



19 December 2022

Release of the *draft 2018 National Risk Report*

This letter provides important context around the release of a now historical draft document, entitled the 'National Risk Report'. This draft report was under development, at the initiative of officials, in 2018 in order to provide information on nationally significant risks. The Department of the Prime Minister and Cabinet (DPMC) coordinated this drafting, involving a number of other government agencies and stakeholders at the time.

The document did not progress beyond the draft stage. It was not endorsed across agencies nor approved by Ministers. It should not be assumed that the content is complete or provides an accurate representation of the risks set out or how these are managed and governed. The draft report reflected some views held at that time, and is now considerably out-of-date. It does not represent the government's assessment of the current risk landscape in 2022, particularly given recent significant domestic and global events such as the terrorist attack on Christchurch masjidain on 15 March 2019, the COVID-19 pandemic or Russia's invasion of Ukraine.

The government maintains a National Risk Register – a tool that supports the identification, management and building of resilience to nationally significant risks in a coordinated and proactive way. Government agencies continue to work together to anticipate, prepare for, and mitigate these risks. You can find more information on the National Risk Register on the DPMC website at: dpmc.govt.nz/our-programmes/national-security/national-risk-approach-0.

The government is committed to lifting the level of engagement with New Zealanders on nationally significant risks and to being more transparent on matters of national security. This is in line with the findings of the Royal Commission of Inquiry into the terrorist attack on Christchurch masjidain on 15 March 2019.

A recent initiative that is currently underway is the development of the first ever National Security Long-term Insights Briefing entitled '*Let's talk about our national security: Engaging an increasingly diverse Aotearoa New Zealand on national security risks, challenges and opportunities*'. This briefing shares information on some of the most significant threats and risks New Zealand could face over the next 10-15 years, and outlines work underway to prepare for these threats and risks now. You can find more information about this briefing on the DPMC website at: dpmc.govt.nz/our-programmes/national-security/national-security-long-term-insights-briefing.

Ngā mihi

Tony Lynch
Deputy Chief Executive
National Security Group
Department of the Prime Minister and Cabinet



DEPARTMENT OF THE
PRIME MINISTER AND CABINET
TE TARI O TE PIRIMIA ME TE KOMITI MATUA

The New Zealand National Risk Report



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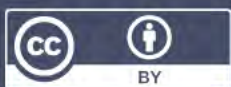
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PRIME MINISTER AND CABINET**
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The New Zealand National Risk Report



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Foreword

Right Honourable Jacinda Ardern



Prime Minister of New Zealand
Minister for National Security and Intelligence

This Government is committed to building a better future for the people of New Zealand. We are helping people thrive by investing in health, housing, education, and the conservation of the natural environment.

To achieve our objectives as a country, we need to be clear about the things that could get in our way. We need to keep the future in mind and bring together our ambitions for greater resilience in a conversation that is open to the public.

This report does just that. It helps us think about the national risks we need to manage for our continued success as a nation. Intended primarily for key decision-makers in public and private organisations, including government agencies, boards and business owners, lifeline utilities and critical infrastructure providers, it paves the way for more discussion about how we can collectively and individually reduce those risks.

As Prime Minister, and as Minister for National Security and Intelligence, I am aware of the challenges New Zealand faces because of the national risks discussed in this report. Those challenges range from weather-related hazards worsened by climate change to more malicious threats that undermine our national security. We are already a resilient country with a reputation as a safe, prosperous, and environmentally appealing place to live. We have tried and tested procedures in place to respond to a crisis – responses to recent earthquakes demonstrate this and I am confident we can achieve even more if we work together as a nation.

The New Zealand National Risk Report is part of my Government's commitment to strengthen our resilience to the national risks we face.

Andrew Kibblewhite



Chair
Officials' Committee for Domestic
and External Security Coordination

The business of national security is often concentrated in the short term. We react, we respond. We deal with the circumstances we face. We bias our efforts to the here and now rather than anticipating the needs of the future.

A focus on risk, is by definition, a focus on what may happen in the future. Our hope in publishing this first New Zealand National Risk Report is that we will lift our sights beyond what immediately presents itself; we want to encourage a broader, national conversation about what steps we can take today to build a more resilient New Zealand tomorrow.

Risk management is a collective process. It requires agencies to work collaboratively, to engage with political leaders, the business sector, iwi, communities, and international partners.

I am grateful for the efforts and support of a range of agencies and individuals that was required to assemble this report. In drawing together such diverse perspectives and insights we have taken an important step towards presenting a future-focused, comprehensive approach to risk management. We will use this tool to help identify capability and policy gaps in the National Security System.

Sir Peter Gluckman



Chief Science Advisor
to the Prime Minister 2009-2018

Prof Juliet Gerrard



Chief Science Advisor
to the Prime Minister

Science plays an important role in understanding the risk landscape and developing strategies to enhance resilience and reduce vulnerability. Risk assessment and management is complex and affected by perceptions of risk. In May and November of 2016, Sir Peter Gluckman's office published reports on understanding uncertainty and risk perception. All risk assessment involves a level of uncertainty, but we can still improve the processes for identifying and managing those risks. We need to come to a collective understanding of events for which we must be prepared.

The New Zealand National Risk Report allows parties beyond central government to understand national risks and the objectives of the National Security System. It helps identify opportunities to reduce risk and improve the resilience of our society. It ensures that risks to national wellbeing are appropriately identified and builds a better picture of how those risks are interrelated. In doing so, it strengthens the evidence base for decision making on national security issues and provides greater transparency and accountability for risk management.

This report is a well-researched document that draws on international best practice and standards. It is similar to reports published by other countries, such as Norway and the United Kingdom, that serve as reference documents for shaping public discussion on risk management. National risk assessments require periodic review and updating, and scientific input will continue to provide evidence that guides this process.

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SECTION

1

Introduction

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1.1

There has never been a better time

Preparing New Zealand for the uncertainties of the future means making sure the country understands its full range of risks and what is collectively being done about them. Good management of national risks enables us to build our resilience, improve our natural, human, social, financial, and physical 'capitals', and our intergenerational wellbeing.¹ In our changing world, the effects of transitions and long-term trends, such as climate change, are constantly shifting the risks we face as a country. Our world tomorrow could look vastly different from our world today. As such, there has never been a better time for our nation to take stock and lay the foundations for better risk management.

New Zealand has significant experience in responding to natural hazard emergencies and other crises, many of which tested the country's resilience. The Canterbury earthquakes in 2010 and 2011, along with the Kaikōura earthquake and tsunami in 2016, were some of our most costly events. Such events showed the strength of the nation in the face of adversity and strengthened New Zealand's ability to manage future crises.

With the progress of technology and globalisation, threats such as malicious cyber activity and transnational organised crime are growing in their ability to affect New Zealand. Alongside environmental pressures, biological and technological hazards, and economic crises, this range of hazards and threats form the basis of our national risks. National risks can disrupt the conditions required for a secure and prosperous nation, including the availability of many of our basic necessities such as water and food production. Even with proactive management, it is probable that many of these national risks will continue to increase.

This first New Zealand National Risk Report (the report) discusses 22 hazards and threats, the method for assessing them, and how they are managed at a national level. This report is not required by New Zealand law; it is a voluntary piece of work to stimulate conversation about and participation in managing our national risks.

The report's primary audience are key decision-makers in public and private organisations, including government agencies, lifeline utilities and critical infrastructure providers. Decision-makers can consider how each hazard and threat might impact their individual organisation or sector and the actions that they could take towards reducing risk and improving resilience.

This report complements the National Security System Handbook, which sets out New Zealand's arrangements with respect to the governance of national security and in response to a potential, emerging, or actual national security crisis.² It also complements the National Hazardscape Report 2007³ and the National Disaster Resilience Strategy.

1 See the New Zealand Treasury website for information about wellbeing and living standards frameworks, including the four 'capitals'

2 Department of Prime Minister and Cabinet. 2016. *National Security System Handbook*. URL: www.dPMC.govt.nz/publications/national-security-system-handbook-html (accessed 24 April 2018).

3 Department of the Prime Minister and Cabinet. 2007. *National Hazardscape Report*. URL: www.civildefence.govt.nz/resources/national-hazardscape-report (accessed 19 April 2018).

It describes processes for assessing the adequacy of national risk management arrangements; this assessment allows the country to get in front of the hazards and threats that can undermine our national wellbeing by allocating additional resources to manage the risks effectively.

The National Risk Report follows the 'all hazards – all risks' approach that New Zealand takes to manage national risks. This comprehensive view allows a wide range of hazards and threats to be considered, but does not mean 'one size fits all.' Each hazard or threat has its own unique features, and these are taken into account when assessing national risks. The national risk summaries in the report show the features of the various hazards and threats, including the likelihood of occurrence and types of consequences.

The report also looks at how national risks may be influenced by long-term domestic and international trends. These trends affect many aspects of New Zealand, from the natural environment and human demographics to the economy and technology. Climate change is an example of an important long-term trend. The precise nature of how climate change and other trends will influence national risks will continue to change over time.

This report provides a way to talk about the array of known risks facing the nation. It helps enable a transparent and consistent conversation so that, as a country, we can be better placed to deal with the constantly shifting levels of uncertainty that come with those risks.

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1.2

Structure of the report

This report is divided into seven sections:

SECTION 1	talks about why it is important to define and assess national risks so that informed risk management choices can be made.
SECTION 2	introduces nine long-term trends that are shaping our future society and national risks.
SECTION 3	explores the concept of risk more generally and defines a national risk. It discusses the components of national risks: hazards and threats, exposure and vulnerability, and likelihood and consequences. It also describes the 'all hazards – all risks' approach, lists 22 hazards and threats, and provides example scenarios used to assess them.
SECTION 4	summarises each national risk and provides descriptions of likelihood and consequences of each. The risk summaries list recognisable coordinating and support agencies for each national risk and the general approach that is taken to manage the risk.
SECTION 5	describes the method used to assess national risks, including discussion of the varying levels of confidence in the assessments.
SECTION 6	talks about the roles, structures, and frameworks that have been put in place to govern and manage national risks.
SECTION 7	concludes the report and mentions other trends and assessments that could be considered in the future.

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1.3

The importance of understanding and managing national risks

National risks can have a dramatic effect on the nation if they arise—not only can they undermine national security and prosperity, they can also damage our collective wellbeing if we are inadequately prepared or struggle to recover from an event or crisis. New Zealand has committed to implementing the Sendai Framework for Disaster Risk Reduction. Signed by 187 United Nations member states, Sendai is a 15-year agreement that aims for “the substantial reduction of disaster risk and losses in lives, livelihoods and health and in the economic, physical, social, cultural and environmental assets of persons, businesses, communities and countries.”⁴

As part of carrying forward its Sendai commitment, New Zealand needs to anticipate potential national risk events, reduce their effects where possible, and prepare, respond, and recover if risk events do occur.

The process of managing national risks is complex and involves a range of government agencies and other organisations. Government agencies work together as part of the National Security System, which oversees the arrangements for dealing with national security.

The National Security System also recognises the importance of building societal resilience. Local government, non-governmental organisations, and the private sector play vital interconnected roles in the management of national risks. This collective effort contributes to increasing communities’ resilience as described in the National Disaster Resilience Strategy i.e. it seeks to decrease the consequences of disaster events improving communities’ tolerance for disruption.

The National Security System is supported by a legislative framework that requires hazards and threats to be identified and managed. For example, one function of the Director of Civil Defence Emergency Management is to identify hazards and risks of national significance under the Civil Defence

Emergency Management Act 2002. Some other important pieces of legislation in this context include the Building Act 2004, the Resource Management Act 1991, and the Intelligence and Security Act 2017.

The National Security System is also supported by strategies, policies, and capability in specific areas. An example is the Strategic Defence Policy Statement 2018.⁵ The strength of the National Security System lies in government agency cooperation, bringing together a range of interdependent and agile capabilities for coordinated action. This method recognises that the sum is often greater than the parts.

The challenge is to build upon the arrangements that New Zealand already has in place for responding to events and crises. It means improving how the National Security System reduces and treats risk, as well as responding to and recovering from events that occur. To address these challenges, the National Security System will need to support growth in the capabilities of those involved in managing national risks.

A national risk assessment identifies and evaluates the big risks to people and social structures, the economy and critical infrastructure, and the natural and built environment. It enables the Government to monitor the effectiveness of existing risk management procedures and assists with developing new management options for the future. Example scenarios for each national risk have been chosen to enable a consistent comparison as part of the assessment.

In assessing New Zealand’s national risks, we should not expect the past to simply repeat itself. While we can learn from past events and crises, we also need to develop foresight to think about how longer-term trends may affect national risks and plan accordingly. Assessing the potential influence of such trends as part of a national risk assessment can provide insight into how the country can address future challenges and seize opportunities to strengthen national wellbeing.

4 United Nations. 2015. *A/RES/69/283: Sendai Framework for Disaster Risk Reduction 2015–2030*. URL: http://www.un.org/en/development/desa/population/migration/generalassembly/docs/globalcompact/A_RES_69_283.pdf (accessed 20 July 2018).

5 Ministry of Defence. 2018. *Strategic Defence Policy Statement 2018*. URL: <https://defence.govt.nz/publications/publication/strategic-defence-policy-statement-2018>. (accessed 16 July 2018).

1.4

Report use and other information

This report can be used by central and local government agencies with responsibilities for managing, coordinating, and responding to national risks, and the stakeholders that they work with to perform those duties.

Information in this report can also be used by the boards and management of non-governmental organisations and the private sector to increase understanding of national risks and guide their risk management activities.

Individuals, communities, and iwi may wish to read this report to increase their understanding of national risks, how they are assessed and managed nationally, and the effects they could have on community resilience planning.

Summaries of national risks are included in this report. It is important to note that they do not describe all possible hazards and threats that could affect New Zealand.

Readers of this report are encouraged to consider each risk summary and reflect on how they may be able to use the information in this report to help reduce the risks both nationally and locally.

Readers are encouraged to seek further information on risk management or those national risks they consider most relevant. Links to further information are included in the risk summaries.

Future publications of this report may include

- updates to the risk assessment methodology and national risks;
- developments in the steps the Government is taking to manage national risks; and
- continued identification of long-term trends and how they could influence national risks.

An online version of the New Zealand National Risk Report can be found on the National Security and Intelligence section of the Department of the Prime Minister and Cabinet website.

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SECTION

2

Our changing world

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2.1

Expecting the unexpected

Some of the trends introduced in the following sections are global while others relate specifically to New Zealand.

These long-term trends can influence or alter relationships between some national risks by impacting hazards, threats, and exposure or vulnerability. Effective management of risk enables New Zealand to capture opportunities that are created by these trends.

A long-term trend is an ongoing situation occurring with a degree of certainty that is likely to influence a national risk or alter its relationship with other risks.

We cannot expect our world to change in a way that is linear and smooth. While trends may develop gradually, they could also build to a point where they trigger an abrupt change or transition. An example of this is the large-scale loss of a fish population that can occur when an environmental toxin reaches a critical level.

As long-term trends develop, there is a need to consider flexible and innovative ways to adapt, such as strategies and specific measures to address the impacts that they will have on national risks. Developing a shared understanding of trends helps policymakers define the necessity of possible responses.

The purpose of this discussion is not to present simple observations about these long-term trends, but to begin a discussion about future challenges for New Zealand. As each trend is occurring already with cross-cutting impacts, there is no better time to begin a national conversation about trends, risks, and our intergenerational resilience.

2.2

Climate change and environmental degradation

Climate change will create challenges associated with increasing atmospheric and ocean temperatures, ocean acidification, and sea-level rise. It will alter the frequency and severity of some national risks such as severe weather, droughts, and wildfires.⁶ The progressive damage to sensitive marine ecosystems from ocean acidification and the effect of sea level rise on our ability to live and thrive near the coast will continue apace with climate change. Higher atmospheric temperatures can also have a direct health effect on humans, animals, and plants.^{7,8}

If climate change expands the geographic range of certain species of mosquitoes, there is a higher risk of diseases (like Zika or dengue fever) being spread to humans and animals.⁹ Climate change can also impact agriculture and increase the risk to coastal infrastructure, which will already be challenged by worse flooding, droughts, and erosion. Likewise, some armed conflicts overseas have been made worse by the pressures of drought and water scarcity that occur in arid regions.¹⁰

Climate change is putting further pressure on existing trends, such as the degradation of the natural environment, particularly with regard to soil health, freshwater lakes and rivers, and native biodiversity.¹¹ Much of the water quality degradation in New Zealand is the result of a long-term, widespread clearing of forests and wetlands. This degradation is likely to continue if rising seawater intrudes into wetlands and disrupts their ability to filter contaminants and regulate water level surges.

Environmental degradation can be effectively treated. For example, government agencies set standards on vehicle emissions and the efficiency of wood burners to improve air quality in urban areas. The replanting of land with native trees have resulted in a gradual increase in some forested areas over the last two decades. However, mitigating climate change requires both national and international effort. Given current climate change trends, New Zealand needs to adapt to the effects of, as well as mitigate, climate change.

6 Climate Change Adaptation Technical Working Group. 2017. *Adapting to Climate Change in New Zealand*. Stocktake report from the CCATWG.

7 Royal Society of New Zealand. 2016. *Climate change implications for New Zealand*. RSNZ, Wellington.

8 Gluckman, P.D. 2013. *New Zealand's changing climate and oceans: The impact of human activity and implications for the future*. Office of the Prime Minister's Chief Science Advisor, Auckland.

9 Royal Society of New Zealand. 2017. Climate change and health. URL: royalsociety.org.nz/what-we-do/our-expert-advice/all-expert-advice-papers/climate-change-and-health (accessed 18 April 2018).

10 World Economic Forum. 2018. *The Global Risks Report 2018*, 13th Edition.

11 Dymond, J., Ed. 2013. *Ecosystem Services in New Zealand: Conditions and Trends*.

2.3

Changing demographics

New Zealand demographics are changing. Society is becoming older and more ethnically diverse, with changing levels of income inequality.¹² An ageing population can be more susceptible to communicable diseases and will place added pressure on healthcare and welfare services. As we live longer, greater demand will be placed on private assets and public infrastructure; this will reduce the transfer of wealth between generations and the capacity of our infrastructure. In rural communities, decreasing and ageing populations will need to consider how they may need to plan differently for hazards and threats.

