the event of an earthquake or a tsunami. Over half a million people took part on 15 October in New Zealand ShakeOut, the national earthquake drill and tsunami hikoi.



# 1. Introduction

New Zealand (Aotearoa) is an island country, located in the southwestern Pacific Ocean. It consists of approximately 600 small islands and two distinct landmasses: The North and South Islands, which altogether comprise a land area of approximately 263,310 square kilometres. The country's climate is complex, varying from subtropical regions to cool temperate zones in the far south, and the mountain chains extending throughout the country host rough alpine conditions as well (NIWA, 2016). Given the topography and positioning in the Pacific, the weather varies drastically depending on the region. Also, the remoteness and isolation has rendered much of the country's biodiversity wholly unique over time: there are an estimated number of 80,000 endemic species residing in the terrestrial and aquatic ecological systems (Environment Foundation, 2019).

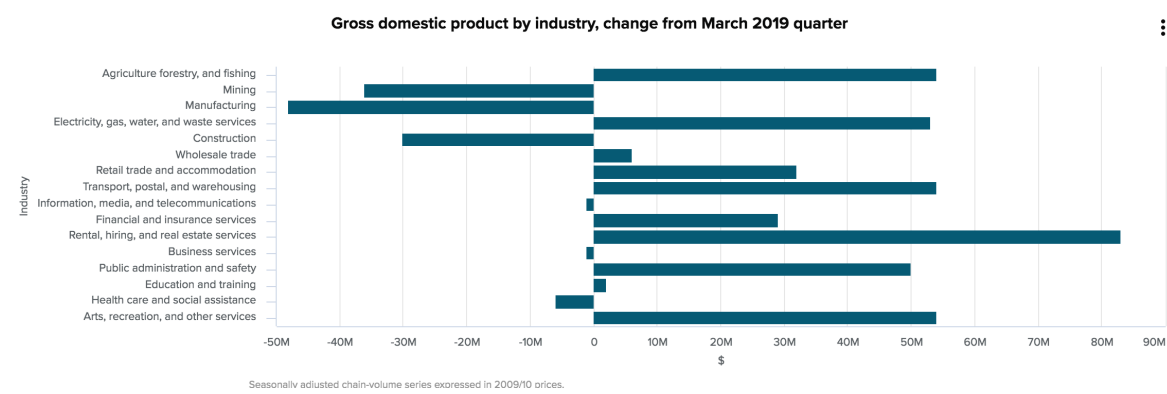
Administratively the country is divided into sixteen regions (takiwā, in Māori), however these regions have differing local government arrangements. The local government sector consists of 11 regional councils; 61 territorial authorities, 11 of which are city councils and 50 are district councils; and six unitary councils which are territorial authorities with regional council responsibilities (LGNZ, 2019). The country does not have state or provincial governments – only local and central government units represent the interests of people through a Mixed Member Proportional voting system which determines the share of a party's seats in Parliament depending on the results of national vote (Ministry of Business, Innovation & Employment, 2019). While the structure of the government is relatively simple, governance remains complex. For example, the local government bodies (consisting of elected councils), have limited powers in terms of their operating authority, as regional councils are responsible over infrastructure functions and resource management requiring coordination (water quality, flood defences or transportation planning).

In terms of its economy, New Zealand has managed to diversify its exports and domestic markets since 1950s, now seeing significant growth in tourism, manufacturing and services (The Commonwealth Secretariat, 2019). Export of goods and services account for one third of real expenditure GDP (New Zealand Government, 2019). As a result, well-being is high, supported by comprehensive social support and high employment rate, and the growth has stabilised at around 2.5 percent per capita annually (OECD, 2019). However, income inequality, concentrations of wealth and rising housing prices all contribute to challenges common to free-market economies. The economy is also exposed to fluctuations of the global markets given that finance, insurance and business services contributed to 28.8 percent of the GDP in 2014, and banks account for 80 percent of the assets of the financial system (Colombo, 2014). Additionally, the sustainability and the country's natural capital (of which the economy is dependent on) is under threat by anthropogenic and climate change-related stressors, which may offset positive developments. Water scarcity is a growing concern in the key agricultural areas, and while the government is active in reducing its emissions per capita, they are likely to exceed the 2030 Paris Agreement Commitments (OECD, 2019).

Numerous natural and man-made hazards also pose a threat to the country's economy and people, alongside climate concerns. These are exacerbated by on-going environmental degradation, coastal erosion, pollution and loss of biodiversity. New Zealand is exposed to a range of natural events, including droughts, earthquakes, tsunamis, landslides, flooding, coastal inundation, volcanic eruptions, extreme weather, as well as pests, diseases and infectious diseases which may severely endanger agricultural output (Ministry of Civil Defence & Emergency Management, 2019). Additionally, heavy reliance on technology and vulnerable

supply chains renders the country prone to disruptions of domestic or international origin, geopolitical climate and trade.

Figure 1. GDP per industry in 2019 (Stats NZ, 2019).



## 1.1 Demographic Characteristics

In 2019, the estimated resident population of New Zealand had reached 4,942,500 people, which is an increase of 2.1 percent annually since 2013 (Stats NZ, 2019). Most of the population is concentrated to urban regions, which comprise 87.2 percent of the total population in the largest cities including Auckland, Wellington, Christchurch and Hamilton. The population is also diverse, despite the geographical isolation and remoteness. New Zealand maintains one of the highest net inflows of migrants of any OECD country (Broatch, et al., 2019), and 16.5 percent of the population identify as indigenous Polynesian Māori descended from tūpuna (ancestors) who arrived in the country in 14th century. Auckland alone hosts more than 100 ethnicities, and over 150 languages are spoken daily given the demographics.

New Zealand has reached very high human development category with a value of 0.921 in 2018, thus positioning at 14 out of measured 189 countries and territories (UNDP, 2019). The government has also committed to enhancing gender equality by supporting women and girls in education and training, by supporting and encouraging participation and by inspiring women leaders at all levels of public and private spheres. However, while the gender pay gap is measured consistently as one of the lowest in the world (9.3 percent in 2019), women still uptake far more unpaid work as opposed to men, and the various groups (including indigenous, those with disabilities or of migrant origin) face unique challenges in terms of gender and access to opportunities (Ministry for Women, 2019).

It should also be noted that the country is potentially facing demographic challenges in the future. By 2050, nearly 30 percent of the people are projected to be over 65, reflecting an aging population which is likely to have implications on development (Broatch, et al., 2019). While the potential support ratio (those at working age versus those dependent at 0-14 to 65+ years) is growing, the balance can shift given the declining fertility and growing numbers of elderly (Ministry of Māori Development, 2019). Population age structure and its dependencies have significant implications to the whole of society and the economy, given how the size of labour force and available human capital affect taxation, household income as well as savings. Aging population then means that fewer people are at working age paying taxes, while the demand for health and social services are growing.

## 1.2 Economic Impacts of Disasters

In the past, disasters have already had severe and lasting impacts on the country's economy, despite the rate of development and high resilience. In late 2010 to early 2011, Canterbury region endured a series of major earthquakes causing deaths and destruction in the Christchurch metropolitan area. The initial repair and rebuilding costs were estimated at US\$ 3.2 billion, leading to deterioration in the national economic activities by March 2011 (Parker & Steenkamp, 2012). Altogether, the estimated repair costs reached 10 percent of the annual domestic output (nearly US\$ 13 billion in 2011 prices) for infrastructure damage alone, most of which was concentrated on residential properties given that over 150,000 homes sustained damages (Parker & Steenkamp, 2012). Total employment in the area decreased by 8 percent in 2011 (26,800 people), and food services, accommodation and retail were the hardest hit sectors in terms of employment contingency (New Zealand Parliament, 2011). However, the impacts were slightly mitigated by the fact that the event was the most insured earthquake ever to occur – 98 percent of the affected properties were insured at the time of impacts (Nguyen & Noy, 2017). While the longer-term economic consequences were minor, and recovery took place rapidly, changes in employment, migration and other factors affecting region post-2011 earthquake have caused persisting demographic and structural changes which can still hinder development in adverse ways which are difficult to predict and estimate (Doyle & Noy, 2015).