The proportion of non-European groups in the population is increasing—one in four people living in New Zealand in 2013 was born in another country. The number of people identifying with Asian ethnic groups has grown rapidly and in 2013 made up 12 percent of the population.¹³ Ethnic diversity brings opportunity by introducing different perspectives and cultural experiences, which can inspire creativity and innovation. However, schools, workplaces, and health care services will need to modify and adapt their approach so the perspectives and experiences of diverse groups are taken into account. Building an inclusive society in which all individuals and groups are able to participate reduces the potential negative consequences that can arise when ethnic balances change. Within urban populations, increased diversity may increase exposure to overseas sources of transnational organised crime.

Since the mid-2000s, income inequality after housing costs has increased across individuals and households. Some level of inequality provides incentives for people to study, compete, and invest so that they can move ahead financially. However, high and sustained levels of inequality come with large social costs. Income inequality can have an impact on healthcare and welfare services, social cohesion, and open politics. This could lead to more corrupt behaviours in New Zealand.

12 The Treasury. 2016. He Tirohanga Mokopuna: 2016 Statement on the Long-Term Fiscal Position.

13 Stats NZ. 2013 Census. URL: archive.stats.govt.nz/Census/2013-census.aspx (accessed 13 April 2018).

2.4

Global economic growth and productivity

Global economic growth continues to fluctuate. It increased from 2.4 percent in 2016 to 3 percent in 2017, driven by significant increases in investment, manufacturing, and trade behaviours. However, demographic trends show that long-term economic growth in advanced economies like New Zealand is expected to slow down. An ageing population will cause the economy to become more dependent on improvements in productivity than on increases in the labour force. Productivity is a longstanding and unresolved challenge for New Zealand that involves a wide range of factors, including lower levels of research and development.

Global trading prospects also depend on the openness of global trading. International connections open up access to markets, people, capital, and ideas that our smaller domestic market cannot offer; however, these connections can also allow harmful incursions into New Zealand, such as pests and diseases. Geopolitical events such as terrorist attacks, Brexit, and Middle East tensions create further uncertainty. Global economic growth and productivity have implications for national risks, even when elements of the trend appear to be concentrated overseas. For example, resource scarcity in other parts of the world could encourage maritime incursions into our exclusive economic zone or increased smuggling. Another example of vulnerability created by global economic growth and demand is the changing use of land in New Zealand. Rapid conversion to dairy farming and monocultural kiwifruit production over the last decade has implications for biosecurity, as monocultural farming is more vulnerable to disease.

2.5

Digital connectivity and technological change

New Zealand's experience is consistent with the global trend of increasing digital connectivity and use of personal electronic devices. The number of New Zealanders accessing and using smartphones increased from 46 percent of the population in 2013 to 70 percent in 2015.¹⁴ Increasing digital connectivity and dependence on digital technologies create challenges and opportunities. For example, the internet gives people access to goods and services that were previously out of reach and has enabled participation in the 'sharing economy'. The internet, however, also makes it difficult for governments to regulate aspects of economic activity, support safety and security online, prevent harmful messaging, and provide consumer protection.¹⁵ At the same time, government agencies and the private sector have greatly enhanced their ability to deliver targeted services through digital channels.

For children, increasing digital connectivity can encourage development through online collaboration and access to information. It also brings the potential for harm through online bullying. In the classroom, the increasing digital delivery of education can benefit learning while also increasing the risk of creating a divide between those who have online access and those who do not. Technological change is affecting the labour market, reducing traditional job opportunities, and displacing workers. In New Zealand, employment is already shifting towards high-skill, technology-based occupations. This trend is likely to continue as the pace of technological change increases.

Technologies that radically change the way we work and live are sometimes referred to as disruptive technologies. Disruptive technologies tend to displace an established technology and can shake up an industry or create a completely new one. The consequences of disruptive technologies can be difficult to predict; they can change societal expectations and behaviours and create unknown future risks.

Digital connectivity and technological change mean that our daily lives are increasingly reliant on global information networks. As a result, we may be more exposed and vulnerable to events such as the failure of power generation and distribution grids or damaging data breaches. One example of this vulnerability is our reliance on the Global Navigation Satellite System to support our critical infrastructure. There is little or no backup in the event of a satellite malfunction or the loss of service.

Digital connectivity means that many problems can be transmitted as fast as information, magnifying the impact of some events. While technological change can be a source of risk, there is huge potential for new technologies to make risk management more effective. For example, the spread of cellular phones means that early warning messages for natural hazards can be spread farther and faster than before. The rate of digital connectivity and technological change is likely to increase, as will the challenges and opportunities for risk management.

14 Research New Zealand. 2015. *A Report on a Survey of New Zealanders' Use of Smartphones and other Mobile Communication Devices*.

15 Gluckman, P.D. 2016. *The Digital Economy and Society: a preliminary commentary*. Office of the Prime Minister's Chief Science Advisor, Auckland.

2.6

Challenges to the rules-based international order

New Zealand's interests are best served by the rules-based international order where conflict, transborder, and global challenges are addressed effectively. Established after the Second World War, the prevailing rules-based international order encompasses a range of global institutions, rules, standards, and norms.

Having agreed rules, standards, and norms that govern international cooperation on peace, security, and economic, financial, human rights, and social issues provides stability and certainty. Rules, rather than simply power, provide protection for small, internationally connected countries like New Zealand.

New Zealand funds international organisations to deliver globally and efficiently extend the reach of our actions. When effective, these organisations can achieve positive outcomes in response to incidents such as humanitarian crises.

The rules-based international order underpins our economic prosperity. New Zealand uses it to

- promote values that are important to New Zealanders;
- showcase best practice;
- share our experiences; and
- pursue international support that brings benefit to our Pacific neighbourhood.

The United Nations and other international organisations have unparalleled convening power. They afford New Zealand an opportunity to engage and influence at the highest level and understand and assess the wider international context. While there have been notable successes, the rules-based

international order is challenged by long-standing, intractable conflicts and new issues. Global governance is more contested than ever. Geopolitical changes and the assertion of different values and national interests impact the primacy and effectiveness of the rules-based international order.

Challenges or pressures on the rule-based international order include growing great power competition, shifts in how large states influence international norms, effects from climate change, technologies that change the nature of conflict, and malicious threats such as transnational organised crime.

Additional Challenges

Antimicrobial resistance is a rapidly evolving, serious, global public health risk affecting patients and communities. Antimicrobial resistance occurs when antibiotics can no longer effectively treat bacteria. It largely develops through the overuse and misuse of antibiotics. Without effective antibiotics, we lose the ability to manage infections. Routine surgeries, cancer treatments, and other medical treatments can become increasingly dangerous.

Security in the Pacific

New Zealand is linked to all parts of the vast and diverse Pacific region by history, culture, politics, and demographics. Our national security and prosperity are directly affected by the Pacific's stability. Pacific Island countries are particularly vulnerable to the effects of climate change and natural hazards, which are exacerbated by environmental degradation. These, and other long-term trends, are contributing to an increase in security challenges in the Pacific region.

SECTION

3

Understanding
national risks

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This section provides information on

- the components of risk— introducing the terms and concepts used in this report and explaining what a national risk is;
- the seven objectives that underpin New Zealand's approach to national security; and
- the 'all hazards - all risks' approach that New Zealand uses to manage national risks.

3.1

What is risk?

Risk is defined as the effect of uncertainty on objectives. It is measured by the combination of the likelihood of a hazard or threat occurring and the consequences for the things we value that are exposed or vulnerable to that hazard or threat. These things of value include

- physical safety and wellbeing of people;
- social and cultural capital;
- international reputation;
- the economy;
- buildings and infrastructure; and
- the natural environment.

This report collectively refers to these things as people and assets. People and assets are aligned with the human, social, natural, physical, and financial 'capitals' identified in the Treasury's Living Standards Framework. Assets can grow in value when hazards and threats are managed well. If hazards and threats are not managed well, the value of those assets can diminish. Similarly, good risk management enables improvements to our human, social, natural, physical, and financial capital.

People and assets can be exposed in different ways and can be vulnerable to different hazards and threats. Section 4.1 further describes the things we value.

A national risk is an uncertain, yet conceivable, event or condition that could have serious, long-term effects on New Zealand's security and prosperity, requiring significant government intervention to manage.

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3.1.1 Hazards and threats

Hazards are any source of potential harm. They are often naturally occurring events, such as earthquakes, volcanoes, flood-prone rivers, or infectious diseases. Other hazards are created by humans, such as hazardous substances and food safety issues.

Threats generally refer to a person or thing likely to intentionally cause damage or harm. They involve weapons (including chemical, biological, and radiological weapons), harmful use of technology, or people acting covertly or en masse.

While hazards involve no intent, threats may be driven by political, economic, religious, or ideological motives that must be taken into account. Threats can also be adaptive to countermeasures that are put in place against them.

3.1.2 Exposure and vulnerability

For there to be a risk, something of value (i.e., people or other 'assets') must be exposed to a hazard or threat. For example, a tsunami becomes a risk if people or buildings are exposed to it, which could be determined by the proximity of houses to the coast.

Risk is also influenced by the vulnerability of an asset to the effects of a hazard or threat. For example, the vulnerability of a building depends on how it is built and the materials used. These factors determine the building's strength in an earthquake. A wooden building is less vulnerable to shaking than a brick building, because wood is more flexible than bricks. However, a wooden building is more vulnerable to other hazards, such as a wildfire.

Physical, environmental, economic, and social factors also increase vulnerability. Examples of these factors include disabilities, language barriers, or being financially dependent on others. Communities can be vulnerable if they lack social cohesion and support structures. These factors create differences in how much harm or damage will be experienced during an event or crisis.

The basic relationship between hazards, threats, exposure, and vulnerability, and how risk can arise, is shown in Figure 1. A hazard or threat only gives rise to a risk when the things we value are exposed and vulnerable.

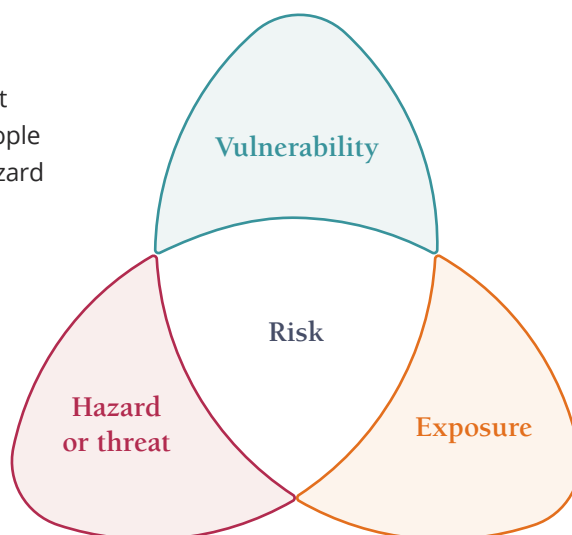
Figure 1. The components of risk

Vulnerability

The physical, environmental, economic, and social factors that increase the susceptibility of people and assets to the effects of a hazard or threat.

Hazard or threat

A naturally occurring source of potential harm or a person or thing likely to intentionally cause damage or harm.



Exposure

People, critical infrastructure, buildings, the economy, and other assets that are exposed to a hazard or threat.

3.1.3

Likelihood and consequences

The risk from a particular hazard or threat is measured in terms of its likelihood and the severity of its consequences to exposed and vulnerable people or assets. The more likely the hazard or threat, and the more severe the consequences when it does occur, the greater the risk.

New Zealand's risks are increasing and changing, and the losses from events and crises are rising. This is not necessarily because they are occurring more frequently; rather, it is because the consequences of similar sized events are often now higher. This is because of interconnected factors that affect exposure and vulnerability, including population growth, increased value of assets, increased development in hazard-prone areas, and the progress of technology and globalisation.

In general, exposure to hazards and threats is growing at a faster rate than vulnerability can be reduced. For example, intensive development in earthquake-prone areas increases the overall exposure of buildings to ground shaking and deformation, despite the improvement of building standards over time. The new development and higher value of houses and buildings in these locations also increases economic vulnerability.

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3.2

National risks

For a hazard or threat to give rise to a national risk, it must have the potential to undermine national security and prosperity or damage our collective wellbeing. It must have consequences that cut across all parts of society and require a significant government intervention to manage. Its occurrence must also be conceivable.

National risks include

- sudden onset events (e.g., earthquakes, industrial accidents, and terrorist attacks); and
- gradual onset events, which may occur over a period of time from days to years (e.g., influenza pandemics, biodiversity loss).

To help determine the impact of a national risk, it is useful to identify how that risk could affect the nation's ability to achieve its objectives. The National Security System has endorsed seven national security objectives that describe what needs to be protected for New Zealand to thrive.¹⁶ These objectives have been considered when assessing national risks; the main national security objective at risk is listed in each risk summary in Section 4.

The seven national security objectives

1. **Ensuring public safety** – providing for, and mitigating risks to, the safety of citizens and communities (all hazards and threats, whether natural or created by humans)
2. **Preserving sovereignty and territorial integrity** – protecting the physical security of citizens and exercising control over territory consistent with national sovereignty
3. **Protecting lines of communication** – ensuring the security of New Zealand's physical and virtual lines of communication to connect, trade and engage globally
4. **Strengthening international order to promote security** – contributing to the development of a rules-based international system and engaging in targeted offshore interventions to protect New Zealand's interests
5. **Sustaining economic prosperity** – maintaining and advancing the economic wellbeing of individuals, families, businesses, and communities
6. **Maintaining democratic institutions and national values** – preventing activities aimed at undermining or overturning government institutions, principles and values that underpin New Zealand society
7. **Protecting the natural environment** – contributing to the preservation and stewardship of New Zealand's natural and physical environment

¹⁶ These national security objectives were agreed by Cabinet in 2011 and provide enduring guidance to the national security sector.

3.3

An ‘all hazards – all risks’ approach

New Zealand takes an ‘all hazards – all risks’ approach to managing national risks. This wide-ranging approach does not mean planning or preparing for every possible event or crisis—even if we could see everything in advance, no country would have the resources to fully cover every scenario. Rather, it means that the view is comprehensive and all types of hazards and threats are taken into account in a balanced and measured way.

The ‘all hazards – all risks’ approach recognises that many hazards or threats can have similar consequences, so there are common measures that can be taken to manage them. The hazard and threat sources of national risks have been grouped according to these similarities. Grouping national risks enables more effective coordination for response activities while acknowledging the different approaches required for treating and reducing various hazards and threats. The Table 1 overleaf shows groups of risks and example scenarios; their use is explained further in Section 4.

The ‘all hazards – all risks’ approach also recognises that hazards and threats are often interdependent and can be connected to each other through complex interactions. Some have the potential to trigger other hazards with their own set of consequences, which worsens the impact of the original event. These are often referred to as ‘cascading hazards’.












An earthquake can trigger a landslide, which can block a major river by creating a landslide dam, which causes a potential flood hazard for any downstream community. This was witnessed after the Kaikōura earthquake in 2016.












This complexity means that when planning for a particular hazard or threat, the other hazards or threats they could trigger also need to be considered. For this reason it is sometimes more useful to plan for managing the consequences of a risk event than the risk itself. This involves identifying vulnerable people, communities, and infrastructure that could be affected and putting plans in place that will protect them in a range of events and crises.

Hazards are generally assessed based on scientific understanding of their likelihood and consequences of their occurrence. Threat assessments may use collected data and prior knowledge, but they must also take intent and capability into account. Assessment of threats from the deliberate actions of humans must consider the ability to innovate and adapt to any countermeasures.

Although some national risks are changing because of various pressures and long-term trends, those risks associated with malicious threats tend to require more frequent reassessment to account for changing circumstances.

Table 1. Groups of hazards and threats contributing to national risks

Groups	Hazard or threat	Example scenario
Natural hazards – geological	 Earthquake	Magnitude 7.5 earthquake on the Wellington Fault
	 Landslide	Many landslides triggered by an earthquake or severe weather event
	 Tsunami	Magnitude 9.0 earthquake and tsunami along the Hikurangi subduction zone
	 Volcanic activity	Eruption in the Auckland volcanic field
Natural hazards – meteorological	 Coastal hazards	A king tide coinciding with a very low-pressure storm
	 Drought and wildfire	Prolonged, severe drought over many years
	 Severe weather and flooding	Major multi-regional flooding involving urban areas
Environmental pressures	 Biodiversity loss, ecosystem disruption and resource depletion	Loss of the North Island west coast snapper fishery
Biological hazards	 Communicable diseases	Influenza pandemic affecting 40 percent of the New Zealand population
	 Food safety	Food safety incident resulting in death or serious illness (in a domestic or export market)
	 Plant and animal pests and diseases	Domestic biosecurity incursion affecting agriculture or aquaculture

Groups	Hazard or threat	Example scenario
Technological hazards	 Industrial accidents	A large hazardous substance release at a major hazard facility with an associated fire or explosion
	 Infrastructure failure	Failure of the national electricity grid (unspecified cause)
Malicious threats	 Armed conflict	Armed conflict in the Asia-Pacific
	 Corruption	A large New Zealand company is found to be paying bribes overseas with allegations the New Zealand Government was aware, but did not react appropriately
	 Espionage and foreign interference	An act of sabotage against infrastructure or interference in the political system
	 Major cyber incident	Sensitive government data is accessed and released
	 Maritime security threats	An incursion onto protected subantarctic islands with associated illegal dumping of waste
	 Terrorism	A terrorist attack in a New Zealand city or town
	 Transnational organised crime, smuggling and irregular migration	New Zealand gains a reputation as a significant transshipment port for illicit drugs, people, or other illicit commodities
Economic crises	 Commodity price shocks and trade problems	A global oil price shock resulting in fuel price rises in New Zealand of up to 35 percent
	 Financial Crisis	A financial crisis similar to the Global Financial Crisis that occurs at the same time as a major natural hazard event

SECTION

4

National risk
summaries

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This section presents the national risk summaries for 22 identified hazards and threats. It is a resource about the national risks that were identified by government agencies as part of the national risk assessment. The summary of national risks for each hazard or threat contains information on

- **likelihood¹⁷ and consequences;**
- **the main national security objective at risk** – although more than one objective can be at risk, only the most significant objective is listed in relation to each example scenario;
- **the assets that are likely to be affected** under the scenarios – these are described further in Section 5.1 and are organised under five domains: social indicators, governance and sovereignty, the economy, the built environment, and the natural environment;
- **selected risk management examples** organised under ‘the 4 Rs’: categories that together enable a holistic approach to risk management:
 1. **Reduction:** identifying, analysing and evaluating risks, taking steps to reduce their impacts
 2. **Readiness:** developing operational procedures and capabilities before an event or crisis happens
 3. **Response:** taking action immediately to save lives and property during and after an event
 4. **Recovery:** using coordinated efforts and processes to help recovery in the short and long term
- **risk coordinating and support agencies** for each national risk ; and
- **actions** that are currently being taken or considered to help with risk management, organised under the heading ‘Future focus areas’

The risk summaries:

- **do not describe all possible hazards and threats that could affect New Zealand;**
- **do not contain the complete risk assessments – the summaries are based on detailed assessments that are maintained by risk coordinating agencies; and**
- **do contain links to further sources of information.**

¹⁷ For natural hazards, information on magnitude is commonly included when discussing likelihood. For example, information such as the size of the event in terms of energy produced (earthquake), volume (volcanic ash, flooding), or material displaced (landslide, coastal erosion) might be included.