It should be noted that natural hazards – not disaster events only – contribute to damages that cost the country millions of dollars annually. According to the Insurance Council of New Zealand, damages caused by severe weather events, including cyclones, fires and flooding exceeded US\$ 640 million to insured assets between 2009 and 2019, measured with the number of payment claims for damage (ICNZ, 2019). Given the incidence of frequent hazards and high exposure to hydro-meteorological and seismic events, New Zealand is ranked among the most vulnerable countries globally in terms of exposed GDP, and the average cost of hazards and disasters is estimated to reach 1 percent of the GDP annually (ICNZ, 2014).

## 1.3 Social Impacts of Disasters

Disasters also constitute to significant social burdens to a given society. Apart from physical injuries (such as the 3,129 injured and 185 fatalities caused by the February 2011 earthquake), psychosocial recovery of the affected may take anywhere between five to ten years due to secondary shocks and recovery-related issues (New Zealand Parliament, 2014). In the aftermath of the 2010-2011 earthquakes, 80 percent of respondents of a study conducted in Canterbury stated that their lives had been significantly changed, a third experienced financial problems, alongside post-traumatic stress disorders, stress and anxiety (New Zealand Parliament, 2014).

It is also important to consider the dimensions within which social impacts affect different demographics. Often, those with the least carry the largest share of the social costs, given the potential lack of assets, lack of safety nets (such as insurances), due to disability or age, or marginalization leading to an unequal standing during and after recovery. Children and young persons also experience disaster disruptions differently. While they have inherent strength, knowledge and capacities leading to personal resilience, they may still face high uncertainties, loss, anxiety and stress more so than adults (Freeman, et al., 2015), in a context which may overlook their voice and agency. Maintaining, improving and understanding children's physical

and emotional relationships and experiences are elemental for successful community recovery in New Zealand, while also understanding that they are not only victims of disasters, and have the capacity to contribute to development processes (Freeman, et al., 2015).

Additionally, given that quality of housing, social networks (neighbours, families and friends), sense of control and place attachment are significant contributors to personal resilience (Winstanley, et al., 2015), those without such attributes, including the homeless, migrants and those living below the poverty line may be disproportionately vulnerable to social impacts of disasters. Homelessness is a growing problem in New Zealand, affecting the largest cities including Auckland and Wellington. Furthermore, these individuals disproportionately represent Māori, Pacific and Asian ethnicities, suffering from limited resources, lack of food, illnesses and exposure to violence and weather alongside policies increasing the pressures on those poorest (Gaillard, et al., 2019). Thus, homeless are not only disproportionately vulnerable and exposed to disasters, but also to everyday life due to their marginalized status (Gaillard, et al., 2019).



## 2. Disaster Risk Profile

### 2.1 Hazards and Climate Change

Due to its location on the Pacific Ring of Fire subduction zone, in the nexus of the Pacific and Australian tectonic plates, New Zealand is exposed to seismic, tsunami and volcanic hazards occurring within and outside of the country's borders. Other hazards include hydrometeorological events, such as cyclones, droughts, flooding (riverine, coastal and flash flooding) as well as landslides. Most fatalities and economic damage in the past occurred due to earthquakes and flooding, but the potential for a severe volcanic eruption or catastrophic tsunami cannot be overlooked either. Volcanoes and volcanic fields are grouped into areas of intensive and long-lived activity, which also represent most of the volcano-types documented in the world (apart from modern basaltic shield volcanoes) (Johnston & Houghton, 1995). The active volcanoes include Ruapehu, Ngauruhoe, Tongariro, Auckland fields, Tarawera, Taranaki, Raoul Island and White Island, most of which have potential for generating ash falls, pyroclastic flows, landslides, and violent eruptions.

Given the positioning among active tectonic plates, earthquakes are also a relatively common event in the country. For example, the recent 2016 Magnitude 7.8 Kaikōura earthquake was generated from an extremely complex system involving at least 13 separate faults extending over an area of 150 kilometers (Kaiser, et al., 2017), affecting the upper South Island and causing tens of thousands landslides and a tsunami that reached 7-meter run-up height (GeoNet, 2016). It was a very unusual event, and suggestions have been made that rethinking of seismic hazard mapping is required in certain regions of New Zealand given that most models do not consider the potential for such complex rupture patterns (Hamling, et al., 2017). Often occurring in association with high precipitation or seismic/volcanic activity, landslides are also common in the hilly and mountainous regions of New Zealand. They often manifest in multiple simultaneous events, sometimes involving thousands of mass movements across areas extending up to 20,000 square kilometers (Crozier, 2005). Since 1843, there have been at least 600 recorded deaths due to landslides, and the on-going processes of top-soil loss and soil degradation constitute to the growing risks (Rosser, et al., 2017). Other secondary hazards, such as severe liquefaction, have also been present during the Christchurch earthquake, for example, which constituted to the large damages to infrastructure and housing.

New Zealand is highly exposed to tsunami hazards. All New Zealand coastal areas have some degree of tsunami risk, with those situated nearest subduction zones being the most exposed. For example, the Hikurangi-Kermadec subduction zone of the North Island's east coast is believed to be capable of generating tsunami of a similar scale to the 2011 Tōhoku, Japan event. The country is also at risk from tsunami generated in the south-Pacific region or from major subduction boundaries further afield along the Pacific Ring of Fire. Geological and historical records show many large and smaller tsunamis have occurred in New Zealand's past, since historical records began (around the mid-1800s), although no tsunami has caused widespread damage.

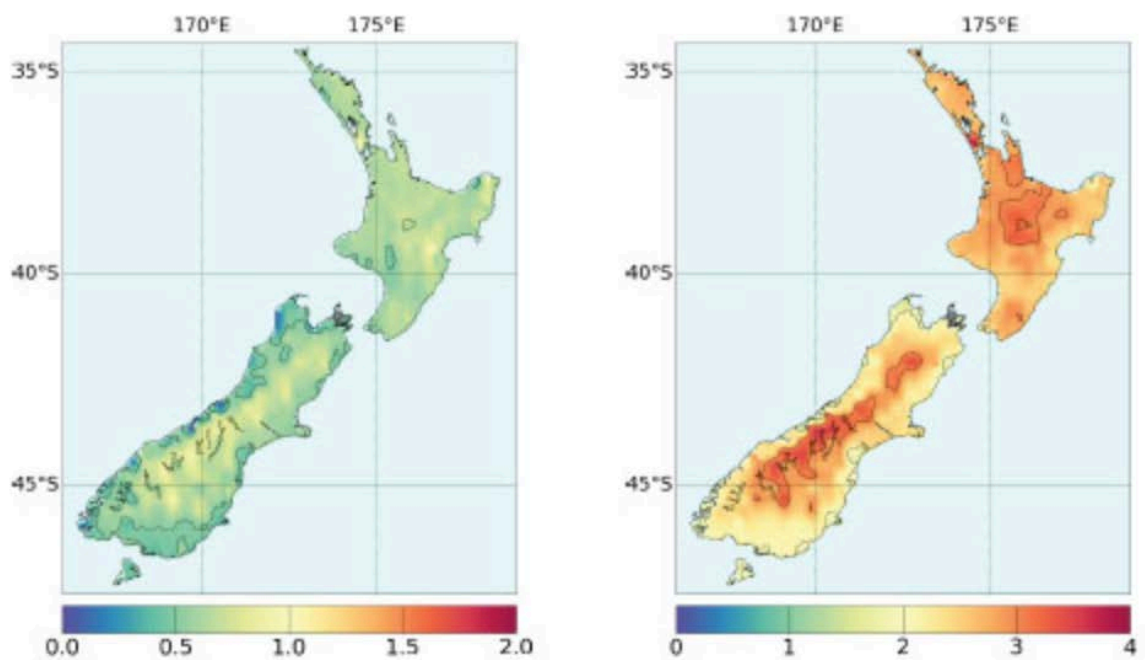
Droughts are also a significant concern in New Zealand. For example, during 1994 Auckland was facing a severe water supply crisis following low rainfall of the winter 1993 which failed to recharge reservoir supplies (Fowler & Adams, 2004). While drought causes, popularly associated with El Niño Southern Oscillation, are numerous and disputed (Fowler & Adams,

2004), the months during which strong ENSO conditions are present, droughts are more common in the east coast, while the west tends to experience more rainfall (Ford & Wood, 2015).