NATURAL HAZARDS



Earthquake



Landslide



Tsunami



Volcanic activity



Coastal hazards



Drought and wildfire



Severe weather and flooding

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4.1

Natural hazards – geological and meteorological

New Zealand's unique geology and location in the Pacific brings with it relatively high risks from a variety of natural hazard sources. Natural hazards are naturally occurring physical phenomena that can negatively affect humans, the economy, and the built and natural environments.

Natural hazards fall into two broad groups:

1. Geological hazards (relating to the Earth's physical structure), which include earthquakes, landslides, tsunamis, and volcanic activity
2. Meteorological hazards (relating to weather and climate), which include coastal hazards, drought and wildfire, and severe weather and flooding

Natural hazards can be understood through scientific research of past events and estimates of their magnitude and frequency. The ability to do this is increasing as more data and knowledge are gathered. Some consequences of natural hazards may not be apparent until they occur because of complex interactions with other natural hazards. For example, an offshore earthquake may cause a regional tsunami that could impact New Zealand's coastline and create a series of environmental problems in the future, including erosion and damage to coastal ecosystems from salt water inundation.

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4.1.1 Earthquake

Context

New Zealand is situated on the Pacific Ring of Fire and is tectonically active. Earthquakes are a frequent occurrence throughout New Zealand. On average, 20,000 earthquakes are detected every year; about 250 of these are large enough to be felt.

Earthquake hazards include fault rupture and ground shaking, deformation, landslides, and in extreme cases can trigger large tsunamis. Earthquakes have shaped our landscape and continue to shape it today.

Many New Zealand towns and cities are built on or near active faults. Proximity to faults increases the hazard from fault rupture or severe ground shaking, but all parts of New Zealand can experience earthquakes. Vulnerability to earthquake damage is controlled by land use, construction materials, design, and the overall condition of the buildings and infrastructure.

Likelihood and magnitude

Most earthquakes in New Zealand are small and cause no damage. Large earthquakes that can cause damage are less frequent. Long-term averages are useful for understanding how many earthquakes of different magnitudes are likely over time. Earthquake forecasts can describe the probability of earthquakes occurring, but when and where they will happen cannot be predicted. The magnitude 7.8 Kaikōura earthquake has increased the likelihood of other large earthquakes nearby as the Earth's crust adjusts to changes.

Earthquakes are also described by how much damage they could do. The Modified Mercalli Intensity Scale measures the intensity of an earthquake. Each earthquake has a range of intensities depending on how close people and assets are to the source and how far below ground the earthquake occurs. When

earthquakes of larger magnitudes (7.0 and above) occur near highly developed areas and are less than 100 km deep in the Earth's crust, they could result in significant consequences.

Consequences

Since the 1840s, earthquakes have cost New Zealand tens of billions of dollars in direct and indirect losses to the economy. They have resulted in 480 fatalities and thousands of injuries, largely associated with building damage, and have caused severe disruption to property, infrastructure, and services.

The consequences of large earthquakes are mostly due to their impacts on buildings, infrastructure, and the landscape. This physical damage can result in deaths and injuries, disruptions to critical lifeline utilities, and disruption to schools, businesses, and other essential functions.

When earthquakes trigger other hazards such as landslides, liquefaction, and tsunamis, the consequences can be significantly increased. The effects on people and the economy can last for years. People may be displaced from their homes or their jobs may be affected. The violent shaking and aftershocks associated with strong earthquakes can be frightening for people and result in ongoing psychological health impacts.

Managing the risk

The most important way to reduce earthquake risk is through land-use planning, building codes and standards, and infrastructure upgrade programmes. Such standards and programmes work very well for most earthquakes, but some earthquakes are so strong that not all damage can be prevented.

For these very large earthquakes, New Zealand focuses on planning and preparing to deal with the impacts, and the main focus is to ensure public safety. Economic losses to the public and private sector can be reduced through insurance cover. Private insurance reduces financial losses to the community. Response and recovery for earthquakes focus on keeping people safe and restoring services, protecting livelihoods, and future-proofing new infrastructure.

Reduction

- Earthquake hazard maps
- Land-use planning rules
- Building codes and standards
- Infrastructure upgrade programmes

Readiness

- Public education campaigns ('Drop, Cover, Hold')
- National, regional and local civil defence emergency management plans
- Business continuity plans
- Procedures and sector capability to undertake rapid building assessments

Response

- Activation of civil defence centres and emergency management operations centres to coordinate response efforts and welfare services and initiate recovery
- Building inspections and surveying procedures to identify and prevent access to high risk areas

Recovery

- Repairing and rebuilding critical buildings and infrastructure
- Insurance cover and payments
- Building back better and future-proofing new infrastructure

Risk coordinating agency(s)

- Ministry of Civil Defence & Emergency Management

Support agencies

Civil Defence Emergency Management Groups – local government | Earthquake Commission | GNS Science
Ministry of Business, Innovation and Employment | Ministry for the Environment New Zealand Police
Fire and Emergency New Zealand | New Zealand Defence Force | Ministry of Transport and transport agencies
Ministry of Social Development | Department of Internal Affairs | Ministry for Primary Industries | Ministry of Health

Example scenario

Magnitude 7.5 earthquake on the Wellington Fault

Main national security objective at risk

Ensuring public safety

Under this scenario the assets at risk would be

- public safety, health, and wellbeing
- habitation access
- employment
- social and cultural capital
- ability of government agencies to provide services
- all assets in the economy domain
- all assets in the built environment domain
- primary production (land and marine)

Future focus areas

- investigating methods to increase the uptake of lower damage solutions for the internal fit-out for buildings, such as seismically restrained lighting and water systems

For more information see

- civildefence.govt.nz
- getthru.govt.nz/disasters/earthquake
- geonet.org.nz
- eqc.govt.nz



4.1.2 Landslide

Context

Landslides occur in urban and rural areas. They are typically triggered by a strong earthquake or large amounts of rainfall, but some occur with no obvious trigger. Landslide occurrence largely depends on hillslope angle, but also on rock type, vegetation cover, and any modifications to the natural slope (e.g., cutting or filling). Landslide types include rock falls, slumps, and debris flows.

The expected increase in intensity and frequency of extreme rainfall associated with climate change means landslides are likely to become more common in the future. Together with increases in population, assets at risk, and land-use intensification, the costs associated with landslides will also increase.

The consequences of large landslides relate mostly to their movement of significant volumes of material that can damage buildings and infrastructure, such as roads. Landslides can cause injury and loss of life, especially when homes are affected.

The national cost associated with landslides is estimated to be at least \$250 million per year but may exceed \$300 million per year. Immovable structures on hillslopes and buried infrastructure are most exposed to landslides. Vulnerability to damage is determined in part by construction materials and design of the assets.

Likelihood and magnitude

Thousands of landslides occur each year in New Zealand. These range from massive earth movements that remove and deposit mass quantities of material to small surface landslides that can temporarily block roads, reduce productivity, or cause localised damage. Very large earthquakes or heavy rainfall can trigger thousands of landslides, some of which can be life threatening.

Consequences

Since record keeping began in New Zealand, landslides have caused over 360 fatalities. These have mostly been caused by landslides affecting property, vehicles with people trapped inside, or people being struck by rocks or debris in outdoor areas. Large landslides are particularly damaging to distributed infrastructure networks such as roads, rail, and pipelines. Damage can be so severe that services are disrupted for months; an example of this is the damage caused to State Highway 1, south of Picton, following the Kaikōura earthquake.

A landslide can cause further problems when it interacts with other dynamic natural features, such as rivers. When a landslide blocks a river, it creates a dam that causes a new lake to form. This can lead to additional risk of flooding and debris flowing downstream, as was seen following the Kaikōura earthquake.

Managing the risk

The risk of landslides in urban areas is primarily managed through engineering solutions, such as retaining walls. Many cities in New Zealand have infrastructure and houses in locations where slopes have been modified and made steeper, with low areas filled in and levelled. These cut slopes must be reinforced to ensure they can withstand heavy rainfall or other triggers, such as earthquakes. In some parts of New Zealand, special land-use planning requirements have been applied to slopes that are particularly susceptible to landslides. Where there is a risk to life, response plans include evacuation. Before an event, where slope monitoring suggests an imminent risk, evacuations could occur. Likewise, immediately following an event, rapid building and

geotechnical assessments will be made and people will be evacuated from high risk areas. Coordinating the restoration and rehabilitation of roads and other networks during response and recovery will be managed by infrastructure providers for smaller events or as part of wider management for large events.

Reduction

- Landslide hazard maps
- Land-use planning rules
- Building codes and standards
- Engineering solutions to stabilise road cuttings and provide drainage
- Planting vegetation

Readiness

- Monitoring slope stability on known landslide-prone areas
- National, regional and local civil defence emergency management plans

Response

- Activation of civil defence centres and emergency management operations centres to coordinate response efforts and welfare services and initiate recovery
- Rapid damage assessment of slope stability to assess at-risk buildings and prevent access where dangerous conditions exist
- Management of roads, including closures of at-risk sections, and facilitating alternative transport means

Recovery

- Repairing and rebuilding critical buildings and infrastructure
- Insurance cover and payments
- Building back better (e.g., engineering solutions to rehabilitate slopes)

Risk coordinating agency(s)

- Ministry of Civil Defence & Emergency Management

Support agencies

Civil Defence Emergency Management Groups – local government | Earthquake Commission | GNS Science
Ministry of Business, Innovation and Employment | Ministry for the Environment | New Zealand Police
Fire and Emergency New Zealand | New Zealand Defence Force | Ministry of Transport and transport agencies
Ministry of Social Development | Department of Internal Affairs | Ministry for Primary Industries | Ministry of Health

Example scenario

Many landslides triggered by an earthquake or severe weather event

Main national security objective at risk

Sustaining economic prosperity

Under this scenario the assets at risk would be

- public safety, health, and wellbeing
- habitation access
- employment
- the ability of the Government to provide services
- businesses' and individuals' physical assets
- all assets in the built environment domain
- primary production (land and marine)

Future focus areas

- investigating how landslide monitoring systems could be updated as technology improves
- improving the identification of landslide hazard factors in urban areas as a means of allowing for greater land-use planning
- ensuring that knowledge of landslide risk is well integrated into land-use planning decisions

For more information see

- civildefence.govt.nz
- getthru.govt.nz/disasters/landslide
- geonet.org.nz
- eqc.govt.nz

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4.1.3 Tsunami

Context

New Zealand sits at the convergent boundary of the Pacific and Australian Plates in the Pacific Ring of Fire. The meeting of these plates under New Zealand has resulted in significant subduction zone tsunami sources and many other faults capable of generating tsunami. This tectonic setting puts us at risk from local, regional, and distant source tsunami. Notably, rupture of subduction interface faults can cause large, damaging earthquakes and tsunami. Tsunami in New Zealand can also be triggered by landslides or volcanic eruptions.

Locations near the coast and inland from river mouths are most exposed to tsunami. On steep land, tsunami waves can reach elevations twice as high as coastal waves. On flatter land the waves can travel far inland because of the vast energy of tsunami waves. The shape of some parts of the coast can amplify waves and create resonance. Expected maximum wave heights are larger for locations near subduction zones, and thus are lower for much of the west coast of both main islands.

Existing building codes do not take tsunami into account, so all coastal infrastructure and buildings are vulnerable to tsunami damage. Overseas experience has shown that steel-reinforced masonry structures generally perform better than wooden structures when hit by tsunami waves. Few tsunami have caused widespread damage in the past, so it is a relatively unfamiliar hazard.

Likelihood and magnitude

The likelihood of a very large, destructive tsunami is lower than that of a smaller tsunami with more localised effects. Since 1840, New Zealand has experienced more than 10 tsunami with wave heights greater than four metres at the coast, but damage from these was localised. New Zealand's last damaging tsunami occurred in 2016 when an uninhabited house was

destroyed by tsunami waves in Little Pigeon Bay on Banks Peninsula following the Kaikōura earthquake.

Over 85 percent of tsunami are generated in the Pacific Ocean. More frequent, small tsunami are usually a threat only to beaches and marine areas. On average, damaging tsunami that originate across the Pacific Ocean happen decades apart. Very large earthquakes on nearby subduction zones are rare and estimated to occur thousands of years apart, but as the historical record is short, it is hard to determine when these sources last generated big tsunami.

Consequences

Tsunami have the capacity to violently inundate coastlines, causing fatalities, injuries, and damage to property, infrastructure, and the environment. They also have the potential to create one of the most widespread consequences of all natural hazards, particularly on public safety, health, and wellbeing. Even small tsunami can cause damaging currents and surges at the coast and in harbours or estuaries. All of New Zealand's coastline is at risk from tsunami.

The effects of tsunami on people and the economy can last for years. Hundreds to thousands of people are likely to be displaced from their homes after a very large, destructive tsunami and their jobs may be affected. Disruptions to critical lifeline utilities, schools, businesses, and other essential functions could also be expected. There could be widespread coastal pollution and disturbance of marine environments.

Managing the risk

Because very destructive tsunami are rare and coastal development is widespread, New Zealand accepts that some damage would occur, and instead the focus is on protecting people through evacuation. This is

done through end-to-end warning systems, scientific assessment, and mapping of inundation and evacuation zones. For local source tsunami, the focus is on improving public understanding of the correct actions to take after an earthquake: 'Long or Strong, Get Gone.'

Planning is done through the National Tsunami Risk Management Programme and the development of tsunami warning plans and guidelines. New Zealand participates in global and Pacific tsunami planning programmes.

Reduction

- Continued funding for scientific research to understand the risk and support land-use planning decisions
- End-to-end warning systems

Readiness

- Public education campaigns ('Long or Strong, Get Gone')
- National, regional and local civil defence emergency management plans
- Conducting preparatory drills and exercises
- Tsunami evacuation zone maps

Response

- Activation of civil defence centres and emergency management operations centres to coordinate response efforts and welfare services and initiate recover
- Rapid self-evacuation following natural warnings that accompany an earthquake
- National and local public alerting systems

Recovery

- Repairing and rebuilding critical buildings and infrastructure
- Insurance cover and payments
- Land hazard management policies

Risk coordinating agency(s)

- Ministry of Civil Defence & Emergency Management

Example scenario

Magnitude 9.0 earthquake and tsunami along the Hikurangi subduction zone

Main national security objective at risk

Ensuring public safety

Under this scenario the assets at risk would be

- public safety, health, and wellbeing
- habitation access
- employment
- social and cultural capital
- ability of government agencies to provide services
- all assets in the economy domain
- all assets in the built environment domain
- biodiversity and ecosystems

Future focus areas

- planning and undertaking national tsunami evacuation drills
- investigating further options for monitoring tsunami close to New Zealand

For more information see

- civildefence.govt.nz
- civildefence.govt.nz/get-tsunami-ready
- getthru.govt.nz/disasters/tsunami
- geonet.org.nz

Support agencies

Civil Defence Emergency Management Groups – local government | Earthquake Commission | GNS Science | Metservice
Ministry of Business, Innovation and Employment | Ministry for the Environment | New Zealand Police
Fire and Emergency New Zealand | New Zealand Defence Force | Ministry of Transport and transport agencies
Ministry of Social Development | Department of Internal Affairs | Ministry for Primary Industries | Ministry of Health

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4.1.4 Volcanic activity

Context

Since human settlement, the impact on the population from volcanic eruptions and unrest in New Zealand has been varied. In the past, volcanic eruptions have caused fatalities and injuries, property damage, and impacts on infrastructure, agriculture, and tourism. The North Island, in particular, is scattered with active and extinct volcanoes of all types and morphologies.

Volcanic hazards include ash fall, lava flows, superheated ash and gases, lahars (ash and mudflows), toxic gas emissions, and ground deformation. Prolonged volcanic unrest could result in social and economic anxiety, particularly when it occurs near urban areas. Volcanic activity can potentially trigger urban or rural fires (wildfires), landslides, and earthquakes. Air travel has been disrupted by eruptions of volcanic ash in the past.

Most of our large volcanoes are in sparsely populated locations, but much of the North Island could be exposed to volcanic ash fall. Auckland sits on a volcanic field of 50 known volcanic vents within a 360 km² area. The towns of Rotorua and Taupo have been established on potentially active caldera volcanoes. Apart from urban development near volcanoes or on volcanic fields, most public exposure to volcanic activity occurs through recreation in Tongariro and Egmont National Parks and when visiting White Island in the Bay of Plenty.

Likelihood and magnitude

New Zealand has several frequently erupting volcanoes, which have erupted varying quantities of ash, lava, and volcanic gases. These are mostly in sparsely populated locations, such as Tongariro National Park. In most cases the main impact on people would be dealing with

ash fall. However, during heightened activity there could be a risk to life for people on or near a volcanic vent. White Island is the most active volcano in New Zealand.

Other North Island volcanoes have a lower likelihood of eruption, but are closer to, or underneath, established cities. The Auckland volcanic field has had approximately 50 eruptions over the last 150,000 years. Caldera volcanoes, such as those in Taupo and Rotorua, can produce massive eruptions, although on average these happen thousands of years apart. They can also have more frequent unrest periods, and occasionally, minor eruptions.

Consequences

Volcanic eruptions have either directly or indirectly caused at least 338 fatalities in New Zealand over the last 150 years. This includes the Mount Tarawera eruption (153 fatalities) and Tangiwai train derailment when a lahar washed out the train bridge (151 fatalities).

The physical impacts of the 1995-1996 Mount Ruapehu eruptions involved relatively minor damage and disruption to communities. This damage was limited to buildings, machinery, vehicles, some infrastructure, farming, and the transport industry.

An eruption in the centre of Auckland could affect over 223,000 residents, 38,000 businesses and 204,000 employees through exposure to near (e.g., lava and ground deformation) and distant (mainly ash fall) eruption hazards.

Airborne volcanic ash plumes from eruptions outside New Zealand can also significantly disrupt international and domestic air travel. For instance, there were significant disruptions following the Puyehue-Cordón Caulle eruption in 2011.

Manging the risk

Volcanic risk is typically managed through monitoring and detection, warning systems, and emergency planning. As the most active volcanoes are largely in unpopulated areas, the approach is to keep people away from volcanic hazards when an eruption could occur.

There is a lot of research on the effects of ash fall on people, agriculture and infrastructure that draws on New Zealand and international experience. This research is used for planning and developing public messages. During a volcanic eruption, specialist science advice will be provided.

Reduction

- Continued funding for scientific research to understand volcanoes and support land-use planning decisions
- Volcanic hazard maps

Readiness

- Monitoring volcanic activity and communicating any changes (e.g., GeoNet volcanic alert level bulletins, airborne ash, and lahar monitoring)
- National, regional and local civil defence emergency management plans

Response

- Activation of civil defence centres and emergency management operations centres to coordinate response efforts and welfare services and initiate recovery
- Volcanic contingency and mass evacuation plans
- Real-time eruption monitoring
- National and local public alerting systems

Recovery

- Repairing and rebuilding critical buildings and infrastructure
- Insurance cover and payments
- Land hazard management policies

Risk coordinating agency(s)

- Ministry of Civil Defence & Emergency Management

Support agencies

Civil Defence Emergency Management Groups – local government | Earthquake Commission | GNS Science | Ministry of Business, Innovation and Employment | Ministry for the Environment | New Zealand Police | Fire and Emergency New Zealand | New Zealand Defence Force | Department of Conservation | Ministry of Transport and transport agencies | Ministry of Social Development | Department of Internal Affairs | Ministry for Primary Industries | Ministry of Health

Example scenario

Eruption in the Auckland volcanic field

Main national security objective at risk

Sustaining economic prosperity

Under this scenario the assets at risk would be

- public safety, health, and wellbeing
- habitation access
- employment
- ability of government agencies to provide services
- law and order compliance
- all assets in the economy domain
- all assets in the built environment domain
- all assets in the natural environment domain

Future focus areas

- understanding the social and economic impacts for exposed communities from long periods of volcanic unrest

For more information see

- civildefence.govt.nz
- getthru.govt.nz/disasters/volcano
- geonet.org.nz

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4.1.5 Coastal hazards

Context

Weather-related coastal hazards include coastal erosion, coastal storm inundation, and the infiltration of saltwater into coastal aquifers. While coasts are dynamic environments that can periodically advance and retreat, coastal erosion is the long-term retreat of the shoreline. Unconsolidated cliffs and exposed sand and gravel beaches are more vulnerable to erosion than consolidated rock cliffs or shore platforms in enclosed bays.

Coastal inundation occurs when storm tides and waves are higher than the land, overwhelming storm water drainage and river banks. Causes of coastal inundation include storm surges, waves and swells, and monthly variation in sea level combining with higher tides. The causes of inundation can also contribute to raised groundwater levels and brackish waters in coastal aquifers; these can then pose issues for water quality and surface drainage, especially during heavy rainfall.

Climate change has contributed to sea level rise around the New Zealand coastline over the last century (up to 22 centimetres since 1916). It is expected to increase the risks to existing infrastructure and buildings from coastal hazards as the area exposed to coastal hazards migrates inland.

Infrastructure in coastal areas, such as roads, rail, airports, jetties, and other buildings and property in coastal communities, are most exposed to coastal hazards. Large areas of low-lying coast, such as the Hauraki Plains, southern Hawke's Bay, South Canterbury, and Tasman Bay, are most exposed to storm inundation, with some of those areas also prone to erosion (including West Coast settlements and South Canterbury coasts).

Likelihood and magnitude

Coastal erosion and inundation can occur with high annual frequency as a result of the coincidence of low pressure storm events, onshore winds, swells, and high astronomical tides in low-lying unprotected areas.

The risk from coastal hazards will continue to grow as sea level rises over time. For example, a modest 30–40 centimetre sea level rise will change what is currently a 100-year inundation event into annual occurrence in many parts of New Zealand. Coastal erosion will also become more severe, especially where natural buffers such as sand dunes are limited or have been removed by development.

Consequences

The range of consequences caused by coastal hazards varies. For example, coastal flooding may cause significant disruption by closing roads, causing traffic delays, losing productivity, and creating general inconvenience. One of the largest impacts of coastal hazards is on the built environment. Residential, commercial, public, and community buildings (including marae and whareniui) and infrastructure located near the coast are all at risk from damage and disruption caused by coastal flooding and erosion.

In the long term, rising sea levels will raise water tables. This has the potential to create long-term impacts by damaging roads, pipes, cables, and building foundations, particularly if the groundwater becomes saline. Repeated inundation of saltwater onto low lying agricultural land may render it unsuitable for productive use.

Managing the risk

Risk reduction typically involves either modifying the hazard through hard or soft coastal defences or modifying the exposure and vulnerability of assets through land-use planning (e.g., zoning, set-back lines, or planning controls), groundwater management, or drainage and storm water upgrades. The management of the coastal environment is supported by the New Zealand Coastal Policy Statement and coastal hazards and climate change guidance, which provide national direction and practical advice to local government.

The lack of a formal storm-tide warning system is a notable gap in the “meteorological warning service” as mentioned in the Meteorological Services Act 1990. Although there is no formal storm-tide warning system, support agencies provide expert advice on forecasts and potential impacts.

Reduction

- Continued research on the consequences of coastal hazards and climate change
- Regional coastal and district planning
- Adaptive hazard strategies linking long-term community and asset management planning
- Maintaining and operating coastal defences, including dune restoration

Readiness

- Large wave and other adverse sea conditions warning and outlooks
- National, regional, and local civil defence emergency management plans
- Astronomical high tide predictions and weather forecasting of storm surges

Response

- Activation of civil defence centres and emergency management operations centres to coordinate response efforts and welfare services and initiate recovery
- Minimising any damage and disruptions to infrastructure

Recovery

- Repairing and rebuilding critical buildings and infrastructure
- Insurance cover and payments
- Build back better (e.g., enhancing coastal defences)

Risk coordinating agency(s)

- Ministry of Civil Defence & Emergency Management
- Ministry for the Environment
- Department of Conservation

Example scenario

A king tide coinciding with a very low pressure storm

Main national security objective at risk

Sustaining economic prosperity

Under this scenario the assets at risk would be

- public safety, health, and wellbeing
- habitation access
- employment
- economic growth
- the value of government, businesses', and individuals' physical assets
- all assets in the built environment domain
- primary production (land and marine)

Future focus areas

- further mapping and modelling of coastal hazards and inundation zones supported by high-resolution topographic data
- continued research into the effects of climate change
- adaptive planning to manage areas where the frequency and severity of coastal hazards will increase

For more information see

- civildefence.govt.nz
- mfe.govt.nz/publications/climate-change/preparing-coastal-change-fact-sheet-series
- doc.govt.nz/about-us/science-publications/conservation-publications/marine-and-coastal/new-zealand-coastal-policy-statement

Support agencies

Civil Defence Emergency Management Groups – local government | Earthquake Commission | GNS Science | MetService NIWA | Ministry of Business, Innovation and Employment | New Zealand Police | Fire and Emergency New Zealand Ministry of Transport and transport agencies | Ministry of Social Development | Department of Internal Affairs Ministry for Primary Industries | Ministry of Health



4.1.6 Drought and wildfire

Context

Periods of lower rainfall and higher temperatures have a direct effect on river levels, soil moisture, and levels of evapotranspiration, which can lead to dry conditions and drought.¹⁸

New Zealand is primarily vulnerable to drought due to the agricultural base of the economy. Lower rainfall levels have a direct effect on production. Intensification in the agriculture sector increases the economic risks that droughts impose, especially in the context of climate change. Some farmers in consistently dry areas of New Zealand have developed resilience by adapting their farming practices. As drought risk increases, such adaptation will need to be more widely practiced.

Prolonged dryness can turn vegetation into tinder. When combined with strong winds, this dryness can result in unexpected and uncontrollable wildfires in open, vegetated areas.

Likelihood and magnitude

Regional droughts can occur with a relatively high frequency (every year) and often coincide with El Niño weather patterns. One of the most extreme droughts in the last 70 years occurred in 2012–2013, affecting much of southern Northland, Auckland, Waikato, Bay of Plenty, the North Island Central Plateau, Gisborne, Hawke's Bay, and the West Coast of the South Island. Previous significant drought conditions also occurred during the major El Niños of 1972–1973 and 1997–1998.

Wildfire risk in New Zealand is considerably lower than in other countries, such as Australia and the United States, as the maritime climate is generally wetter and access to water sources is easier. Based on the record of historical wildfires and seasonal weather patterns, large wildfires (over 500 hectares) occur approximately

once every 10 to 15 years. Climate change is expected to increase the frequency of large wildfires in eastern regions throughout New Zealand.

Consequences

The environmental and physical impacts of droughts can vary considerably between communities, regions, and industries. Droughts develop over time and, depending on timing and pre-conditions, similar conditions can lead to a different range of social and economic impacts for each event.

Wildfires typically affect the forestry, wine, and agricultural industries. Of all forest in New Zealand, 22.5 percent is exotic plantation that is more flammable than native forest. Secondary landslide risks may develop where fire has burnt vegetation and erosion has destabilised slopes.

Development in the rural and urban fringe increases wildfire risk, as evidenced in the Christchurch Port Hills in February 2017.

Managing the risk

Managing the risk of drought involves strategies to increase water use efficiency, particularly in consistently dry areas. This includes water storage strategies, precision irrigation, planting of drought-resistant crops, and matching land use to water availability. In the wider New Zealand population, drought risk is managed by encouraging water conservation and developing plans that account for the foreseeable impacts of climate change.

Wildfires are managed through rural fire authorities, who undertake wildfire risk assessments and planning, including monitoring daily fire danger, declaring fire

¹⁸ The process by which water is transferred from the land to the atmosphere by evaporation from the soil and other surfaces and by transpiration from plants.

seasons, issuing fire permits, predicting fire behaviour, and implementing decisions about evacuation or asset protection. National fire incident management teams are available to respond to complex wildfire events. Pine planted in steep hill country poses significant challenges for managing wildfires.

Reduction

- Drought awareness and sustainable farming practices
- Farm feed planning
- Public education campaigns ('Fire Smart' and 'Fire Prevention')
- Fire bans and fire control measures
- Minimising the development of new properties and infrastructure in wildfire-prone areas

Readiness

- National and operational response plans
- Irrigation and other water use and storage options
- Destocking and farm feed management procedures
- Income protection for farmers
- Fire plans and the training of national fire incident management teams

Response

- Farm feed sharing
- Command and control arrangements and wildfire communication and messaging
- Rural fire fighting resources
- Fire break construction
- Investigations, prosecution, and activities focused on arson cases

Recovery

- Rural support trusts
- Fire debriefs and fire ground rehabilitation methods

Risk coordinating agency(s)

- Ministry for Primary Industries
- Fire and Emergency New Zealand

Support agencies

Ministry of Civil Defence & Emergency Management | Civil Defence Emergency Management Groups – local government
Department of Conservation | MetService | NIWA | New Zealand Police | New Zealand Defence Force | Inland Revenue
Ministry of Social Development | Ministry of Transport and transport agencies

Example scenario

Prolonged, severe drought over many years

Main national security objective at risk

Sustaining economic prosperity

Under this scenario the assets at risk would be

- standard of living
- employment
- economic growth
- product demand
- the value of government, businesses', and individuals' physical assets
- primary production (land and marine)
- public safety, health, and wellbeing

Future focus areas

- understanding how climate change impacts the risk of drought and wildfire damage to ecosystems and settlements, and the economic losses and risks to public health and safety that wildfire damage can create

For more information see

- mpi.govt.nz/protection-and-response/responding/adverse-events/dealing-with-drought-conditions
- fireandemergency.nz
- checkitsalright.nz



4.1.7 Severe weather and flooding

Context

Severe weather occurs when a low pressure weather system or thunderstorm moves across or very close to New Zealand. Common characteristics of severe weather can be strong winds, heavy or prolonged rainfall, hail, or snow. Most commonly, broad-scale severe weather results from the passage of a large depression (such as an ex-tropical cyclone) or its associated fronts. However, significant impacts can also occur because of localised, severe weather. Thunderstorms are an example of this and occur because of regional convection, which can cause potentially damaging lightning, hail, or tornadoes.

Though uncommon in New Zealand's temperate climate, severe weather can include extreme temperatures (e.g., a heatwave or extreme cold snap).

All parts of New Zealand are subject to the effects of severe weather, particularly strong winds, heavy rainfall, and the risk of flooding. Heavy snowfall is generally confined to the east and south of the South Island and those parts of the North Island at high altitude.

New Zealand has widespread flooding risks due to its geography and temperate climate. Flooding occurs when a river or lake receives more inflow than it can contain or when surface rainfall exceeds the drainage capacity of a storm water system. Flash flooding occurs where extreme rainfall or channel blockages produce a sudden rise or surge of water. Such events can create debris flows with greater impacts. Flooding can also be worsened by changes in topography after an earthquake (e.g., in the eastern suburbs of Christchurch and along the banks of the Avon River).

Likelihood and magnitude

Severe weather events are some of the most frequent natural hazards to occur in New Zealand. They cause millions of dollars of damage each year.¹⁹ On average, New Zealand experiences at least one ex-tropical cyclone passing within 550 kilometres of the country every year, which is a distance close enough to be damaging.

In any one year, across any of the 100 most populated New Zealand catchments, there is a 60 percent chance of at least two significant floods, and a 63 percent chance of at least one major flood. Many urban locations in New Zealand have experienced significant flooding and remain at risk (e.g., Queenstown, Whanganui, Palmerston North, Lower Hutt, and Dunedin).

Rainfall sufficiently heavy to cause multiple landslides occurs a few times a year. Less frequently observed is widespread wind damage, although localised wind damage can occur one or more times each year. Widespread, heavy snowstorms occur a few times a decade.

¹⁹ Insurance Council of New Zealand. The Cost of Natural Disasters in New Zealand. URL: www.icnz.org.nz/statistics-data/cost-of-disaster-events-in-new-zealand (accessed 13 April 2018). Department of Conservation. New Zealand Biodiversity Strategy and Action Plan. URL: www.doc.govt.nz/nature/biodiversity/nz-biodiversity-strategy-and-action-plan (accessed 13 April 2018).

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Consequences

Flooding results in the most frequent natural hazard-related emergencies and, cumulatively, the highest ongoing annual losses of all natural hazards. For the kind of floods that have been experienced in recent decades, infrastructure can be affected, causing disruption over days or weeks. Bridges and abutments, sub-stations, drinking water supply, and sewerage systems can be especially vulnerable.

There has been much investment in structural flood schemes over many years. However, this approach could lead to a growing risk from severe weather, in which intensified urban development behind flood barriers raises the possible consequences of rare and extreme flood events.

Improvements in weather forecasting and river level monitoring mean some prior consequences, such as levels of stock loss and human fatalities, have decreased over time for comparable events. In contrast, intensified land use and higher levels of economic activity and asset values increase the potential consequences of floods in relation to physical damage, lost output production, clean-up, and welfare.

Strong wind may cause damage to buildings and infrastructure and disruption to travel and public events. Severe snowstorms can cause significant losses to agriculture and disruption to network infrastructure, especially in rural areas.

Managing the risk

Risk management focuses on reducing the impact of severe weather and flooding. The risk to property and infrastructure is managed largely by building controls, land-use planning, and engineering structures. Flood management includes catchment management and structural engineering (e.g., stop banks and flood control schemes). Storm water and drainage systems also help mitigate the effects of flooding in urban areas. Land-use planning for all these hazards can include requirements for specific building designs (e.g., minimum floor levels), and reducing the exposure of people and property through the use of setback or avoidance areas and other zoning rules (e.g., identifying high wind zones for building requirements).

Reduction

- Hydro-meteorological observing and forecasting system
- Land-use planning rules
- Building codes
- Maintaining and operating flood and irrigation control schemes

Readiness

- Severe weather warnings and outlooks
- National, regional, and local civil defence emergency management plans
- River and lake level monitoring, supported by the hydro-meteorological observing and forecasting system

Response

- Activation of civil defence centres and emergency management operations centres to coordinate response efforts and welfare services and initiate recovery
- Flood control and hydro-scheme operators water level management procedures
- Supporting efforts to bolster flood defences (e.g., sandbagging)

Recovery

- Repairing and rebuilding critical buildings and infrastructure
- Insurance cover and payments
- Build back better (e.g., enhancing flood defences)

Risk coordinating agency

- Ministry of Civil Defence & Emergency Management

Example scenario

Major multi-regional flooding involving urban areas

Main national security objective at risk

Ensuring public safety

Under this scenario the assets at risk would be

- public safety, health, and wellbeing
- habitation access
- employment
- economic growth
- the value of government, businesses', and individuals' physical assets
- all assets in the built environment domain
- primary production (land and marine)

Future focus areas

- accurate mapping and modelling of flood zones
- continued research into the effects of climate change
- adaptive planning to manage areas where the frequency and severity of flooding will increase

For more information see

- metservice.com
- civildefence.govt.nz
- getthru.govt.nz/disasters/flood
- getthru.govt.nz/disasters/storms

Support agencies

Civil Defence Emergency Management Groups – local government | Earthquake Commission | MetService | NIWA
Ministry of Business, Innovation and Employment | Ministry for the Environment | New Zealand Police | Fire and Emergency New Zealand | New Zealand Defence Force | Ministry of Transport and transport agencies | Ministry of Social Development | Department of Internal Affairs | Ministry for Primary Industries | Ministry of Health

ENVIRONMENTAL PRESSURES



Biodiversity loss,
ecosystem disruption
and resource depletion

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4.2

Environmental pressures

Biodiversity and ecosystems are central to all human life. They provide the necessities of life, air, water, and food and insulate us from natural forces, such as flood and fire. Despite their importance, human activities continue to place a great deal of pressure on our biodiversity and ecosystems. Direct actions such as pollution, land-use intensification, or overfishing and indirect activities such as greenhouse gas emissions affect the resilience of natural systems. The impact is not always obvious or immediate—effects can occur gradually or manifest in different places than the activities that caused them. This can shift the costs of degradation to people or generations that did not create the problem. Effects may also be cumulative and can be exacerbated by other pressures such as severe weather events, pests, diseases, and hazardous substance spills.