Cyclones can also cause significant damage due to high intensity rainfall and winds, which occur approximately on a one-year return-period between December and April. Cyclones also correlate with the ENSO conditions, as severe tropical cyclone origin seems to exhibit distinct areal patterning when the conditions arise (Hastings, 1990). Flood related coastal hazards often arise during storms and cyclones, causing inundation and sea swells – however, potential tsunamis and tidal floods can also affect New Zealand’s population and infrastructure, irrespective of weather conditions.

Climate change is likely to increase the pressures on human and ecological systems, endanger biodiversity and wellbeing, agricultural production and contribute to increased intensity and frequency of hydrometeorological hazards. Under a high-emissions scenario, New Zealand could experience a warming of 3° to 4° Celsius by 2090 (Figure 2). Similarly, rainfall is projected to increase significantly in the South Island, followed by rising sea levels endangering coastal settlements, apart from more extreme and frequent droughts and flooding, higher temperatures, increased risk of vector-borne diseases, as well as water scarcity (Ministry for the Environment, 2019). These impacts may also affect biodiversity, given that numerous species are dependent on particular temperatures, and prolonged drought conditions may endanger lowland forests alongside the health of people residing in urban regions.

*Figure 2. Projected temperature changes by 2090 in New Zealand, under a low emission (right) and high emission scenario (left) in degrees Celsius (Ministry for the Environment, 2019).*



The Environment Aotearoa 2019 Report also highlights climate change among the key concerns affecting New Zealand now, and in the future. Given the uniqueness of the local flora and fauna, on-going degradation following pollution, increasing pressures on ecological systems and the rate of current climate change, the country increasingly requires all-of society-approaches which represent the severity and magnitude of the threat at all levels of government, cities, communities and within households (Ministry of Environment, 2019). These processes threaten the peoples connection to land and life in myriad of ways, and given the interrelatedness of ecological processes vis-à-vis the functioning of any given society, one must begin imagining changes in the ways of land-use, production, use of water resources, urban expansion and agricultural practices in New Zealand (Ministry of Environment, 2019).

## 2.2 Exposure

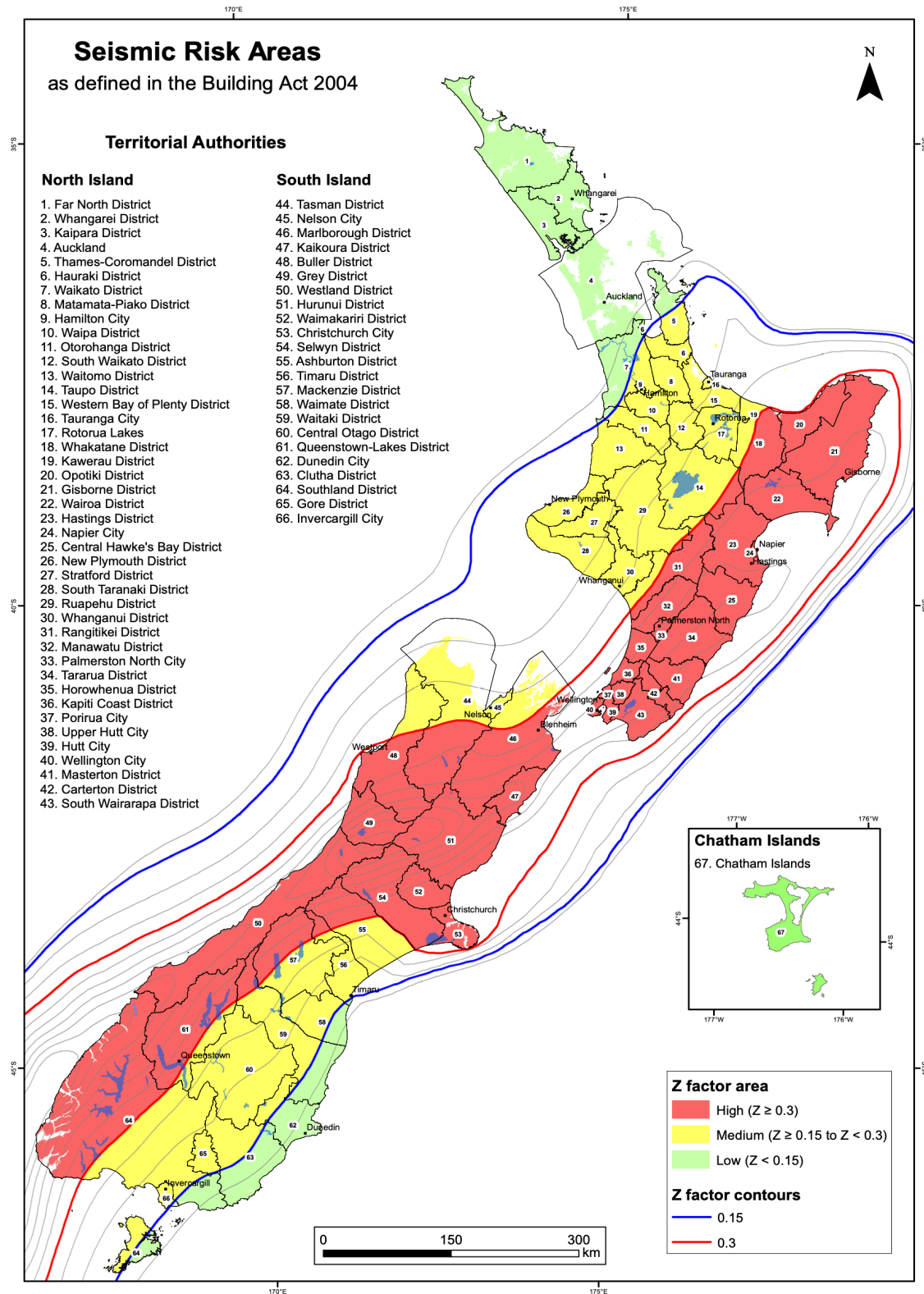
Exposure to hazards and disasters varies greatly depending on the region of the country given the diverse topography, local environmental context and proximity to the coasts. For example, the coastal and river flooding inundation areas are disproportionately exposed to the impacts of storms and sea-level rise. Also, given the high rate of urbanization and development, “bad practice” has constituted to unnecessary risks and exposure to repeated events such as landslides and flooding following uninformed land-use planning (Glavovic, et al., 2010). Coastal and riverbank erosion contribute to growing exposure, and increasing numbers of residential development areas are now under threat of increased inundation and flooding.

Already – according to National Institute of Water and Atmospheric Research estimates – , 700,00 people and over 400,000 buildings worth nearly US\$ 90 million are exposed to riverine flooding (Paulik, et al., 2019), whereas coastal flooding threatens approximately 72,000 people and 50,000 buildings (Paulik, et al., 2019). Furthermore, sea-level rise could cause wave-swell reaching higher than 3 meters than that what they are today. For each 10 centimetres the sea rises, 7,000 buildings become exposed nationwide with an average combined replacement value of US\$ 1.6 billion (Paulik, et al., 2019). Coastal buildings and infrastructure are also exposed to tsunami risk.

Earthquake risk has a high spatial variability as well; some regions are more prone to seismic activity than others despite the extensive network of active faults present in the country. There are four distinct risk-zones in New Zealand with more stringent regulation for structures in high-risk areas (Figure 3). Highest risk zones follow the subduction boundaries extending through the country – along the Southern Alps of the South Island, central New Zealand including the capital city Wellington, and the length of the North islands’ east coast. Volcano-exposure also depends on the vicinity of active volcanic sites. Currently, White Island is the most frequently active volcano, but its distance from the Bay of Plenty coastline renders the risk to people relatively low (Nairn, et al., 1996).

Hazards such as prolonged extreme temperature, contamination of water supplies and diseases have the potential to affect the whole of society, but mainly infants and children, elderly, those homeless or of low-socioeconomic status and those living with disabilities. Thus, considerations must be given to social vulnerability as well, to structural factors and effects that a stratified society may impose on those with the least means to protect themselves from climate and disaster risks.