Biodiversity loss, ecosystem disruption (especially soil loss), and resource depletion (especially overfishing of marine fisheries) are particularly important issues for cultural reasons and because of our reliance on land and marine-based primary industries. If New Zealand's environmental resources (including ecosystems and native biodiversity) are extensively degraded, they could take centuries to recover or be lost forever.

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4.2.1 Biodiversity loss, ecosystem disruption and resource depletion

Context

New Zealand's geographical isolation and its lack of native land-based mammals and predators has allowed the evolution of a globally distinct and vulnerable biodiversity.²⁰ Bird species have evolved to fill many of the positions normally occupied by land mammals, and many other native species are highly specialised or naturally found in only a few small, localised populations. Examples include the Cook Strait giant wētā, flightless moths in salt pans of Central Otago, and Bartlett's rātā in Northland. This makes them vulnerable to human activities, such as changes in land use and pollution.

Soil

Soil is fundamental for life on earth—it underpins food, stock feed, and fibre and fuel production. Healthy soils also support clean water, nutrient cycling, and carbon storage and host more than one quarter of the world's biodiversity. Soil is formed through the complex interactions of climate, underlying geological material, vegetation, animals, humans, topography, and time. It can take thousands of years to form, meaning that soil resources are largely non-renewable.

The quality and quantity of soils are affected by erosion and intensifying agriculture. Some erosion is natural, but human land-use practices have made it worse. Erosion models show that 44 percent (or 84 million tonnes) of the soil entering our rivers each year comes from pasture.²¹ Soil can also be lost if strong, dry winds occur in areas with bare soil from land-use practices such as cropping and cultivation.

Fresh water

Fresh water underpins almost every aspect of life. Our freshwater environments provide a range of ecosystem services that support agriculture, industry, tourism, and the health and wellbeing of people and communities. Freshwater ecosystems can provide food, help control flooding, and naturally filter contaminants from water.

Freshwater environments contain specialised fauna (birdlife, native fish, and invertebrates). This is the case particularly with groundwater, much of which is threatened by over-extraction, changes to water quality, and climate change. Modified water bodies and reduced water quality and quantity can have negative consequences for species richness and the ability of some ecosystems to function.

Marine

Marine fisheries are an important environmental resource. They provide food, employment, recreation, tourism, and export earnings for New Zealanders. Export earnings are around \$1.5 billion per year, with more than 20,000 people directly employed in commercial industries. In some areas and for some species, the recreational catches are similar to those from the commercial sector.

Benefits from fisheries can be negatively affected by overfishing, accidental catches of protected species, disturbance of seabed habitats and sedimentation, and other forms of pollution. The accidental introduction of invasive marine species has the ability to significantly affect fisheries in New Zealand. In addition, effects of climate change, such as ocean warming and acidification, will have profound impacts on marine life and fisheries.

Likelihood

Ecosystem loss, disruption, and depletion is already occurring throughout New Zealand and is well documented. Significant components of our native wildlife have been lost since human arrival—at least

20 Department of Conservation. *New Zealand Biodiversity Strategy and Action Plan*. URL: www.doc.govt.nz/nature/biodiversity/nz-biodiversity-strategy-and-action-plan (accessed 13 April 2018).

21 Ministry for the Environment and Stats NZ. *New Zealand's Environmental Reporting Series: Our land 2018*. URL: www.mfe.govt.nz/publications/environmental-reporting/our-land-2018 (accessed 15 May 2018).

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76 land species, including all moa species, are now extinct. Projections show that the rate of future loss is likely to be high and largely irreversible and that many species are at risk of disappearing. Examples of species at risk include kākāpō, kiwi, Teviot flathead galaxias (a critically threatened native freshwater fish species), and the New Zealand sea lion.

Ecosystems that were once widespread continue to decline, such as wetlands and sand dunes. They are threatened by pressures such as drainage, conversion to other land uses, and weed infestation. Water quality is being degraded by runoff and modification of water bodies. Our reliance on irrigation to support our economy has the greatest potential of all uses to cause altered flows downstream, affecting the biodiversity, health, and mauri (life force) of freshwater ecosystems and many of the services they provide.²²

Healthy, 'high class' soils that are the best for growing food make up only 5.5 percent of New Zealand's land area. These high class soils are being lost to urban development, erosion, and the breakup of large areas of rural land into smaller lots. For example, between 1990 and 2008, 29 percent of new urban areas were on high-class land. In 2012, it was estimated that 8 percent of the high class soils surrounding Auckland were lost at an accelerating rate to urban development. 192 million tonnes of eroded soil also enter New Zealand's rivers each year, resulting from severe weather events and historic forest clearance.²³ This accelerates soil loss and is a risk for downstream biodiversity (e.g., the Kaipara Harbor seagrass and the snapper and other finfish species it supports).²⁴

Accidental catches of protected species, disturbance of seabed habitat, sedimentation, and pollution are all ongoing. Additional pressures are also caused by recently introduced species that are spreading rapidly, including the Mediterranean fanworm, the sea squirt (*Styela clava*), and Asian paddle crabs. The Pacific seastar (*Asterias amurensis*), a highly invasive and opportunistic predator of a wide range of marine species, could become established in New Zealand through maritime trade routes.

Significant sedimentation, oil spills, and other hazardous substance spills all have the potential to impact native wildlife or marine fisheries.

Consequences

Biodiversity loss, ecosystem disruption, and resource depletion have serious economic and cultural consequences. A 2012 study found that biodiversity contributes \$57 billion to human wellbeing and around 27 percent of GDP through the domestic and international tourism industry.

New Zealand has a major economic dependence on soil and water. Around half our land area is used by primary industries, and productive processes were the basis of over \$35.4 billion in exports in 2016, or 50 percent of total export earnings. In terms of soil degradation, farming production on the land can be lost for years to decades, and this can affect everything from people's livelihoods to the quality and health of our lakes and rivers.

Every iwi and hapū has associations with particular landforms, freshwater bodies, and species that are reflected in their whakapapa (ancestral lineage), waiata (song), and whaikorero tuku iho (stories of the past). Damage to the environment has adverse effects on food, materials, customary practices, te reo, and the overall wellbeing of Māori.

Managing native populations when they are threatened can be costly and require a lot of resources to prevent extinction. Past experiences indicate that when significant reductions occur in a marine population or habitat, recovery can be slow or may not occur at all. Changes to the food chain as a result of species loss can also have impacts for other marine species; removal of a nursery habitat (e.g., for snapper) could impact other fish in that habitat.

22 Ministry for the Environment and Stats NZ. *New Zealand's Environmental Reporting Series: Our fresh water 2017*. URL: www.mfe.govt.nz/publications/environmental-reporting/our-fresh-water-2017 (accessed 15 May 2018).

23 Ministry for the Environment and Stats NZ. *New Zealand's Environmental Reporting Series: Environment Aotearoa 2015*. URL: www.mfe.govt.nz/node/21222 (accessed 15 May 2018).

24 Increased sediment in water (turbidity) reduces the amount of light that can reach marine species.

25 Department of Conservation. *New Zealand – a biodiversity hotspot*. URL: www.doc.govt.nz/nature/biodiversity/nz-biodiversity-strategy-and-action-plan/new-zealand-biodiversity-action-plan/new-zealand--a-biodiversity-hotspot/ (accessed 13 April 2018).

26 Ministry for the Environment and Stats NZ. *New Zealand's Environmental Reporting Series: Our land 2018*. URL: www.mfe.govt.nz/publications/environmental-reporting/our-land-2018 (accessed 15 May 2018).

Managing the risk

Processes are available to manage environmental pressures, but their effective use is challenging because of competing values and the chronic, cumulative nature of much environmental degradation. Nevertheless, central and local government, iwi, community groups, and landowners around the country are responding to issues of water and soil degradation and species loss. The implications of climate change for ecosystem health and how species and ecosystems will adapt is largely unknown. Initiatives will need to remain agile to respond to the effects of climate change.

Reduction

- Implementing, monitoring, and enforcing regulatory requirements (e.g., national environmental standards and policy statements)
- Sustainable farming practices
- Fisheries management that is responsive to emerging pressures

Readiness

- Environmental monitoring
- Land-use capability ratings
- Fish stock status assessments

Response

- Protection initiatives on private land, estuaries and coastlines
- Intensive species breeding programmes, relocation, and habitat restoration
- Pest and disease control
- Fish catch rules, area closures, and fishing method restrictions

Recovery

- Financial assistance schemes for a broad range of conservation projects
- Fishing ground closures
- Fish stock rebuilding plan

Risk coordinating agency(s)

- Department of Conservation
- Ministry for the Environment
- Ministry for Primary Industries/Fisheries New Zealand

Support agencies

Local government | Environmental Protection Agency | NIWA

Example scenario

Loss of the North Island west coast snapper fishery due to over-fishing and critical habitat loss

Main national security objective at risk

Protecting the natural environment

Under this scenario the assets at risk would be

- standard of living
- employment
- social and cultural capital
- economic growth
- product demand
- primary production (land and marine)
- biodiversity and ecosystems

Future focus areas

- developing a national policy statement on biodiversity to help formalise the protection of remaining biodiversity on private land, estuaries, coastlines and in fresh water
- improving collaboration between government agencies to reduce soil loss and implementing options for responding to entire ecosystem failures
- extending routine monitoring of marine biodiversity to a greater variety of study sites and fish species
- extending the threat classification system to all marine fish
- reviewing the biodiversity strategy and completing a threatened species strategy to guide protection and management of our indigenous resources

For more information see

- fs.fish.govt.nz
- marinebiosecurity.org.nz
- www.doc.govt.nz
- www.mfe.govt.nz

BIOLOGICAL HAZARDS



Communicable
diseases



Food safety



Plant and animal pests
and diseases

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4.3

Biological hazards

Biological hazards are mainly associated with impacts on human or animal health and safety native flora, or economically important agricultural crops. The most important biological hazards in New Zealand are infectious diseases affecting humans, plants, or animals.

Communicable diseases are infectious diseases that are transmitted to people and between people, including through a vector (such as a mosquito) or from an animal (zoonotic diseases). Some communicable diseases have the potential to cause pandemics.

Biological hazards also include food safety and plant and animal pests and diseases, which can cause biosecurity concerns. These can occur on land, in waterways, or in the marine environment. They can be restricted to discrete locations or regions of New Zealand or occur throughout the country if the pest or disease spreads easily.

Food safety is fundamental to consumers, producers, and regulators of food and is important for overseas market access.

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4.3.1 Communicable diseases

Context

Communicable diseases affecting humans can be endemic to a region or country or can be imported from another country. An outbreak of a communicable disease occurs when the number of cases goes over what would normally be expected in a community. When outbreaks are widespread they are called epidemics. When an epidemic is worldwide or over a very wide area crossing international boundaries, it is known as a pandemic. Seasonal increases of a disease, like influenza, are not considered outbreaks, epidemics, or pandemics, as they are expected each year.

There are small outbreaks of vaccine-preventable diseases each year in New Zealand, such as measles. They typically occur after the disease is introduced from travel to countries where these diseases are widespread.

New Zealand currently has no mosquito species that efficiently transmit mosquito-borne diseases, such as dengue fever or Zika virus. However, the effects of climate change may increase our risk if it makes our environment more suitable for such vectors. For example, temperature and water availability determine the abundance and distribution of mosquitoes, so the establishment of exotic mosquitoes is a greater risk in Auckland and Northland due to their generally warmer climate.

An influenza pandemic is the most likely event to cause a large-scale, severe health risk in New Zealand. Influenza pandemics are characterised by the global spread of a new type of flu virus to which the population has little or no immunity. They may cause unusually high illness or mortality rates.

Determining the epidemiology and actual risk to New Zealand of other emerging and re-emerging infectious diseases, such as those caused by severe

acute respiratory syndrome (SARS), Zika virus, and Ebola, has proven challenging. The 2002 outbreak of SARS in China showed how quickly an emerging disease can spread between countries and the impact it can have on world economies.

The continuing emergence of antimicrobial resistance is an increasingly serious communicable disease risk. New Zealand has already experienced highly resistant communicable microorganisms, and this is likely to occur more frequently, with the potential to become a national health risk.

Likelihood

Seasonal influenza occurs every year in New Zealand, along with imported cases of vaccine-preventable diseases (such as measles), non-vaccine preventable diseases, and mosquito-borne diseases (such as dengue fever).

As a result of climate change, New Zealand may also become more receptive to populations of major disease vectors, such as mosquitoes. If these vectors become established, there is a risk of local transmission of mosquito-borne diseases, such as dengue fever and Zika virus.

Influenza pandemics are naturally occurring events that could happen at any time: New Zealand has experienced four significant influenza pandemics in the last 100 years (1918, 1957, 1968, and 2009). The World Health Organization advises that the risk of a pandemic has generally increased due to the growing population of the world, the closer proximity of humans and animals in rural and urban settings, and the increased speed and frequency of international travel.²⁷

27 World Health Organization. *Influenza update* – 312. URL: www.who.int/influenza/surveillance_monitoring/updates/latest_update_GIP_surveillance/en/ (accessed 13 April 2018).



New Zealand was not directly affected by cases of SARS and Ebola virus, but emerging and re-emerging diseases are likely to continue presenting globally, and given increases in international travel, they are more likely to directly affect New Zealand at some time.

Consequences

The consequences depend on how infectious a communicable disease is, or how severe it is (in terms of both short and long term effects), including

- if people are susceptible;
- how long it takes to show symptoms after being infected;
- the mode of transmission (through the air, blood, vectors, or other); and
- if people can be infectious before symptoms present.

The effectiveness of preventive measures (such as immunisation) and the availability of any treatment also play a role in the consequences of different diseases.

Based on international experience, if exotic mosquitoes of concern establish themselves in New Zealand, outbreaks of mosquito-borne disease can be expected in exposed areas.

Managing the risk

It can be difficult to predict when communicable disease events could significantly affect New Zealand and who would be most vulnerable.

International bodies such as the World Health Organization and mechanisms such as the International Health Regulations (2005) play a crucial role in the early identification and risk assessment of communicable disease risks. Effective epidemiological surveillance within New Zealand enables the early detection of communicable diseases and appropriate responses to cases, outbreaks, and larger events.

For vaccine-preventable diseases, vaccination is the most effective mitigation. An individual is susceptible unless they have been immunised or previously had a specific disease and retained immunity. High levels of immunisation in a population provide 'herd immunity' and prevent a disease from spreading widely. It also reduces the likelihood that someone who cannot be immunised contracts the disease (e.g., due to a reduced immune system during cancer treatment).

Biosecurity and border measures at international points of entry, including inspections of risk goods and mosquito surveillance, are designed to exclude, detect, and enable a rapid response to mosquitoes and other vectors that may transmit diseases in New Zealand.

National exercise programmes, health plans, and national pandemic reserve supplies (including personal protective equipment, vaccination supplies, and antibiotics for secondary infections) all support these activities.

Reduction

- Surveillance and intelligence for early detection and assessment of communicable diseases and exotic mosquitoes
- Implementation of a national immunisation programme
- Measures to remove any mosquitoes of concern (such as aircraft disinsection and fumigating imported goods)

Readiness

- Business continuity plans
- National pandemic reserve supplies, including personal protective equipment, vaccination supplies, antibiotics for secondary infections, and antivirals
- Procedures for identification and response to exotic mosquitoes

Response

- Local and national response plans, including public health messaging, clinical care, and management
- Mosquito control and eradication procedures

Recovery

- Public health advice on how to prevent transmission of disease (e.g., coughing and sneezing etiquette, handwashing, staying at home if sick, and how to prevent mosquito bites)
- National immunisation programme
- Environmental management, such as advice on minimising mosquito breeding sites

Risk coordinating agency

- Ministry of Health

Support agencies

District Health Boards | Ministry of Civil Defence & Emergency Management | Civil Defence Emergency Management Groups - local government | New Zealand Police | Fire and Emergency New Zealand | New Zealand Defence Force

Example scenario

Influenza pandemic affecting 40 percent of the New Zealand population

Main national security objective at risk

Ensuring public safety

Under this scenario the assets at risk would be

- all assets in the social indicators domain
- ability of government agencies to provide services
- economic growth
- currency and price stability
- financial system stability

Future focus areas

- increasing household preparedness so that individuals are able to care for their family and whānau if health services are overwhelmed
- supporting large and small businesses planning for an influenza pandemic as part of their business continuity
- understanding how to balance the benefit of public health interventions, such as restricting public transport, with the impact on businesses
- better communicating on rapidly changing science as more is known about emerging and re-emerging diseases

For more information see

- health.govt.nz/publication/national-health-emergency-plan-framework-health-and-disability-sector
- health.govt.nz/publication/new-zealand-influenza-pandemic-plan-framework-action
- health.govt.nz/your-health/healthy-living/environmental-health/pests-and-insects/mosquitoes



4.3.2 Food safety

Context

Food safety is fundamental to consumers, producers, and regulators of food and is a prerequisite for overseas market access. There are around 45,000 regulated businesses in New Zealand's food sector operating 85,000 food premises. Approximately 580 businesses export products to more than 200 markets around the world. New Zealand also imports one-fifth of its food (by value) to meet diverse and sophisticated demand from domestic consumers. Food supply chains ('from farm to fork') are increasingly long and complex, often involving multiple processing steps.

Microbiological (pathogens, viruses, and parasites), chemical (pesticides and food additives), and physical (plastic, metal, and glass) contamination can be introduced or increased through unintentional action at any stage of the food supply chain. Serious contamination on a large scale would become a food safety incident and is a national risk.

Likelihood

Food safety incidents are always occurring. The majority of these are minor and the food regulatory system is designed to manage minor contamination without Government intervention.

New Zealand maintains a national surveillance database of foodborne gastroenteritis and other infectious diseases. Campylobacteriosis is the most visible and recognised source of foodborne illness in New Zealand, although a concerted effort to implement risk management programmes for poultry processing is helping to reduce this.

Major incidents occur rarely but can have significant national impacts, either because of the number of people affected or the risk to New Zealand's reputation for exporting high-quality food products. Food safety incidents can include 'scares' such as the 2013 whey protein concentrate (WPC80) contamination incident, which involved suspected (but ultimately unfounded) contamination of milk powder with fatal *Clostridium botulinum* toxin. Lessons learned from this incident, particularly about food safety culture, manufacturing practices, laboratory testing, and crisis planning should help reduce the likelihood of similar events in the future.

Consequences

Major and unintentional food safety incidents can result in death or serious illness, particularly in infants or young children. They can cause a widespread or nationwide outbreak of foodborne illness.