Figure 3. New Zealand's seismic risk areas (Ministry of Business, Innovation & Employment, 2018)



## 2.3 Socio-Economic Vulnerability

Socio-economic vulnerability is important for understanding the mechanisms which limit community participation, influence their capacities and capabilities to respond and recover from disaster impacts, and how processes contributing to vulnerabilities prevail in systems at a global scale despite best efforts to mitigate such concerns. Social dimensions of resilience are affected by plethora of functions, including social, economic, institutional, infrastructural and natural environments (Kwok, et al., 2016) and associated available capitals. Individuals affected negatively by the presence of structural issues, or by the lack of social capital, access to risk transfers and the economic means to support themselves may render parts of the population disproportionately vulnerable and/or less resilient to cope with disaster and climate change impacts.

Vulnerable populations in New Zealand include young children, older adults, Māori or other minority ethnicities, people with disabilities, single-parent households or those with lower socio-economic status (Massey University, 2019). In some cases, vulnerability is related to livelihoods; for example the Māori are more reliant on primary industries such as farming (thus being more vulnerable to climate change impacts and environmental risks), whereas elderly adults and those with disabilities may face issues in accessibility and health, and those with fewer economic resources may require assistance in coping with disaster impacts (Massey University, 2019). Factors contributing to these predicaments are myriad and diverse and cannot be thoroughly discussed here. However, understanding the depth of the issue, in consideration of the structural root causes of marginalization, poverty and homelessness, for example, are necessary to understand the formation of vulnerabilities.

Vulnerability hotspots in Auckland tend to correlate with high rates of one-parent households, low average income, high housing stress (or greater portion of income allocated to rent), and high deprivation index (Fernandez & Golubiewski, 2019), all of which correspond to hypotheses presented here. Yet, the complexity of needs is ever increasing while government funding has remained static and directed to for-profit organizations, thus leading to a development pathway where social support needs are skyrocketing given the increasing costs for living and growing population vis-à-vis inadequate social safety net response from the government (NZCCSS, 2016). Additionally, high focus on individual responsibility and self-dependence, such as insurances, may harmfully affect those who cannot afford risk-transfers, and create conditions for “victim-blaming” which does little to lessen vulnerabilities. Responding to the needs of the most marginalized, exposed and vulnerable requires thorough investigation (and responses) as to what processes contribute to their status in the outskirts of development which does not cater to populations equally. Personal preparedness is indeed important, but not as much for those without financial means, capacity or required support to prepare. Positioning vulnerabilities based on individual capacities would then work to reinforce structural violence of systems which are the undercurrents constituting to the inability to meet the needs for personal preparedness (Blake, et al., 2017).



## 2.4 Physical Vulnerability

As briefly mentioned before, land-use planning has a critical role in building sustainable and resilient communities in New Zealand, not only in terms of location, but also in urban design, quality of infrastructure and mechanisms which do not negatively impact the already-sensitive and fragile ecological systems. For example, many natural systems have important protective functions, including riverine vegetation which lessens flooding impacts, or forests stabilising slopes and minimising erosion (Glavovic & Becker, 2010). Urbanization continues to encroach not only these fragile systems, but also spreads to areas prone to coastal and volcanic hazards of Auckland, as well as the landslide and seismic risks of Wellington (Glavovic & Becker, 2010), mitigation of which is difficult given the potential scale and impact of these hazards. Many of the current planning options available to urban planners in New Zealand are limited and influenced by the legacy of historical land-use decisions and risk management choices in towns that were established in areas prone to hazards, including flooding, thus rendering even the best efforts to mitigate hazards as band-aiding conditions that have been created over past decades (Glavovic & Becker, 2010).

Agriculture also contributes to challenges which endanger the environment, thus feeding further into the feedback loops between natural and human systems contributing to hazard risks. For example, intensive dairy production has increased nitrogen levels in the ground water and soil, changes in land cover have rendered large areas inadequately protected against heavy rain, and numerous species are in decline given the fragmentation of natural space (Smith, 2015). The vulnerability of the marine and terrestrial ecosystems requires due consideration alongside human assets, given its importance to sustaining life, wellbeing and industry.

Seismic risk is primarily managed through building legislation, codes and standards. Following destructive earthquakes in the mid-19<sup>th</sup> and early 20<sup>th</sup> centuries, building methods and materials changed. The New Zealand building stock is designed to protect life, and while buildings may lose functionality due to damage, collapse or structural damage resulting in loss of life during earthquakes is a rare occurrence.

Additionally, the sensitivity of supply chains also renders many of the interdependent infrastructure assets increasingly vulnerable to impacts of hazards. For example, the Marsden Refinery refines approximately 70 percent of New Zealand's fuel, and provides a pipeline serving Auckland and its airport (New Zealand Lifelines Council, 2017). Furthermore, hazards such as major earthquakes have the potential to isolate Wellington region and cut off water supply, electricity, gas and telecommunications for several weeks to even months. Major power disruptions then would affect telecommunications and fuel terminals, rendering port and airport facilities inoperable (New Zealand Lifelines Council, 2017). In Auckland, any volcanic eruption scenario is a threat to most lifeline utilities, telecommunication and critical water reservoirs (New Zealand Lifelines Council, 2017), which is another illustration of the myriad of physical vulnerabilities manifesting in New Zealand. Interdependencies increase the overall risks, as well as the consequences of a potential failure of a single infrastructure type (e.g. loss of electricity affecting hospitals). The most vulnerable areas have been identified in Christchurch, Wellington (especially transport, rail links and resiliency of infrastructure) and Auckland, alongside regional concerns such as increasing pressure on the environment following development and population growth (New Zealand Government, 2011).

## 2.5 Future Disaster and Climate Risks

Predicting changes in the climate over the next 100 years in New Zealand requires considering myriad of complex processes, which renders future risk estimation difficult. One has to consider global greenhouse gas and aerosol emission projections, modelling these into changes in carbon dioxide concentrations, atmosphere-ocean global circulation modelling, and downscaling results to illustrate the impacts on New Zealand in consideration of its topography and local climate (NIWA, 2019).

The current mid-range estimates project a temperature change of approximately 0.8° C by 2040 and 1.4° C by 2090 depending on the possible pathways of greenhouse gas concentrations, which corresponds to a rate of 75 percent of the global estimated air temperature increases over land and sea (Ministry of Environment , 2018). This trajectory is expected to contribute to severe temperature increases across the country under a high-emissions scenario, alongside increased rainfall, which could then contribute to more intense winter precipitation and riverine flooding. Conversely, longer summers and higher temperatures may contribute to lessened water resources and lower river flows (Ministry for the Environment, 2019). These will impose stress on agricultural production, the built environment and people as well as biodiversity in the form of habitat loss and species distribution changes. Furthermore, coastal hazards, including ex-tropical cyclones are projected to increase in intensity which may further endanger coastal settlements. Already, the country has experienced an 11-percent decrease of ice volume at the South Island glaciers, and during the next 30 to 100 years, droughts, erosion, flooding and the prevalence of pests and diseases are likely to grow as well.

Given the magnitude of the current and projected changes, primary industries are under a severe threat. New Zealand relies on its environment and production it supports, including farming, forestry and fishing, which are likely to suffer under unpredictable weather and temperature changes (Ministry for Primary Industries, 2019). This could contribute to increased disaster damages and indirect economic losses in the form of microeconomic impacts (revenue declines), loss of natural assets and interruptions to supply chains, as well as macroeconomic impacts, including price increases, increase in debt and decline in GDP (Frame, et al., 2018). Already, climate-change attributable extreme flooding and rainfall have caused New Zealand nearly US\$ 80 million in insured damages between 2007 and 2017, whereas costs associated to droughts exceeded US\$ 450 million during the same time period (Frame, et al., 2018). If the current estimated trajectory for climate change is accurate, these costs will only increase in the future, not to mention the need for funding for increased protection and mitigation measures.

### 3. Disaster Risk and Climate Action Interventions

Given the diverse hazards, mounting anthropogenic and climate change-related pressures, New Zealand is facing immense challenges now and, in the future, to manage disaster and climate risks successfully. In the past, the government has largely emphasized the importance of emergency management and response-orientated approaches, thus leaving marginal attention to comprehensive disaster risk reduction (DRR) and climate change adaptation (CCA) occurring at all scales and sectors. However, the government has now started to move towards gradual implementation of risk reduction efforts as represented in the newly-drafted National Disaster Resilience Strategy of 2019 and the first national climate change risk assessment and associated Action Plan currently in progress (Ministry for the Environment, 2020). This section intends to estimate New Zealand's current success and future challenges in terms of managing risks by assessing the four priorities of Sendai Framework vis-à-vis sustainable development and commitments to the Paris Agreement.

**Priority 1. Understanding Disaster Risk** Increasing the understanding of disaster risks is fundamental to successful land-use planning, risk identification and prioritisation, to inform risk and vulnerability assessments, for early warnings and to maintain a comprehensive overview on disaster trends for future preparedness. Also, available data should be made publicly accessible to local governments, planners and the public, and stored in a manner which can be easily analysed and compiled by harmonizing cross-platform compatibility and interoperability.

In New Zealand, multiple organizations and agencies are responsible for monitoring hazards. These include GeoNet, responsible over 24/7 earthquake, landslide, tsunami and volcano monitoring and prediction. It is a partnership between the Earthquake Commission, GNS Science and Land Information New Zealand, established in 2001 to operate a contemporary monitoring system for geological hazard via instruments and automated software applications (GeoNet, 2019). Similarly, the national weather authority MetService provides comprehensive full-time monitoring and mapping of hydrometeorological hazards, and provides public maps, warnings and other services for effective and accurate dissemination of risk information (MetService, 2019). However, challenges remain in increasing the availability of all collected information and assessments to the people and planners across levels of government (Ministry of Civil Defence & Emergency Management, 2019). At the local level, availability of information is crucial to enable local governments and the communities with the capabilities to identify and prioritise the use of resources where they are most needed. Furthermore, improving the quality and availability of information on safe building practices, informed by hazard-data modelling would enable the transition towards resilient, smart and sustainable land-use in areas where permanent dwellings and infrastructure are not built on highest risk grounds (Ministry of Civil Defence & Emergency Management, 2019).

The government has also outlined priorities in improving the current intelligence system to support decision-making in emergencies which would facilitate timely, informed and consistent decisions by disaster stakeholders and the public (Ministry of Civil Defence & Emergency Management, 2019). This is hoped to be achieved by providing an equal access to emergency management systems to all stakeholders, equipped with same operational and technical information supported by harmonized data-collection and analysis mechanisms,

for which research is now conducted under the Resilience to Nature's Challenges Program. Stakeholders in New Zealand would indeed benefit from a comprehensive natural hazards information portal bringing together series of linked regional portals and existing information to risk managers and the general public with integrated GIS technology and application guidance (LGNZ, 2014). There is also a need for a national disaster loss database which is integrated, systematic, neutral, covers multi-hazards and enables risk modelling of future losses for further Sendai compliance (Longworth, 2017). The National Emergency Management agency is the focal point for Sendai reporting on the impacts of emergencies and with local authorities, central government agencies, insurance and research sectors, it has been working to further the collation of impacts of disasters into a coordinated loss database.

To improve the utility of available hazard and disaster data, the government has also introduced a standard risk assessment procedure. New Zealand's national security system takes a structured approach to managing the range of risks that could significantly affect New Zealand's security and prosperity. A national risk framework is used to support ongoing oversight of nationally significant risks, and involves using a standardised risk assessment methodology to identify, assess and compare nationally significant risks. The national risk framework is designed to build a comprehensive picture of the nationally significant risks facing New Zealand, how they are inter-related, and to identify opportunities to effectively reduce risk and improve resilience. More recently, a new initiative is focusing on the interaction of climate and current risks vis-à-vis the potential for adaptive responses, cost issues and resource availability of local authorities. It is based on the New Zealand Standard for Risk Management (AS/NZS4360, replaced by the AS/NZS ISO 31000 in 2009), and involves developing a list of climate change event scenarios which can be integrated into standard risk assessment procedures by local authorities to contextualize disaster risk management (Ministry for the Environment, 2019). Also, despite existing hazard-specific assessments and the ISO Standard on Risk Management, many local authorities continue to utilize a range of approaches to a varying degree depending on their capacities, resources and perceptions of risk (LGNZ, 2014). It is expected that this will improve following the publication of risk assessment guidance for Civil Defence Emergency Management Groups (cooperating local authorities) by the National Emergency Management Agency in early 2020.

**Priority 2. Strengthening Disaster Risk Governance to Manage Disaster Risk** Disaster and climate risk management also requires robust institutional frameworks which facilitate effective and effortless collaboration in pre- and post-disaster phases, reduce hierarchical hindrances and seek to localize risk management efforts. Coordination and collaboration strategies must be supported by updated and harmonized policymaking, which seeks to reduce overlapping responsibilities, budgeting and maintains a holistic understanding over the interlinkages between national development, DRR, CCA and sustainable growth.

New Zealand does not have a single constitution, per se, but rather a one made up of a number of legal instruments, wherein legislation refers to principles of the Treaty of Waitangi (founding document) rather than the treaty itself (IFRC & UNDP, 2014). The current system aims towards established frameworks with regulatory goals as opposed to mandates, which allows a greater contribution from local governments, and emphasizes flexibility, cooperation, partnerships and capacity-building (IFRC & UNDP, 2014). The statutory landscape for disaster risk management is outlined in the Civil Defence Emergency Management Act of 2002 (CDEMA) and the National CDEM Plan (2005). The CDEMA includes provisions for "four R's"; reduction (of risks), readiness, response and recovery (LGNZ, 2014). Other core acts addressing DRR include the Resource Management Act (1991), the Climate

Change Response (Zero Carbon) Amendment Act, (2019), Building Act (2004) and the Local Government Act (2002). In 2016, the CDEMA was amended to provide a comprehensive framework for recovery management, to provide guidance on transitioning from initial response to recovery, in consideration of local authorities (Ministry of Civil Defence and Emergency Management, 2016). Furthermore, the Zero Carbon Act is important due to the fact that it provides a framework for developing and implementing climate change policies in New Zealand that will aid in contributing to the efforts under the Paris Agreement to curb global average temperature increase, and allow the country to prepare and adapt to the impacts of climate change (Ministry for the Environment, 2019). It seeks to reduce net emissions of all GHG gases to zero by 2050, reduce emissions of biogenic methane, establish a system of emission budgets, mandates the government to develop and implement policies to support adaptation and mitigation, as well as requires the establishment of a new, independent Climate Change Commission (Ministry for the Environment, 2019).

Ministry for the Environment, Ministry of Civil Defence & Emergency Management, the Department of Internal Affairs, and the Ministry of Business, Innovation and Employment all share responsibilities in providing direction and support for the consistent implementation of these acts in New Zealand. Also, in 2019 a newly established National Emergency Management Agency (previously the Ministry of Civil Defence & Emergency Management) assumed responsibilities for coordinating integrated emergency management across central and local government, emergency services, communities, lifeline utilities and businesses (Faafoi, 2019). At the local level, implementation of the relevant acts is linked to local risk assessments and targets for development to support democratic and local decision-making. Currently, 16 Civil Defence and 3 Emergency Management Groups alongside their constituent local authority members are responsible for managing the broad range of issues specific to disaster and climate risk management.

In 2015, the National Civil Defence Emergency Management Plan was revised to further clarify roles and responsibilities, and to provide resolutions to existing gaps and weaknesses in the CDEM arrangements in the country (Ministry of Civil Defence & Emergency Management, 2015). It covers the range of all hazards affecting New Zealand and outlines standards for managing them as per the mandates of CDEMA (2002) at all levels of government, including a crisis management model at the national level. Management of hazards and risks is under the oversight of the Hazard Risk Board (HRB) (Figure 4). The HRB also now includes the Ministry for the Environment, which provides its insights on climate change to the forum.

For climate concerns, suggestions have been made to integrate climate change adaptation into decision-making, to establish a regularly updated national adaptation plan and risk assessments, monitoring and reporting function, alongside funding mechanisms and capacity building (Climate Change Adaptation Technical Working Group, 2018). Often, DRR and CCA concerns are treated as separate issues with a focus on reactive emergency management practices, which results in disconnects between policies and departments intended to address said dimensions which ideally require holistic approach, funding and identification of synergies to avoid overlapping (Chmutina, et al., 2016). While such considerations are represented in most available frameworks and plans at the national level, lack of integrated approach is prevalent at the local governments' levels regarding climate change (IFRC & UNDP, 2014). The newly established Climate Change Commission under the Zero Carbon Act alongside supporting plans seek to respond to these concerns.