New Zealand's economy depends on exporting primary production commodities and associated products. Our reputation as a provider of safe food enables preferential export conditions and premium rates for food products. An incident that presents a low food safety risk may affect the perception of the food regulatory system and have significant trade impacts. An incident that causes significant trade impacts may eventually be shown to have never presented any food safety risk, but our international reputation may already have been damaged, with flow-on effects to employment and agriculture or aquaculture industries.

Managing the risk

The food sector continues to change rapidly, including changing consumer preferences and market access requirements, increasing volumes and diversity of traded food, and a greater public demand for safe and healthy food.

Government agencies implement and enforce appropriate food safety measures that assist with growing consumer interest in nutrition and food safety, the growth in international food trade, and changes to sustainable agricultural practices, such as new processing technologies. To support our well-regarded food safety regime, other measures are used across the 4 Rs, including food safety verification and compliance activities and the use of recalls for suspected contamination or products that do not meet standards.

Reduction

- Food safety and overseas market access standards (including what can be added to food and labelling)
- Verification and compliance activities

Readiness

- Procedures for providing specialised advice on contamination responses
- Procedures for food recalls
- Enforcing overseas market access rules

Response

- Investigation, identification and destruction of contaminated food procedures
- Public health messaging

Recovery

- Public advice (e.g., published lists of recalled foods)

Risk coordinating agency

- Ministry for Primary Industries/New Zealand Food Safety

Support agencies

Ministry of Foreign Affairs and Trade | New Zealand Customs Service | Ministry of Health | District Health Boards
Local government | New Zealand Police | Ministry of Civil Defence & Emergency Management

Example scenario

Food safety incident resulting in death or serious illness (in a domestic or export market)

Main national security objective at risk

Ensuring public safety

Under this scenario the assets at risk would be

- public safety, health, and wellbeing
- human life
- employment
- effective international partnerships
- international reputation
- economic growth
- product demand
- primary production (land and marine)

Future focus areas

- working to continually update the requirements and standards for all people and businesses trading in food products, including the more effective traceability of food products (e.g., being able to find out where particular food products were grown or manufactured)

For more information see

- mpi.govt.nz/food-safety



4.3.3 Plant and animal pests and diseases

Context

Plant and animal pests and diseases can create biosecurity risks that can have unwanted impacts on the economy, natural environment, or social and cultural values. Biosecurity risks are growing as volumes of traded goods from overseas and tourism increase. Each year 54,000 tonnes of cargo consignments are inspected, 50 million items of mail are cleared, and around 5.5 million passengers are checked. Each of these areas (cargo, mail, and passengers) have the potential to allow plant and animal pests and diseases into New Zealand. Over 13,500 reports of suspected biosecurity incursions were received in 2014 and 2015, of which 23 required a biosecurity response.

New Zealand is currently free from many internationally significant pests and diseases (e.g., foot and mouth disease). Our export trade benefits significantly because trading partners recognise that New Zealand's agriculture and aquaculture products pose no risk to their own biosecurity status.

Likelihood

Around five to ten biosecurity incursions of varying size and scope occur every year in New Zealand. These have included a reoccurring incursion of Australian subterranean termites since 2009, the Eucalyptus leaf beetle in 2012, and the exotic fruit fly in 2015. There are usually two to four significant biosecurity incursions during a 10-year period.

Climate change is likely to increase the impacts of some previously established pests from warmer climates by providing additional habitat and changing the distribution of organisms on a global scale. It also makes it easier for new pests to establish themselves in New Zealand and can alter the biosecurity risk for trading partners.



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Consequences

The consequences of a biosecurity incursion can vary depending on the nature of the pest or disease, what organism or environment it affects, and its ability to spread within New Zealand. For example, Psa vine wilt, which affected kiwifruit production in 2014, cost the economy approximately \$0.9 billion.

A major biosecurity incursion could result in a severe loss of productivity in agriculture or aquaculture; in July 2017, the bacterial infection *Mycoplasma bovis* was found in cattle in the Oamaru area of the South Island.

Mycoplasma bovis is a bacterium that causes illness in cattle, including udder infections (mastitis), abortion, pneumonia, and arthritis. It does not infect humans and presents no food safety risk.

The disease is found worldwide and is not considered a disease of relevance to trade by the World Animal Health Organisation. However, it has the potential to reduce industry productivity through increased animal health costs and lower production of infected animals.

The Government has agreed with dairy and beef sector partners to attempt to eradicate the disease from New Zealand. The Ministry for Primary Industries (MPI), animal production industry bodies, veterinarians, and farmers are working together to achieve this. The total response costs are expected to be \$870 million over 10 years.

Supporting farmer welfare during this period is also a priority. MPI is working with industry and the Rural Support Trust to ensure help and support are available.

A pest or disease could also cause illness or death of native plant or animal species, ecosystem change, or human health impacts (e.g., the transmission of Zika virus from mosquitoes).

New Zealand could also lose its status as being free from a pest or disease regulated by our trading partners, which would result in suspension of trade or application of measures that could damage exports.

Managing the risk

There are many agencies, organisations, businesses, and individuals that make up the biosecurity system in New Zealand. The Biosecurity 2025 Direction Statement provides a shared purpose and direction for the collective efforts of all participants in the biosecurity system.

The biosecurity system protects New Zealand from imported pests and diseases by seeking to

- move biosecurity risks offshore through the use of import standards and offshore auditing;
- mitigate risks at the border through the checking of goods, craft, and people entering New Zealand;
- maintain vigilance inside New Zealand through surveillance programmes; and
- identify and respond to pest incursions when they do occur.

Partnerships with the food and primary sector, a range of government agencies, regional councils, and the public have also been established.

Reduction

- Prevention activities before and at the border
- International agreements and collaboration to manage pests and diseases before they reach New Zealand
- Overseas product certification standards
- Research, education, and social marketing

Readiness

- Building biosecurity system capacity and capability
- Procedures for providing specialised advice on biosecurity responses
- Surveillance to detect organisms and changes in established pest populations
- Maintenance of quarantine facilities

Response

- National and operational response plans and exercises
- Control and eradication procedures
- National animal identification and tracing

Recovery

- Financial assistance schemes, such as tax relief
- Rural support trusts
- Plans for restoring overseas market access

Risk coordinating agency

- Ministry for Primary Industries/Biosecurity New Zealand

Support agencies

Ministry of Foreign Affairs and Trade | New Zealand Customs Service | Local government | New Zealand Police New Zealand Defence Force | Ministry of Civil Defence & Emergency Management

Example scenario

Domestic biosecurity incursion affecting agriculture or aquaculture

Main national security objective at risk

Protecting the natural environment

Under this scenario the assets at risk would be

- international reputation
- economic growth
- product demand
- primary production (land and marine)
- biodiversity and ecosystems

Future focus areas

- engaging with the public on what to do when travelling or bringing goods into New Zealand to prevent the creation of new pathways for pests and diseases
- spreading awareness of specific pests and diseases so that more people are able to recognise potential incursions if they occur

For more information see

- mpi.govt.nz
- mpi.govt.nz/protection-and-response/biosecurity/biosecurity-2025

TECHNOLOGICAL HAZARDS



Industrial accidents



Infrastructure failure

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4.4

Technological hazards

Technological hazards are best described as hazards created by humans, because they are usually caused directly or indirectly by human action or inaction. They include industrial accidents and infrastructure failure. Technological hazards can also occur as a result of natural processes (e.g., fires or explosions as a result of an earthquake or infrastructure failure due to a geomagnetic storm) or from security-related threats (e.g., electricity outages from major cyber incidents).

Industrial accidents involve the uncontrolled release of a hazardous substance or major transport incidents. Hazardous substances also include major oil spills, which can impact the environment when they are released and may result in social, economic, and reputational problems. Major transport incidents can result from the malfunction, breakdown, collision, or capsizing of vehicles, ships, or aircraft with potential loss of human life.

Infrastructure is critical to our economic performance and quality of life. The failure of physical assets such as roads, ports, gas pipelines, and communications networks (including satellite outages) can vary depending on whether there is a complete or partial loss of the physical asset, the duration of the loss, or the number of individuals or organisations affected.

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4.4.1 Industrial accidents

Context

Many industrial accidents involve the leak of a flammable or explosive, corrosive, or toxic material (hazardous substance) at a single location. The unplanned or uncontrolled release of hazardous substances can have an adverse effect on people, property, and the natural environment. There can also be a significant delay between exposure and future.

Generally, a combination of ineffective management procedures and decisions, staffing oversights, communications problems, inadequate hazard assessments, complacency, or a failure to adequately audit and maintain safety-critical plant and equipment are the underlying causes of a major industrial accident. Operating hazardous substance plant and equipment beyond its original design life also increases the risk of a major industrial accident.

It is estimated there are around 200 major hazard facilities in New Zealand that contain significant amounts of hazardous substances. There are also thousands of smaller locations that keep hazardous substances in lesser quantities, including many workplaces.

A natural hazard event (e.g., earthquake) is another trigger for a large-scale, simultaneous release of a hazardous substance, which can result in fires from flammable or explosive chemical or gas releases. These can lead to large industrial fires or large fires in the built environment. Natural hazard events (e.g., earthquake, tsunami, and volcanic eruption) are a credible trigger for a major urban fire and could cause the destruction of multiple buildings or structures.

A major oil spill is classified as an industrial accident. This involves the release of a large amount of liquid hydrocarbon into the environment. Major oil spills are typically the result of a shipping or transport accident.

Major transport incidents also have the potential to create an unplanned or uncontrolled hazardous substance release and can result in multiple deaths. A transport incident with more than 10 fatalities exceeds the usual events attended by emergency services in New Zealand. Major transport incidents generally refer to vehicles, ships, or aircraft colliding with one another in the air, at sea, or on land. However, incidents may also include non-collision such as exploding craft, derailment, sinking, or infrastructure failure (e.g., bridge collapse).



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Likelihood

Small unplanned or uncontrolled releases of hazardous substances, ranging from minor household incidents to low-level industrial accidents (including oil spills) occur every year in New Zealand. The same can be said for fires and transport accidents, which see one-off buildings or structures destroyed, and fatal crashes on our roads.

Data on major hazardous substance-related industrial accidents dates back to 1963 and has recorded 22 accidents, or one every two to three years.

The possibility of a natural hazard event triggering a large-scale, simultaneous release of a hazardous substance, resulting in a large fire or explosion, is much less likely.

New Zealand has experienced major transport incidents in the past. The worst air and sea accidents after 1960 include the Wahine ferry grounding in 1968 (53 fatalities) and the Mount Erebus air crash in 1979 (257 fatalities).

Consequences

The consequences increase proportionately to the amount of hazardous substance spilled and the duration of the substance's exposure to people and assets. Significant industrial accidents have also either involved an explosion or have had corrosive or toxic characteristics associated with them.

In general, major air or sea transport incidents are more likely to result in greater consequences than land transport incidents. Road transport incidents are unlikely to result in more than 10 fatalities at any one time, and other costs such as disruptions to services are relatively low. Rail incidents may result in significant fatalities or damage, but comparatively fewer people and goods travel on rail in New Zealand

than they do overseas. Marine shipping incidents, such as the grounding of the container ship *Rena* in 2011, can have significant environmental and economic consequences, mainly from spillage of hazardous substances and salvage operations that cost hundreds of millions of dollars.

Managing the risk

Government agencies have well-developed procedures for responding to hazardous substance incidents on land, but it is more difficult to detect and monitor incidents at sea. Procedures are supplemented by private sector capability to respond to incidents involving hazardous substances. The suitability of emergency response plans for major hazardous substance facilities, as well as pre-incident planning processes, are checked at a national level by several agencies.

Regulations have also been put in place under work health and safety legislation (administered by WorkSafe) to prevent industrial accidents. For example, facilities that produce, use, or store large quantities of hazardous substances are subject to major hazard facility regulations, which require operators to prepare and implement a safety case to manage major industrial accidents. Similar regulations apply to onshore and offshore petroleum operations, such as exploration and production operations (e.g., wells, drilling rigs, and production installations), and underground mining operations.

Transport in New Zealand is highly controlled with legislation, regulations, and rules covering all modes of commercial operation; operators are held to greater account for safety management. Operators are also required to prepare and practice security and response plans. Mass rescue and fatality plans are available.

Reduction

- Compliance and enforcement activities
- Environmental and work health and safety regulations
- Hazardous and dangerous goods checks of airline passengers

Readiness

- Hazardous substances and major hazard facility locations database
- Fire and explosion awareness and intervention programmes

Response

- National and operational response plans
- Containment procedures and maintenance of specialised appliances (e.g., fire trucks and boats)
- Accident investigation and casualty management procedures

Recovery

- Public advice clean-up procedures in accordance with environmental and work health and safety regulations
- Insurance cover and payments

Risk coordinating agency(s)

- Fire and Emergency New Zealand
- Maritime New Zealand
- Ministry of Transport and transport agencies

Support agencies

Ministry of Civil Defence & Emergency Management | Civil Defence Emergency Management Groups – Local government
Ministry of Business, Innovation and Employment | WorkSafe | Civil Aviation Authority | New Zealand Transport Agency
KiwiRail | New Zealand Police | New Zealand Defence Force | Environmental Protection Agency

Example scenario

Large, hazardous substance release at a major hazard facility with an associated fire or explosion

Main national security objective at risk

Ensuring public safety

Under this scenario the assets at risk would be

- public safety, health, and wellbeing
- habitation access
- employment
- international reputation
- the value of government, businesses and individuals' physical assets
- buildings and residential property
- commercial and industrial property
- primary production (land and marine)
- biodiversity and ecosystems

Future focus areas

- improving monitoring and remediation of marine industrial accidents
- understanding implications of emerging contaminants that can accumulate in the environment from a slow-release accident rather than an acute accident

For more information see

- [worksafe.govt.nz](https://www.worksafe.govt.nz)
- [nzta.govt.nz/traffic-and-travel-information](https://www.nzta.govt.nz/traffic-and-travel-information)
- [saferjourneys.govt.nz](https://www.saferjourneys.govt.nz)



4.4.2 Infrastructure failure

Context

Infrastructure involves the provision of five essential services:

1	Water 'three waters' (drinking, waste, and storm water), pipelines, dams, and levees
2	Electricity power generation and distribution
3	Transportation roads, rail, airports, and marine ports
4	Information and communications technology telecommunications, fibre optic cables, internet, the Global Positioning System, and international submarine cables
5	Fuel petrol, diesel, aviation fuel, natural gas, and liquid petroleum gas

New Zealand's geographic shape, rugged topography, and low rural population density often results in infrastructure networks spread across the country with low levels of redundancy. This makes communities more vulnerable to a failure in the network. Because infrastructure networks also tend to be interconnected, a failure in one part can flow across to others. These connections create the potential for impacts to increase in an unpredictable way.

New Zealand has ageing infrastructure networks that depend on constrained funding for renewal and maintenance. Without investment in maintenance, renewals, or upgrades, the failure of existing infrastructure is likely to become more frequent and

costly. Infrastructure failure may result from either the failure of a physical asset or facility or from a natural hazard event. The resilience of infrastructure will also be increasingly tested by the effects of climate change. The long lifetime of infrastructure means that climate change adaptation must be part of all infrastructure decisions.

Another component of infrastructure is the Global Navigation Satellite System, which has become a part of New Zealand's everyday activities. This encompasses services such as the Global Positioning System and other space-based satellite navigation. It provides the positioning, navigation, and the timing of data exchange between users worldwide and is now used extensively in many of New Zealand's critical infrastructure sectors (e.g., transport and information and communications technology networks). It is also a key component in many of the modern conveniences that people use daily, including banking and financial services, aviation, maritime navigation and surveillance, surveying, vehicle navigation, and other recreational activities.

Disruptions to the Global Navigation Satellite System can come from a variety of unintentional sources, such as space weather events (e.g., solar flares or geomagnetic storms) or intentional acts. Space weather events can further disrupt infrastructure through impacts on the electrical power grid, compounding other communications-related failures.

Submarine cable connectivity provides most of New Zealand's data connectivity with the rest of the world. Disruption can occur to cables on the seabed and within the countries on the other end (e.g., Australia and the United States).

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Likelihood

Local infrastructure failures in New Zealand occur every year. They are generally dealt with by network owners under business continuity planning and result in minor outages.

Globally, several large infrastructure failures have occurred over the past decade, including the 2011 Fukushima Daiichi nuclear reactor failure in Japan, the 2005 levee breaches in New Orleans, and the 2003 power outage affecting the northeast United States and Canada. The Kaikōura earthquake came close to causing the critical failure of multiple, essential services at the same scale as these events, with impacts on water, electricity, communication, and transportation networks (including the closure of part of State Highway 1 for over a year).

Consequences

The consequences of an infrastructure failure can vary depending on whether there is a complete or partial loss of the physical asset or network (with or without replacement required), the duration of the outage, and the number of individuals or organisations affected. A widespread and long-term failure can have substantial economic, social, or environmental effects and may require a coordinated regional or national response for welfare and logistical issues. For example, drinking water is one of the basic necessities of life, and the failure of a network for more than a few hours could have serious public health effects.

Sudden outages do occur, while deteriorating conditions or quality can become a drag on the economy. If a large infrastructure provider were to face failure it could mean a significant decrease in net worth (with potential government assistance required for a national infrastructure provider); firms would be likely to suffer loss of production or market access constraints.

Managing the risk

The Thirty Year New Zealand Infrastructure Plan 2015 is a guidance document for national infrastructure management. Its desired outcome is better use of existing assets and better allocation of new investment. The plan takes a resilience approach with the vision of shifting beyond a narrow focus on events or infrastructure failure and thinking more about interdependencies, levels of service, and community preparedness.

While infrastructure failure within a network is relatively well understood, further work is required to understand how failure in one infrastructure network may affect others. Plans are in place to manage restrictions following potential large scale disruptions, including prioritisation and rationing. Infrastructure upgrades and routine maintenance contribute to increased resilience. For example, local government is looking at options for improving the three waters, including service delivery, funding, and regulatory arrangements to increase infrastructure resilience and water security.