Figure 4. National Security System (Department of the Prime Minister & Cabinet, 2016)

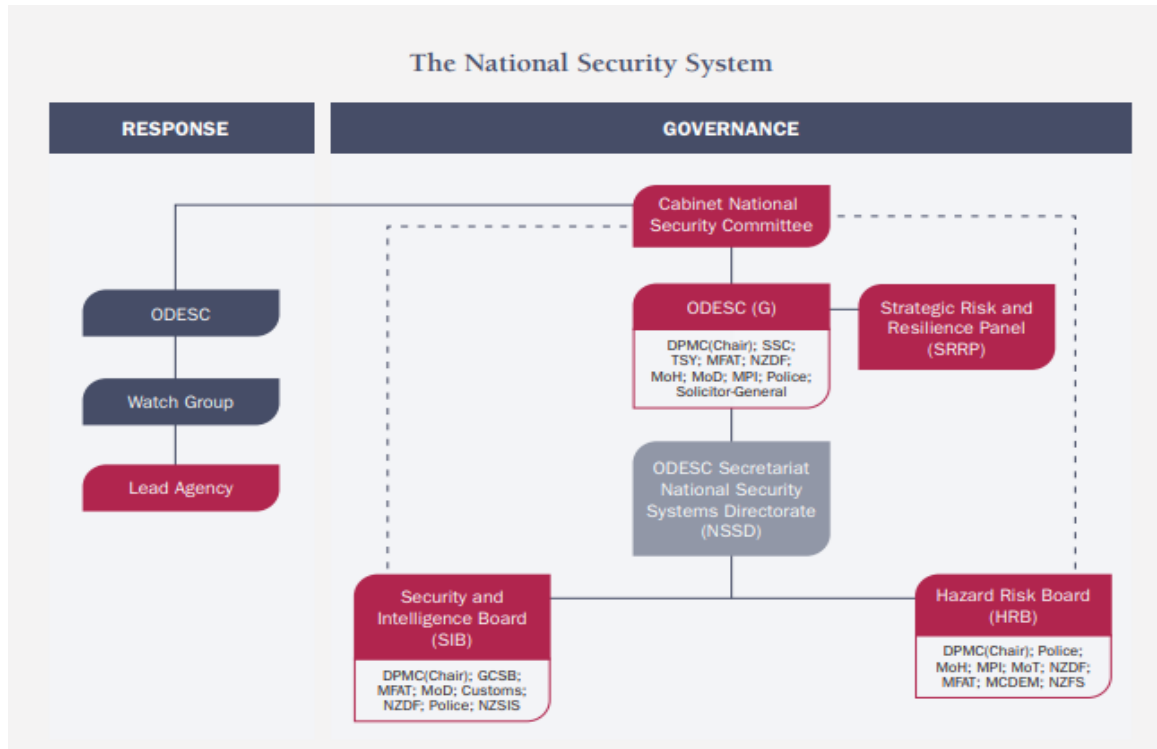


Table 1. New Zealand's legislative plans and policies intended to improve disaster risk reduction and climate resilience

IMPLEMENTATION	PLAN/POLICY	SCOPE	PURPOSE
MINISTRY OF CIVIL DEFENCE & EMERGENCY MANAGEMENT, LOCAL CDEM GROUPS	Civil Defence Emergency Management (CDEM Act 2002)	National, regional, territorial	Framework for guiding mitigation, preparedness and recovery activities at all levels of government. Amended in 2016 to support faster recovery at the community level.
MINISTRY OF CIVIL DEFENCE & EMERGENCY MANAGEMENT, RELEVANT STAKEHOLDERS	Civil Defence Emergency Management Regulations (2003)	National, regional, territorial	Outlines mechanisms for declaring, extending and terminating a state of emergency
LOCAL AUTHORITIES	Local Government Act (2002)	Territorial authorities	Provides a framework for the local governments' activities, and enforces their accountability to their communities
MINISTRY FOR THE ENVIRONMENT, RELEVANT STAKEHOLDER	Climate Change Response (Zero Carbon) Amendment Act (2019)	National, regional, territorial, private sector	Framework to guide policy development and implementation to reduce greenhouse gas emissions and to support mitigation and adaptation activities at all levels of government and private sector.

**Priority 3. Investing in Disaster Risk Reduction for Resilience** Guaranteeing adequate finance for response and recovery is often emphasized on in most of the global disaster management systems – however, much less attention is usually directed towards financing sustained recovery, disaster risk reduction and climate change adaptation, funding needs of which may even be on par with the amounts needed to sustain basic functions such as early warning systems or response mechanisms. Increased focus and flexibility are needed to maintain comprehensive disaster financing, informed by disaster and climate impact modelling to efficiently map and prioritize needs across scales.

Between 2018 and 2019, the government has boosted the funds available to emergency management significantly, with the intention to improve the early warning systems, local government capacities, web-based tools and assessment mechanism, safe school guidance, more in-depth hazard information and support for lifelines resiliency planning. It also included funding for specialist rapid response teams in an emergency known as “Fly-In Teams” with appropriate skills and experience required to support local authorities (Faafoi, 2018). Furthermore, the government also maintains the CDEM Resilience Fund which was established in 2010/11 and intended to enhance resilience to emergencies, targeted to specific projects which aim to improve capabilities and capacities. The fund is open to applications which intend to increase resilience, align with the goals of the National Strategy, National CDEM Plan and will result in material change (Ministry of Civil Defence and Emergency Management, 2016).

However, given the high degree of decentralization and the nature of funding mechanisms, local governments may sometimes struggle for funding. Currently, councils in New Zealand are facing increasing financial pressures and debts, and the costs of their administration to implement risk reduction measures is limited. Local financing follows a property-based rating system which may lead to budget constraints especially in areas which are highly exposed but have a small population (low rates base) (IFRC & UNDP, 2014). Thus, lack of investments to emergency management prevails in rural areas. Also, risk financing is still largely focused on dealing with funding after impacts – concept and language of risks as potential multi-billion-dollar scale future losses is not well articulated in public finance and remains largely invisible (Basher, 2016).

Despite some challenges, the insurance coverage in public and private assets is consistent throughout the nation. For example, to support and protect the assets of people from disaster damages, the Earthquake Commission (EQC) maintains a Natural Disaster Fund to guarantee that insurance claims can be paid out in the event of a disaster. The levies paid as a part of home and contents insurance premiums are deposited in the fund, and the EQC will then utilise the available monies to settling claims, purchasing reinsurances, meeting the costs of administration and improving the understanding of disaster risks (EQC, 2019). Furthermore, EQC pays NZ\$ 10 million to the Crown annually to provide a coverage in an event where the Fund is fully spent.

**Priority 4. Enhancing Disaster Preparedness for Effective Response to “Build Back Better” in Recovery, Rehabilitation and Reconstruction** Numerous early warning systems (EWS) are currently operated in New Zealand, supported by a comprehensive network of hundreds of seismic instruments, range of tsunami gauges and continuous geodetic data gathered through 180 GPS stations (Morton, 2016) as well as meteorological and ocean conditions monitoring systems. Threat assessments are conducted by subject matter experts. Warnings and alerts are disseminated through numerous channels, including Emergency Mobile Alert (cell broadcast), radio and television, websites, social media, apps both nationally,

and locally depending on the emergency. The National Emergency Management Agency is responsible for providing national level warnings for geophysical hazards to local CDEM Groups, central government authorities, lifeline utilities and broadcasters. The latter is supported by a Memoranda of Understanding with radio and TV broadcasters and the government (Ministry of Civil Defence and Emergency Management, 2017). Additionally, some local authorities are utilising the Emergency Mobile Alert, a sophisticated communication system not subject to lags nor congestion. Local CDEM groups are also responsible for relaying national alerts and warning within their own communities through local systems (Ministry of Civil Defence and Emergency Management, 2019). However, the operability of some of the current systems is limited. A critical step in end-to-end early warning systems is to have an aware and prepared public ready to act on alerts and warnings. Public education, drills and awareness are core activities for national and local civil defence emergency management authorities. For example, New Zealanders have participated in an annual national earthquake drill “Shakeout” since 2012 (reaching approximately one million participants each year). Many coastal communities also participate in a tsunami hikoi (walk). Schools and early childcare centre are particularly well represented in drills and preparedness.

In terms of preparedness for response, comprehensive plans and institutional mechanism have been established in New Zealand to clarify roles and responsibilities, and to ease coordination during the phases of emergency response. The general provisions for response are outlined in the 2015 National Civil Defence Emergency Management Plan, with detailed responsibilities of all relevant stakeholders, coordination guidance and operational hierarchies. It follows the “4R” approach, focusing on reduction, readiness, response and recovery with detailed objectives and goals as to what they tangibly mean in terms of operational planning for different stakeholders (New Zealand Government, 2015). However, non-government actors are not considered as a part of this agenda, and civil society actors remain somewhat unengaged in national level planning (Basher, 2016), apart from volunteer organizations whose coordination (by Volunteer Coordination Teams) and role in emergency management are outlined in the CDEM Act of 2002.

Additionally, the newly implemented “fly-in teams” are intended to respond to the growing needs and lack of local capacities to respond to disasters at the sub-national level, with the intention to improve the current emergency preparedness following criticism directed to unclear command, control and coordination across agencies during the Christchurch’s Port Hills fires and after the Kaikōura earthquake. NEMA is also intended to facilitate a change within organizational cultures to provide greater autonomy, transparency and improved status for those involved in emergency management through restructuring. This is reflected in the National Disaster Resilience Strategy of 2019, wherein systems change is represented as a key challenge to maintain the flexibility and adaptive capacity of increasingly complex disasters vis-à-vis the pressures of global conditions and climate change (Ministry of Civil Defence & Emergency Management, 2019). Capacity building, strengthened leadership, relationship-building, improved information management, as well as clarified responsibilities, roles and connectedness at all levels are highlighted as priorities leading to 2030.

Building Back Better in New Zealand is also constrained by institutional, policy-related issues. In the past, especially in the case of Christchurch earthquake, national policy on funding of recovery has targeted replacement of existing infrastructure, leading to missed opportunities in maximizing the potential of recovery activities which could absolve underlying issues constituting to high risks (Macaskill & Guthrie, 2018). Build Back Better

was limited due to lack of capital available for reconstruction, given that the central government subsidy only covers up to 60 percent of reconstruction needs within the territories, despite the fact that under-spending in reconstruction may translate into future credit or deficit in state or local government spending. Some allowance for improvements should be considered in the current recovery funding policy at the national level to support regional initiatives seeking for alternative mechanisms to minimize reliance on the central government support (Macaskill & Guthrie, 2018).

## 4. Coherence with Sustainable Development Goals and the Paris Climate Agreement

Table 2. Some of the synergies between international agreements and different policies and commitments of New Zealand in various sectors.

Sectoral Aim	Policies/Plans with potential links to Sendai Framework for Disaster Risk Reduction	Policies/Plans with potential links to Sustainable Development Goals	Policies/Plans with potential links to the Paris Climate Agreement or Environment
National Development	National Economic Plan (2019)	Cross-cutting policy topic	National Economic Plan (2019) Climate Change Response (Zero Carbon) Amendment Act (2019)
Agriculture and Resource Management	Forest and Rural Fires Act (1997)	Resource Management Act (1991) Soil Conservation and Rivers Control Act (1991)	Resource Management Act (1991)
Disaster and Climate Risk Reduction	Civil Defense Emergency Management Act (2002/2016) Earthquake Commission Act (1993) National Disaster Resilience Strategy (2019)	National Disaster Resilience Strategy (2019)	Climate Change Response (Zero Carbon) Amendment Act (2019) National Disaster Resilience Strategy (2019)
Vulnerability Reduction	National Disaster Resilience Strategy (2019) Resilience Strategy for Natural Hazard Risk Reduction (2019-2029)	Resource Management Act (1991) Investment Statement for the Provincial Growth Fund (outlines sectoral investment priorities to support poverty reduction)	Responding to the Climate Crisis: An Implementation Plan (2019)
Urban Development	Building Act (2004) The Thirty-year New Zealand Infrastructure Plan (2015) Earthquake Recovery Acts, Canterbury (2011) and Christchurch (2016)	National Policy Statement on Urban Development Capacity (directs local authorities in terms of meeting demand for housing)	The Thirty-year New Zealand Infrastructure Plan (2015)

The Government's policies align closely with the SDGs, including reducing child poverty, raising incomes for low and middle-income families, increasing the supply of affordable housing and considerations for protecting the environment, reflected in provisions such as the Treasury's Living Standards Framework (LSF) (The Treasury, 2018). The country is committed to advancing the 2030 agenda, supported by Voluntary National Reviews and



the LSF, which illustrate the innovative thinking required to move away from measuring progress in economic terms towards analysing dynamics of wellbeing, risk and resilience within social and environmental domains as well. Sustainable development is also reflected in most of environmental policy aims alongside social, economic and cultural development objectives, founded in the Resource Management Act of 1991. With the intention not to add onto bureaucracy, New Zealand will contribute to SDGs through its international leadership on eliminating fossil-fuel subsidies, as well as by advocacy and support. Additionally, six priorities direct policy work related to SDGs: advocacy at the global level, partnership engagement for promotion, collaboration to improve donor coordination, improved development impact, Pacific partnerships as well as implementation of policy agreements to improve the Pacific Island countries ability to trade (New Zealand Foreign Affairs & Trade, 2019).

In terms of DRR and CCA, many of the current legislative pieces addressing disasters or climate have not been synergized, and do not contain cross-references which could create much-needed continuity among various documents, targets and aspirations. Furthermore, given that the Hyogo Framework for Action was largely left unimplemented by the country (Basher, 2016), a step was missed in revising the existing legislative framework at the time, which has constituted to the gaps within the current institutional mechanism as well vis-à-vis many other countries with a similar development context. Many of the existing policy-pieces have potential to be harmonized by identifying synergies which are required if the aspirations are to achieve standard-level, integrated approach for managing disaster and climate risks in New Zealand. Additionally, given the ambiguities related to policymaking seeking to support the integration of the SDGs, estimating the efficacy of existing and available legal instruments is very difficult, apart from commitments under the Conservation Strategy for 2017-2022 and as identified under the Seventh National Communication of 2017 (Ministry for the Environment, 2017). However, the recently implemented Zero Carbon Act and supporting work programs are now leading instruments in achieving climate adaptive, green and resilient development, which can further contribute to sustainable development as well. In recognition of the fact that the global efforts to respond to the climate change are not moving fast enough, both sides of the political divide are committed to the new legislation. Moreover, implemented over the past few years, Emissions Trading Scheme, Electric Vehicles Program, Forestry Reference Group and the Climate Change Adaptation Technical Group all support these efforts (Ministry for the Environment, 2017).

## 5. Issues in the Implementation of Disaster Risk Reduction and Climate Policy

Given the range of extensive public and private investments, cultural assets and traditional values which are increasingly at risk of climate change and sea-level rise, climate change adaptation through policymaking is a formidable challenge in New Zealand. All levels of government operate under the framework of Resource Management Act, Coastal Policy statement and number of other policies to cover adaptation and risk reduction issues, but operating practice focuses largely on structural flood controls using static numbers to reflect complex climate risks (Manning, et al., 2014). Increasing population, complexity of needs, low community engagement, existing risk management practices, limited policy-instruments, and low perception of climate change risks all contribute to limited capacity to tangibly implement adaptation policies especially at the local levels (Manning, et al., 2014).

The Civil Defence Emergency Management Act considers risk reduction among its six core elements. However, risk reduction is not set as a national responsibility, but remains decentralized to territorial governments. Little direction, standards or guidance is provided in the act, apart from hazard assessments (Basher, 2016). Furthermore, risk reduction measures are hard to track down, or not always recognised as such. For example, the most significant risk reduction mechanism for seismic risk is building regulation; this effectively reduces life safety risk but economic risk is largely transferred through insurance. Furthermore, most initiatives fail to define as what constitutes to “risk”, apart from the National Disaster Resilience Strategy which is now aligned with the Sendai Framework. Risk reduction efforts are not systematically governed or managed on a national scale, minimal budget is devoted to it, and the localization of DRR and CCA renders many of the existing activities inconsistent and diverse given the LGUs limited capacity to generate funds and limited access to technical expertise (Basher, 2016).