Reduction

- Essential infrastructure service standards and routine maintenance schedules
- Vulnerability and interdependency studies (e.g., projects undertaken by engineering Lifelines Groups)
- Infrastructure upgrade projects

Readiness

- Establishing stockpiles and caches of key supplies and equipment
- National, regional, and local civil defence emergency management plans
- Infrastructure failure event simulations and regular testing through exercises

Response

- Activation of civil defence centres and emergency management operations centres to coordinate response efforts and welfare services and initiate recovery
- Water, electricity and fuel supply rationing
- Undertaking emergency repairs and activating backup systems

Recovery

- Repairing and rebuilding critical infrastructure
- Building back better (e.g., physical hardening of standing infrastructure)

Risk coordinating agency(s)

- Ministry of Civil Defence & Emergency Management
- Ministry of Business, Innovation and Employment
- Fire and Emergency New Zealand
- Ministry of Transport and transport agencies

Support agencies

Department of Internal Affairs | Civil Defence Emergency Management Groups – local government | New Zealand Police
New Zealand Defence Force

Example scenario

Failure of the national electricity grid (unspecified cause)

Main national security objective at risk

Sustaining economic prosperity

Under this scenario the assets at risk would be

- public safety, health, and wellbeing
- habitation access
- employment
- international reputation
- economic growth
- the value of government, businesses', and individuals' physical assets
- critical lifeline utilities

Future focus areas

- continued research to understand interdependencies between infrastructure networks
- ensuring targeted upgrades and investment aimed at reducing under or overinvestment and deterioration and ageing of networks
- understanding what level of infrastructure redundancy is necessary and cost effective

For more information see

- civildefence.govt.nz
- happens.nz
- infrastructure.govt.nz
- civildefence.govt.nz/cdem-sector/lifeline-utilities/lifelines-groups

MAJOR THREATS



Armed conflict



Corruption



Espionage and foreign interference



Major cyber incidents



Maritime security



Terrorism



Transnational organised crime,
smuggling and irregular migration

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4.5

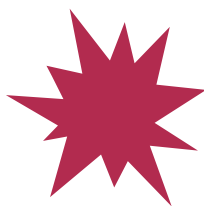
Malicious threats

Malicious threats are derived from those who would do us harm deliberately or in the course of promoting their own interests, as compared with hazards from natural sources. While they may have effects within New Zealand, the threats of most concern are largely driven by factors outside New Zealand. The free flow of ideas, goods, services, and information in our open society can increase exposure and vulnerability to malicious threats. For instance, increasing cross-border flows of goods and people creates challenges for detecting and responding to smuggling attempts.

Each malicious threat is unique, but they are connected in numerous ways. For example, transnational organised crime is a key factor in major cyber incidents, terrorism, and unlawful migration.

Likewise, corruption erodes trust in government institutions and takes a toll on the global economy, increasing vulnerability to other national risks. This means that managing malicious threats in isolation is less effective than taking a holistic view. The sources of malicious threats are varied and complex. They may arise from the actions of state actors or from those pursuing private interests (i.e. threat actors). Threat actors may act independently or work together where they have a shared interest. They may sponsor or direct another group or individual to act on their behalf or act via 'trusted insiders.' Issues that appear borderless (e.g., remote radicalisation) may also be driven by the security concerns of particular states or groups of states.

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4.5.1 Armed conflict

Context

New Zealand is navigating an increasingly complex and dynamic international security environment. Cyber, space, autonomous, and other military technologies, for example, are changing the nature of conflict. Capabilities previously limited to states have become more common and affordable. The effects of climate change, extremist ideologies, transnational organised crime, and other malicious threats influence and, in many cases, exacerbate different aspects of conflict.

It is unlikely that New Zealand will become involved in an armed conflict in our sovereign territory, although should this become likely, the New Zealand Defence Force maintains a level of capability that allows it to deter threats, enlarge its forces when required, and provide time for additional help to be sought from its partners. Internationally, New Zealand supports the prevention or resolution of conflict within and between states, including the maintenance of relevant peace agreements. New Zealand has a long history of partnering with others in contribution to such activities.

Likelihood

New Zealanders can remain confident that the country does not face a direct military threat in the foreseeable future. The number of active armed conflicts in the world has remained relatively steady over the past decade, with multiple conflicts taking place at any one time. The New Zealand Defence Force has been deployed to several of these conflicts and is likely to remain engaged offshore as part of New Zealand's commitment to promoting international peace and security. The deployment of a Provincial Reconstruction Team to Afghanistan from 2003 to 2013 is an example of this commitment.

New Zealand has partnered with Pacific states to support their management of internal instability on several occasions in recent years, including working in Timor-Leste, Bougainville, the Solomon Islands, and Tonga. It is probable that such activities will be required again within the next decade.

There is a range of factors that could influence whether New Zealand would become involved in an armed conflict overseas. Each decision to become involved, and the extent of any contributions we may make, is made on a case-by-case basis. Relevant considerations may include foreign policy or national interests, the nature of the involvement, the level of operational risk, and implications for the New Zealand Defence Force.

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Consequences

Consequences of an armed conflict outside of New Zealand depend on the characteristics of the conflict and those involved, its proximity to New Zealand, and the type of involvement New Zealand undertakes. Conflict does have the potential to impact New Zealand's trade, cultural, or political linkages with the countries affected by the armed conflict; it's possible New Zealand could be affected even more widely depending on the nature of the conflict. An initial and possibly severe consequence is that New Zealand citizens abroad may be caught up in an armed conflict. Resulting humanitarian crises could trigger an increase in irregular migration to New Zealand or draw on our aid programme. Long-term and significant economic, diplomatic, or other security impacts could occur if major global or regional conflicts arise.

Managing the risk

Armed conflicts abroad have serious implications for New Zealand. The rules-based international order is the avenue through which armed conflict should be prevented, managed, and resolved. New Zealand contributes to a range of international initiatives aimed at reducing the risk of conflict.

New Zealand's deployments abroad, which often include government agencies beyond the New Zealand Defence Force, involve risk to the personnel involved. This is an inherent feature of our active commitment to promoting international peace and security.

The New Zealand Defence Force and other government agencies maintain operational effectiveness to reduce risk to personnel when deployed, even as environments become more challenging.

Government agencies support international relationships to ensure we can contribute to shaping the international landscape in line with our values and interests and reduce the likelihood and consequences of armed conflict.

Reduction

- Development assistance, security support, capacity building, and technical assistance
- Building partner capacity, including through military and police cooperation and training
- Strengthening and advocating for rules-based mechanisms for conflict management and prevention, including the United Nations collective security system and relevant regional bodies
- Deployment in peace support and monitoring operations

Readiness

- Use of strategic assessments and Defence White Papers to improve strategic awareness
- Intelligence assessments, situational awareness, interagency cooperation, and information exchange with relevant partners
- Ensuring New Zealand has a robust set of international relationships to support collective action if needed
- Equipping, training, and exercising the New Zealand Defence Force and other agency personnel to ensure readiness for action

Response

- Diplomatic engagement with states, including partners, through multilateral forums, as appropriate, to assist in conflict management
- Deployment of military assets (naval vessels, army units, or aircraft) or other New Zealand personnel, including Police, development, or diplomatic staff
- Consular support to affected New Zealanders
- Humanitarian assistance to affected states and populations

Recovery

- Humanitarian and development assistance to affected states
- Stabilisation and post-conflict reconstruction assistance, such as demining efforts
- Redress through international legal avenues, including supporting affected states in such action as appropriate

Risk coordinating agency(s)

- Ministry of Foreign Affairs and Trade
- Ministry of Defence
- New Zealand Defence Force

Support agencies

Government Communications Security Bureau | New Zealand Security Intelligence Service | New Zealand Police

Example scenario

Armed conflict in the Asia-Pacific region

Main national security objective at risk

Strengthening international order to promote security

Under this scenario the assets at risk would be

- public safety, health, and wellbeing
- international influence
- effective international partnerships
- law and order compliance
- economic growth

Future focus areas

- understanding the effect of geopolitical change on perceptions of New Zealand's capability, needs, positioning, and role in responding to armed conflict
- understanding the effect of changing military technologies on New Zealand's ability to manage the risk of armed conflict

For more information see

- nzdf.mil.nz/operations
- defence.govt.nz



4.5.2 Corruption

Context

Corruption is the misuse of entrusted power for private gain. Corruption takes many forms, including bribes or secret commissions and manipulation of tendering or procurement processes.

New Zealand has an outstanding reputation for its lack of corruption and continually features in global corruption perception surveys that list the top countries that are relatively free from corruption. However, as a nation we need to continue to take steps to avoid becoming complacent.

Our exposure to corruption is potentially increasing due to several factors, including growth in high-risk industries, increased international trade, and income inequality. These factors, and our recent history of low corruption levels, can create an environment where complacency enables corrupt behaviours to become part of accepted business practice. New Zealand's public, private, and not-for-profit sectors must have appropriate mitigations to prevent corruption from becoming a real issue.

Likelihood

New Zealand has a strong culture of integrity, and institutions remain largely free from systemic corruption. In recent years there has been an increase in corruption-related allegations and prosecutions in New Zealand, and incidents with an international element may be increasing.

Most commonly, domestic corruption involves undisclosed conflicts of interest, inappropriate gifts, and personal favours. There have also been recent cases involving bribes paid to government officials

(including central and local government) and corrupt payments made within the private sector. Corruption can become established in a range of ways, from the opportunistic suggestion of a kickback to organised criminals using corruption to aid their operations.

It is difficult to accurately measure the full extent of corruption in New Zealand as by its nature corruption is covert and can be difficult to recognise. Even with appropriate controls in place, the full breadth of corrupt behaviour may not be revealed.

Most corruption assessments are based on perceptions rather than absolute measures. Transparency International produces a yearly Corruption Perceptions Index, ranking countries and territories based on how corrupt their public sector is perceived to be. The latest iteration of the Index ranks New Zealand's public sector as the least corrupt nation in the world.²⁸ It also shows that most countries are making little or no progress in ending corruption.

Consequences

The type of corruption examples seen in New Zealand could lead to a decline in public trust in the Government and other institutions. It could impact the built and natural environments and take a significant toll on the economy while damaging our international reputation as a desirable trading partner.

Managing the risk

There is adequate capability and capacity in law enforcement agencies to deal with current corruption challenges, though this is mostly reactive. A variety

28 Transparency International. *Corruption Perceptions Index 2017*. URL: www.transparency.org/news/feature/corruption_perceptions_index_2017 (accessed 13 April 2018).

of initiatives and responsibilities for addressing corruption are used across the 4 Rs, including the development and maintenance of further guidance and research.

Good partnerships exist across law enforcement agencies and between those agencies and the private sector. However, there is not yet a comprehensive approach to proactively and consistently address the emerging risks of corruption in New Zealand.

Reduction

- Raising awareness of anticorruption laws
- Implementing procedures to support transparency across public, private and charitable sectors

Readiness

- Use of intelligence assessments and development of corruption risk tools
- Protective security requirements for government agencies
- Use of perception survey data

Response

- Investigations, prosecution, and rehabilitation activities focused on bribery and fraud
- Use of integrity and anticorruption resources provided by the State Services Commission, Serious Fraud Office, and Ministry of Justice (see links)

Recovery

- Redress through the New Zealand justice system
- Strengthening community relationships

Risk coordinating agency

- Serious Fraud Office

Support agencies

Ministry of Justice | New Zealand Police | State Services Commission | Office of the Auditor-General

Example scenario

A large New Zealand company is found to be paying bribes overseas with allegations the New Zealand Government was aware but did not react appropriately

Main national security objective at risk

Maintaining democratic institutions and national values

Under this scenario the assets at risk would be

- standard of living
- law and order compliance
- international reputation
- economic growth
- financial system stability
- commercial and industrial property

Future focus areas

- enabling consistency and cooperation across the whole system to reduce New Zealand's vulnerability to corruption and enhance national integrity

For more information see

- sfo.govt.nz/anti-corruption-training
- justice.govt.nz/justice-sector-policy/key-initiatives/bribery-corruption
- ssc.govt.nz/integrityandconduct
- danariely.com/research/learn/the-price-of-a-bribe



4.5.3 Espionage and foreign interference

Context

Acts of espionage and foreign interference could threaten the security of New Zealand and effectiveness of the New Zealand Government. They have the potential to threaten our economic interests by undermining innovation, market development, and the integrity of businesses. These acts may be carried out, directed, or sponsored by foreign states and non-state actors alike, occurring both within New Zealand and offshore. Methods of espionage and foreign interference could vary greatly.

More direct acts of espionage and foreign interference could align with statutory crimes such as theft and bribery, which can also be linked to corrupt behaviours, or on rarer occasions the crime of sabotage. Less obvious acts of interference include inappropriate attempts to influence public opinion, undermine political or democratic processes, and other actions that can quietly but steadily erode social cohesion and economic prosperity.

Likelihood

It is difficult to obtain an accurate picture of the occurrence of espionage and foreign interference attempts against New Zealand, because these activities are covert and the range of tactics has increased.

It is estimated that small attempts of foreign interference against government and economic interests are made on a frequent basis. Some of these may occur under the guise of acceptable activities, such as financial investments. But it is clear from overseas experience that the risk of foreign interference in political processes is growing.

Consequences

Acts of espionage and foreign interference targeting the New Zealand Government may be isolated and the impacts contained. However, a successful act of espionage against central, critical, publicly visible, or internationally important government functions could have major and far-reaching impacts, especially if not detected immediately. Acts against our economic interests might target large corporations, niche or sensitive technology, and small companies with differing effects. These acts could be isolated or ongoing and might take many forms. The full impacts of a successful act are extremely difficult to measure and would be dependent on its success and duration.

Government intelligence settings aim to limit the likelihood and consequences of espionage and foreign interference. Total security, however, is very difficult to provide in a free and open society, so there will always be some risk.

Managing the risk

Risk-coordinating and other agencies undertake a wide range of investigative activities regarding potential foreign threats. However, the Government alone cannot detect and disrupt all foreign threats, nor can it intervene in all instances. It needs the support of individuals, organisations, and communities to identify and guard against espionage and foreign interference. A culture of transparency and a free media are important in reinforcing these norms. A strong, protective security culture across the Government and the private sector is also important. Where this foundation of non-regulatory measures fails to deter foreign interference, New Zealand has implemented regulatory measures in some sectors. New Zealand also has open channels to raise issues with foreign governments if necessary.

Reduction

- Clarifying New Zealand's expectations about norms of international engagement
- Raising awareness of espionage, sabotage, and foreign interference risks among individuals, organisations, and communities
- Compliance, enforcement, and disruption activities

Readiness

- Intelligence assessments
- Situational awareness
- Protective security requirements for government agencies

Response

- Lead agency disruption activities
- Investigations and prosecution
- Diplomatic engagement with states

Recovery

- Post-incident security measures
- Monitoring and debriefs

Risk coordinating agency(s)

- New Zealand Security Intelligence Service
- Ministry of Business, Innovation and Employment

Support agencies

Department of the Prime Minister and Cabinet | Government Communications Security Bureau | New Zealand Police
New Zealand Defence Force | Ministry of Foreign Affairs and Trade

Example scenario

An act of sabotage against infrastructure or interference in the political system

Main national security objective at risk

Maintaining democratic institutions and national values

Under this scenario the assets at risk would be

- standard of living
- employment
- ability of government agencies to provide services
- international influence
- effective international partnerships
- law and order compliance
- international reputation
- private and sensitive data
- economic growth
- fiscal stability
- critical lifeline utilities

Future focus areas

- supporting New Zealand's interests by identifying risks and developing the understanding of our exposure to foreign interference

For more information see

- nzs.govt.nz
- mbie.govt.nz



4.5.4 Major cyber incidents

Context

Secure, dependable technology for information and communication is necessary for our wellbeing and international competitiveness. It is essential for business, finance, public services, and much more.

New Zealand's experience of cyber incidents is not unique—it reflects a serious and growing international risk. Globally, there is growing use of cyber tools by state-sponsored cyber actors for geopolitical advantage. This could be aimed at strengthening influence, stealing commercially valuable information, undermining or embarrassing other countries, creating chaos and disruption, retaliating for the actions of other countries, technique practice, or pre-positioning for future advantage.

Cyber 'threat actors'—state sponsored or criminally motivated—are acting in increasingly bold, brazen, and disruptive ways. Their intent may not always be evident, but it is clear that these cyber threat actors are taking advantage of weaknesses. It is often difficult to attribute responsibility for cyber incidents.

Likelihood

While it is difficult to obtain complete information on the occurrence and overall number of cyber incidents in New Zealand, reports from both the National Cyber Security Centre and CERT NZ (New Zealand's Computer Emergency Response Team) suggest that the number of cyber incidents has increased every year. In addition to the risk of a major cyber incident, New Zealand also faces the ongoing impacts of smaller, more common incidents. Due to the indiscriminate nature of some cyber incidents, New Zealand may be affected without being specifically targeted.

Consequences

The consequences of cyber incidents can range from the theft of personal data and identity fraud to a major failure. They have the potential to cause real harm, including financial losses, reputational damage, intellectual property theft, services and operations damage, and critical infrastructure disruption.

The 2017 global WannaCry ransomware attack and the impact it had on the United Kingdom's National Health Service illustrates the potential disruption that cyber incidents can cause to critical services.

Managing the risk

New Zealand's Cyber Security Strategy provides the framework for cross-government work on cyber security. The approach addresses the 4 Rs and offers a multi-layered approach to cyber security. A review of the Cyber Security Strategy is underway.

Reduction

- Adoption and implementation of information security standards (e.g., the NZ Government's Protective Security Requirements and Information Security Manual)
- Best practice and policy for network installation and design
- Support for international norms of responsible state behaviour online
- Addressing cyber security flaws through advisories, updates, patches, and backups

Readiness

- Cyber security response and business continuity plans
- Information campaigns (e.g., what to do during an incident)
- Maintaining international relationships

Response

- Incident response capabilities (National Cyber Security Centre, CERT NZ, and the private sector)
- Procedures for incident reporting and provision of specialist advice
- Investigations and prosecutions

Recovery

- Government advice and referral to support agencies
- Enhancing private sector capability with business continuity plans and review of security design

Risk coordinating agency(s)

- National Cyber Security Centre
- CERT NZ
- Department of the Prime Minister and Cabinet

Support agencies

Department of Internal Affairs | Government Communications Security Bureau | New Zealand Police
New Zealand Defence Force | Ministry of Defence

Example scenario

Sensitive government data is accessed and released

Main national security objective at risk

Sustaining economic prosperity

Under this scenario the assets at risk would be

- standard of living
- employment
- ability of government agencies to provide services
- international reputation
- private and sensitive data
- financial system stability
- the value of government, businesses', and individuals' physical assets

Future focus areas

- working together to improve New Zealand's cyber security

For more information see

- connectsmart.govt.nz
- gcsb.govt.nz
- ncsc.govt.nz
- cert.govt.nz



4.5.5 Maritime security threats

Context

New Zealand has an expansive maritime area of responsibility with one of the largest exclusive economic zones in the world. New Zealand relies on the maritime environment for the facilitation of trade (e.g., sea shipping of goods and undersea cables for the digital economy) and economic prosperity (e.g., minerals, fishing, and aquaculture). In addition, it has a major interest in preserving the Antarctic Treaty system and marine conservation in the southern oceans. Together with the importance of open sea lines of communication and trade, maritime security is fundamental to New Zealand's national security and prosperity.