Additionally, while important strides have been made towards carbon neutrality and sustainable development, the Zero Carbon bill, for example, remains to be supported by very few policies which would introduce new regulations for cutting emissions. Strong policies and updated 2030 Paris Agreement emission reduction targets are required to guarantee the effectiveness of new legislative measures (New Climate Institute, 2019). Similarly, utilization of the already existing, principle-based policy frameworks to respond to complex social problems, such as child poverty, are inefficient without specific considerations for transformational change through clarified roles, responsibilities and empowerment of local communicates to identify the broad spectrum of stakeholders who must support this agenda (Eppel, et al., 2018).

## 6. Stakeholder Analysis

For effective emergency management, partnerships between central and local government is fundamental, recognized in statutory frameworks focusing on responding to the diversity of local needs, enhancing local autonomy and accountability, different roles of territorial authorities and their funding needs. Regionally, local authorities are required to form their own respective CDEM Groups to provide for and coordinate emergencies in the region. Thus, a wide variety of approaches to response and preparedness exist given that regional councils have some degree of freedom to decide stakeholders who they wish to involve.

Globally, New Zealand is an important supporter of the Pacific Island countries through numerous development coordination initiatives. For example, the budget of 2018 provides over US\$ 460 million over the upcoming four years to support international development efforts, allowing flexible and responsive approaches to the emerging needs of Pacific Partners through mutual agreements and partnership approach (Tabuteau, 2018). Additionally, due to challenges the Pacific Island Countries face in accessing finance from multilateral funding (such as the Green Climate Fund), New Zealand has launched a Technical Assistance for Pacific Access programme in early 2016 to support capacity building for improved project proposals (Ministry for the Environment, 2017).

It is also important to note that the Māori have an important partnership role in New Zealand under the Treaty of Waitangi. Given that their worldview considers the environment as the base from which cultural, spiritual, emotional and physical sustenance flows, they have particular interest in managing hazards, risks and sustainable development on their sites of significance. Thus, communities must have a say in what levels of risk they perceive as important, and what measures they hope to be implemented to protect their lifestyle, culture and traditions through participatory approaches supporting engagement and locally led initiatives.

## 7. Future Priorities

Numerous challenges, gaps and needs have been identified throughout this report. This section intends to summarize some of the findings and collate the most pressing challenges and issues to help prioritization of national strategic goals vis-à-vis the post-2015 development agenda. Albeit subjective, the issues as explored here have been established to source from structural problems, founded on response-orientated and inflexible disaster management and civil defence, which are now running low on their institutional adaptive capacity to respond to the complexity of wicked problems manifesting in vulnerability issues such as poverty, economic stratification and concentrations of wealth, homelessness, marginalization and increased anthropological stressors on the environment and climate.

### 7.1 Challenges

There are numerous gaps in the existing policy. For example, while the Public Finance Act of 1989 guides and directs the management of public assets, mandating the forecasting of fiscal risks facing the government, disaster and climate risks have not been integrated into the policy statement, and remains absent from the Treasury's strategic frameworks (Basher, 2016). Additionally, given the focus on decentralization and high local autonomy, tensions are formed between the central government policies and local authorities implementing legislative provisions at their levels to achieve nationally envisaged outcomes and objectives. Lack of local human capital, technological capacity and funding often constitutes to disparities between New Zealand's governance, alongside recovery funding issues which may not necessarily cover all the funding needs given high reliance on public funding even in smaller, rural local government areas (Department of Internal Affairs, 2019).

Furthermore, New Zealand faces a major challenge in decoupling economic growth from the growth of GHG emissions given the reliance on a few high-emission intensive industries (Ministry for the Environment, 2017). These concerns align closely with the challenges related to responding to climate change proactively; increased funding, planning and comprehensive whole-of-society approaches are required now to lessen the potential destructive impact of sea-level rise, temperature fluctuations and severe, adverse weather. However, this should be supported by cross-cutting research on the key impacts of climate change on New Zealand's agriculture, biodiversity, coastal zones, glaciers, human health, infrastructure and the economy, alongside cultural heritage and marine environments.

Also, there is an increasing need to move away from response-oriented emergency management towards a whole-of-society DRR and CCA agenda which has the capacity to reach across scales from individual to national government levels. While the potential for change exists, information on disaster risk reduction is still difficult to track down on government documents and policies, and minimal cross-referencing exist between agencies. A more comprehensive and revised policy-agenda is urgently needed, alongside updating of existing frameworks and legislation (which are still referenced and relied on) to synergize the government's efforts to match current needs. Presumably, utilizing somewhat outdated policy mechanisms is done to avoid added burden of bureaucracy to the emergency management infrastructure, but given that emergencies, the environment and the society are treated as largely separate issues; harmonization is required now to mainstream the understanding of these issues as a part of a one system. However,

extensive capacity-building, support, revision of local government authorities' emergency management mechanisms and bringing all stakeholders 'to the same page' are also necessary to avoid fragmenting the development agenda as it stretches across multiple and diverse governance systems, legislative pieces and funding needs.

## 7.2 Priority Issues

One of the first and foremost needs for New Zealand would be to establish a comprehensive Disaster Information Management System, combining various existing platforms and databases to harmonize and synergize available information in terms of loss data (for estimating disaster trends), and to support decision-making, prioritization and funding needs projection. This should consider the dimensions of potential climate change impacts as well and be made publicly available to stakeholders and communities. Current, existing systems are maintained by a plethora of actors, and a comprehensive DIMS remains to be established.

Availability of easily accessible disaster information could lead to more comprehensive, detailed and tangible risk and vulnerability assessments at the regional and local level. Integrated climate change impacts would be especially important within local governments' assessments. However, they would require increased technical and human resources to adequately implement regional impact estimates and projections to their local assessment methods to inform decision-making. While the government has invested in increased support (such as the 'fly-in teams' for response), the onus must be transferred towards risk reduction to move away from inherently responsive emergency management and civil defence which dominate the institutional landscape.

Additionally, presenting static and unrevised legislative instruments for responding to complex and evolving social issues renders the governments approach simply doing 'more of the same'. Change needed to reduced child poverty within the SDG development agenda, for example, will not take place unless the policy framework facilitating the current situation remains unrevised. Much like disaster risk reduction and climate adaptation, addressing child poverty requires a whole-of-society approach, not to be achieved by rigid and inflexible administrative provisions, unless they have the potential to facilitate positive changes through consensus-based approaches among the state, communities, and households (Eppel, et al., 2018). Understanding the profound need for transformational change to mitigate risks is paramount as well, and given that mainstreaming 'emergency management' in New Zealand retains a very response-orientated undertone, more focus is required at all levels on addressing risks, its dimensions and the importance of the range of government and non-governmental agencies in responding to the complexities of contemporary 'wicked problems'.

The National Disaster Resilience Strategy of 2019 does indeed bring focus on the importance of tangible Sendai Framework implementation and climate change adaptation by addressing the underlying causes constituting to societal vulnerabilities – yet, it remains largely a separate policy piece given that provides little guidance on local institutions and how they can better implement interventions to improve dimensions of resilience as envisaged under the document. The 2019 strategy should be supported by a wider policy-agenda, seeking to mainstream DRR, CCA and sustainable development throughout the diverse spectrum of available policy documents, especially to those related to emergency management and civil defence.



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3	<b>Dr. Bapon (Shm) Fakhruddin</b> Technical Director- DRR and climate resilience Tonkin + Taylor Level 2, 105 Carlton Gore Rd, Newmarket, Auckland 1023 New Zealand
4	<b>Prof David Johnston</b> PhD, MSc, BSc Director/Professor of Disaster Management Joint Centre for Disaster Research Wellington Campus, Massey University 94 Tasman Street, Mt Cook, Wellington
5	<b>Meeting with Christchurch City Council</b> Andrew Turner Deputy Mayor Christchurch City Council Civic Offices, 53 Hereford Street, Christchurch 8013
6	<b>Dr. Tracy Hatton</b> Joint Managing Director Resilient Organizations Ltd University of Canterbury Unit 2, 188 Durham Street South, Christchurch 8011, New Zealand