The maritime security sector is facing increasing pressures and challenges, including

- increasing challenges to New Zealand's border and resource protection effort, including sophisticated criminal activity that poses complex interagency and multilateral challenges (e.g., smuggling of people, small arms, and drugs; illegal, unregulated and unreported (IUU) fishing; and piracy);
- a more demanding geopolitical environment, which is expected to increase demands for the deployment of New Zealand's multirole maritime security assets;
- biofouling, increased security, and search and rescue challenges associated with increased shipborne tourism to New Zealand and across its search and rescue coordination zone; and
- climate change, which exacerbates resource, migration, and other security pressures.

Likelihood

Competition for maritime resources will likely increase, with scarcity of fish in other regions making our exclusive economic zone and those of the Realm countries a more attractive target for illegal fishing. New Zealand also remains a destination for smuggling, particularly of drugs that are transported via maritime routes.

New Zealand has a long history of deploying its maritime security resources to preserve our maritime security interests. Increasing maritime security pressures are likely to result in increased demand for the use of maritime security resources at home, across our region, and beyond.



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Consequences

Effective management of our extensive maritime domain places our sovereignty at risk. It also undermines efforts to exercise effective stewardship over the resources that New Zealand and our regional partners will increasingly come to rely upon. New Zealand is a maritime nation that depends on the sea as its main connection to international markets; as a key part of its energy, resource, and tourism sector; and as enduring cultural and ecological capital. Fisheries and resource extraction are worth approximately \$4 billion per annum and sustain over 100,000 jobs. IUU fishing can also severely damage ecosystems through unsustainable exploitation of fish stocks and nonfish bycatch. In some cases the use of destructive fishing gear and methods can also destroy habitats.

Our extensive coastline is highly exposed to smuggling activity. The consequences of these kinds of risks are further considered in the transnational organised crime, smuggling, and irregular migration risk summary.

Managing the risk

New Zealand enters into, and plays an active role in, international treaties and agreements that govern the exercise of state power in various jurisdictions. Examples of these treaties and agreements include the United Nations Convention on the Law of the Sea, Western and Central Pacific Fisheries Commission, and the Commission for the Conservation of Antarctic Living Marine Resources.

New Zealand contributes to a range of multilateral and regional diplomatic and defence forums that work to reduce maritime security threats. It is party to the United Nations Convention against Transnational Organized Crime (including the Migrant Smuggling Protocol). New Zealand also engages in regional forums that seek to address threats to states in the Asia-Pacific region (e.g., the Bali Process). This enables greater regional understanding of specific risks and the strengthening of international relationships.

New Zealand conducts regular aerial and surface maritime patrols to build maritime domain awareness, provide presence, deter criminal activity, and provide response options (including search and rescue). This, in turn, deters incursions into our exclusive economic zone, protects our interests in the South Pacific and Antarctica, provides support to the rules-based international order, and enables more informed risk management. Active fisheries management is undertaken in our exclusive economic zone.

Reduction

- Robust international rules, institutions, and joint initiatives
- Fisheries monitoring, patrols, and reporting programmes
- Regular surveillance, patrols (including boarding and inspection), and other deterrence activities
- Capacity building and regional cooperation mechanisms
- Appropriate legislative frameworks that support maritime enforcement and regulatory action
- Targeting consumers through environmental and sustainability expectations, driving traceability, and transparency initiatives

Readiness

- Strategic assessments and interagency national level policy and strategies
- Interagency patrol planning focused on presence, awareness, education, and deterrence
- Intelligence assessments
- Maritime situational awareness, including ability to conduct wide area surface surveillance and to detect and track surface objects that present risks to New Zealand maritime security interests
- Coordinating all-of-government assets through the National Maritime Coordination Centre

Response

- Deployment of nonmilitary capabilities as well as military assets (e.g., naval vessels, army units, or aircraft) in support of other government agencies
- Investigation and analysis
- Collective regional interventions and using regional operational and policy setting bodies where appropriate
- Legal action

Recovery

- Targeted diplomatic engagement
- Redress through domestic and international legal avenues

Risk coordinating agency(s)

- Maritime New Zealand
- Ministry of Foreign Affairs and Trade
- New Zealand Defence Force
- Ministry for Primary Industries
- New Zealand Customs Service

Support agencies

New Zealand Police | Ministry of Defence | Immigration New Zealand (Ministry of Business, Innovation and Employment) | Department of Conservation | Environmental Protection Agency

Example scenario

An incursion onto protected subantarctic Islands with associated illegal dumping of waste

Main national security objective at risk

Preserving sovereignty and territorial integrity

Under this scenario the assets at risk would be

- standard of living
- habitation access
- employment
- international reputation
- territorial integrity
- economic growth

Future focus areas

- better use of information in supporting New Zealand's national maritime interests
- leveraging advances in automation, space-based systems, and analytical tools to increase maritime situational awareness regarding how changes to capabilities affect our maritime security objectives

For more information see

- maritimenz.govt.nz/about/what-we-do/maritime-security
- dpmc.govt.nz/publications/maritime-patrol-review
- oag.govt.nz/2014/maritime-patrols
- mfat.govt.nz/en/environment/oceans/international-fisheries-management



4.5.6 Terrorism

Context

Terrorism is defined in New Zealand law as an ideologically, politically, or religiously motivated act intended to induce terror in the population or coerce a government or other authority. Acts of terrorism have been carried out in many parts of the world over many years by different groups with various motives. Recently, terrorism has evolved into a far more global threat, driven mainly by religious extremist groups. This has increased New Zealand's exposure to an attack.

Likelihood

Certain sociopolitical factors, including population mix and geographic isolation, arguably reduce New Zealand's exposure to terrorism. At the same time, the ubiquity of the internet, the connectedness of international travel, have brought the threat closer to New Zealand. Within all countries there are vulnerable individuals potentially susceptible to extremist messaging or ideology. There are New Zealand citizens who have travelled overseas to fight with extremist groups. There are also individuals in New Zealand consuming extremist material online. As observed in other countries, 'lone wolf attacks' can be undertaken by individuals inspired by extremist groups, but potentially without any direct connection to those groups.

Prevention and security activities by a range of agencies also help reduce the likelihood of an attack, but in a free and open society there will always be some risk.

Consequences

A threatened, attempted, or successful terrorist attack has wide-ranging potential impacts, extending beyond actual loss of life and physical damage. The scale of consequences would vary according to the extent and nature of an attack (or attempted attack), and these consequences would be likely to extend beyond the attack itself. They could include the creation of social, ethnic, and religious tensions; the erosion of confidence in government and institutions; and pressure for policy change (e.g., security and immigration settings) that may place further stress on inter-community relationships.

Managing the risk

Managing the risk of terrorism involves a range of activities delivered by a mixture of security agencies, social agencies, local government, and community groups. One end of the risk management spectrum includes activities that strengthen social inclusion and community relationships. The other end of the spectrum includes support and monitoring activities for high risk individuals, as well as tactical intelligence and law enforcement activities to disrupt extremist activity.

Example scenario

A terrorist attack in a New Zealand city or town

Main national security objective at risk

Ensuring public safety

Under this scenario the assets at risk would be

- public safety, health, and wellbeing
- standard of living
- law and order compliance
- international reputation
- economic growth

Reduction

- Strengthening and supporting communities
- Support and management of high-risk individuals
- Preborder screening and management
- Aviation security
- Participating in global efforts to counter terrorist entities offshore that could project influence into New Zealand

Readiness

- Terrorism threat assessment
- Monitoring global terrorism developments
- Tactical response planning and exercising
- International liaison and coordination

Response

- Investigations and disruption activities
- Law enforcement
- Tactical response

Recovery

- Community support and engagement
- Public communications

Risk coordinating agency(s)

- New Zealand Police
- New Zealand Security Intelligence Service

Future focus areas

- understanding the way in which the threat of terrorism is continually evolving both domestically and internationally
- ensuring the strength and appropriateness of New Zealand's counterterrorism system
- ensuring aviation security settings remain aligned to international best practice and keeping up to speed with changes in technology and emerging threats
- ensuring we have the right approach and tools to help disengage individuals from extremist views and influence

For more information see

- dpmc.govt.nz/our-programmes/national-security-and-intelligence/intelligence-and-security-act-2017/case-studies/counter-terrorism-role-of-nzsis-and-gcsb
- security.govt.nz/our-work/protection-from-terrorism

Support agencies

Department of the Prime Minister and Cabinet | Government Communications Security Bureau | Ministry of Justice
New Zealand Defence Force | Ministry of Defence | Ministry of Civil Defence & Emergency Management | Immigration
New Zealand (Ministry of Business, Innovation and Employment) | New Zealand Customs Service | Civil Aviation Authority



4.5.7 Transnational organised crime, smuggling and irregular migration

Context

Transnational organised crime is organised crime coordinated across national borders, involving groups of networks of individuals working in more than one country to plan and execute illegal activities, and using systematic violence and corruption to achieve their goals.

Transnational organised crime is a serious risk to New Zealand's national security and international reputation. This crime manifests in many forms, such as money laundering and criminal financing, the smuggling of illicit drugs, and irregular migration. Transnational organised crime groups are flexible and adaptable and are connected to criminal networks both internationally and within New Zealand. Their adaptability and global connectedness challenge the way these groups are identified and targeted. The groups are financially motivated and exploit a range of legitimate and illicit markets, trade and travel pathways, and communications platforms. Smuggling—the illegal cross border movement of commodities, including illicit drugs, money and people—is a major component of transnational organised crime. Commodities are smuggled through a full range of trade, passenger, and mail streams as well as through the internet. Criminal proceeds can be smuggled in and out of New Zealand as currency and laundered or hidden in legitimate supply chains.

Irregular migration is the unauthorised arrival of individuals or groups into New Zealand. The scale and complexity of current global migration is unprecedented, reflecting increasing global pressures for forced migration, as well as social and economic aspirations. People smuggling, whether by air or sea, exploits the large gap that exists between the

number of people wanting to migrate—because they are fleeing persecution, or for social or economic benefit—and the relatively few places made available through legal migration channels.

Likelihood

Transnational organised crime groups are active in New Zealand. Advances in technology and transport methods make New Zealand increasingly accessible and attractive for criminal groups and organisers of irregular migration.

The incidence of transnational organised crime—drug, wildlife, firearm, and people smuggling; illegal logging and fishing; and financial crimes—in the Pacific region are also growing. Such challenges make New Zealand's deep relationship with the Pacific crucial to our shared security and prosperity.

New Zealand law and border enforcement agencies regularly undertake investigations and make multiple daily intercepts of prohibited and restricted goods, both at the border and within New Zealand, as well as offshore through working closely with our international partners. Priority is given to disrupting organised crime groups, particularly those that trade methamphetamine and other illicit drugs.

Travellers are regularly prevented from boarding at their point of departure or intercepted when they arrive at the New Zealand border due to false documents or other identity and border security concerns. New Zealand has never experienced a mass arrival. The likelihood of a mass irregular migration is low, but the consequences would be high.

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Consequences

Transnational organised crime poses significant and enduring risk to New Zealand, as it causes social and economic harm to communities. It could also damage New Zealand's reputation as a safe country. This could happen by undermining financial and legal institutions and through the complex social effects of drug abuse and associated violence and gang activities. The potential harm could place significant strain on existing government services, resources, and infrastructure. In 2016–2017, the potential social harm avoided by border interceptions and domestic seizure of methamphetamine and its ingredients has been assessed at over \$3.25 billion.²⁹

People smuggling by sea or air would undermine New Zealand's security and the integrity of its borders. A large amount of irregular migration via sea poses risks to New Zealand, including criminality, national security, and increased social costs.

Managing the risk

Management includes a wide and complex variety of activities by law and border enforcement agencies. These include screening and targeting of goods and passengers at international departure points and at the border and investigations and prevention strategies. These activities require cooperation between government agencies and international partners. Formal liaison positions between domestic and foreign agencies facilitate the sharing of information of disruption efforts and improve the collective understanding of these risks.

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²⁹ McFadden Consultancy. 2016. *Research Report: The New Zealand Drug Harm Index 2016* (2nd Edition). Wellington: Ministry of Health.

Reduction

- Border management procedures and strategies
- Compliance, enforcement, and disruption activities
- Demand reduction methods for the use of illicit drugs (including support and treatment)

Readiness

- Intelligence collection and assessments
- Situational awareness
- Community engagement

Response

- Disruption activities, such as asset seizure
- Investigations and prosecution
- Multiagency operational task forces

Recovery

- Community partnerships fostering community resilience
- Addiction support
- An established justice process where redress is possible

Risk coordinating agency(s)

- New Zealand Police
- New Zealand Customs Service
- Immigration New Zealand (Ministry of Business, Innovation and Employment)

Support agencies

New Zealand Security Intelligence Service | Government Communications Security Bureau | Ministry of Justice
Ministry of Foreign Affairs and Trade | Serious Fraud Office | New Zealand Defence Force

Example scenario

New Zealand gains a reputation as a significant transshipment port for illicit drugs, people, or other illicit commodities

Main national security objective at risk

Maintaining democratic institutions and national values

Under this scenario the assets at risk would be

- public safety, health, and wellbeing
- standard of living
- law and order compliance
- international reputation
- economic growth

Future focus areas

- working as 'whole-of-government' and with international partners to identify and disrupt transnational organised crime
- reducing the demand for illicit drugs while restricting the supply

For more information see

- justice.govt.nz/assets/Documents/Publications/New-Zealands-response-to-Organised-Crime.pdf
- immigration.govt.nz/about-us/research-and-statistics/year-at-the-border-reports
- customs.govt.nz/about-us/annual-report-2017
police.govt.nz/about-us/publication/fiu-reports

ECONOMIC CRISES



Commodity or oil price
shocks and trade problems



Financial crisis

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4.6

Economic crises

Economic crises occur when the economy experiences a sudden downturn or shock to the demand or supply of goods, services, or credit. An economic crisis would most likely result in falling GDP,³⁰ large fluctuations in exchange rates, unavailability of credit, and unstable prices of goods and services. It would require an unlikely number of severe economic shocks for New Zealand to experience a full-scale economic crisis that requires assistance from the International Monetary Fund.³¹

The 2007-2008 Global Financial Crisis and the Canterbury earthquakes are examples of economic shocks. Most national risks would have different economic implications, with the most extreme risks leading to large increases in government debt. An economic crisis could also result from difficulties in issuing New Zealand sovereign debt if public debt gradually builds up over many years. The impact of national risks with economic implications would also be influenced by the state of the economy and government finances immediately before an event.

Because of New Zealand's reliance on international financial markets, a global credit shock leading to the failure of financial institutions is a national risk. Commodity or oil price shocks and trade problems for New Zealand also pose a risk, along with the current rise in trade protectionism in various parts of the world.

30 Gross domestic product is a measure of the value of all final goods and services produced in a period of time.

31 The International Monetary Fund's main purpose is to ensure the stability of the international monetary system – the system of exchange rates and international payments that enables countries and their citizens to transact with each other.



4.6.1 Commodity price shocks and trade problems

Context

Commodity and energy markets are generally quite resilient, but oil warrants attention due to its economic significance and the absence of close substitutes. While the Government has a long-term goal of moving to a carbon-free economy, oil still provides almost half of all energy consumed in New Zealand and almost all transport fuel. Oil is a globally traded commodity and prices can increase dramatically when supplies are disrupted by severe weather or geopolitical events overseas. A global oil price shock would be quickly passed on to New Zealand consumers. Conceivably, oil and oil products may not be physically available even to those prepared to pay very high prices.

Preventing major trade disruptions or export failures is important for securing national security and prosperity. Primary production commodities (including processed goods, such as cheese and butter) account for 75 percent of the total goods exported. For this reason, this risk, which only includes tradable goods and not services like tourism or education, is linked to events that stop overseas export markets from wanting to import from New Zealand. This could include domestic food safety incidents, biosecurity concerns, or malicious threats.

Likelihood

In the event of a major global oil price shock, the International Energy Agency would coordinate collective action by member countries to release strategic oil reserves, thereby moderating the price rise and improving availability. There have been three events since 1977 that required the International Energy Agency's collective action.

As the range of animal and plant products exported to markets increases, trade disruptions will always

occur. The duration of any trade disruption is hard to predict but may span from days (e.g., when there are new market requirements) to years (e.g., when there is market closure due to disease). The latter is likely to result in the failure of New Zealand's export markets.

Consequences

Oil and oil products are an essential input into all economies, and a sharp increase in the oil price will create inflationary pressure throughout the economy. Firms producing goods or services dependent on domestic or international transport would be most affected by a global oil price shock. The cost of imported goods and services would also be affected. Households with high travel needs and limited access to public transport are more vulnerable to high fuel prices. Households may reduce spending, which would have impacts on the retail and service sector.

Effects of a major trade disruption or export failure would vary from solving a minor market access problem to solving major market access problems with accompanying international partnership and reputational issues.

Managing the risk

While the Government intends to transition to a carbon-free economy, little can be done in the short term to reduce the risk of a global oil price shock. Current policy is to support joint efforts through international forums to maintain emergency reserve stocks of oil and oil products in the event of a global price shock. All oil users are encouraged to consider ways to reduce exposure to an oil shock as part of their business continuity planning (e.g., by reducing nonpriority travel and developing staff carpooling schemes).

Situations with the potential to cause trade disruptions or export failures are always occurring and can affect exports and market reputation. As a significant share of New Zealand's exports are agricultural and food and beverage products, managing trade disruptions or export failures often focuses on the interception of pest and diseases or suspicious food products.

Reduction

- Oil reserves to moderate the effects of a global oil price shock
- International trade agreements and standards
- Prevention activities before and at the border

Readiness

- Business continuity planning
- Enforcing overseas market access rules
- Maintaining international relationship (e.g., with the International Energy Agency)

Response

- National oil response strategy
- Public information to promote and assist fuel savings efforts
- Liaison with trading partners to resolve disruptions

Recovery

- Restoration of overseas market access plans

Risk coordinating agency(s)

- The Treasury
- Ministry of Business, Innovation and Employment
- Ministry of Transport and transport agencies

Support agencies

Ministry of Foreign Affairs and Trade | Ministry for Primary Industries

Example scenario

A global oil price shock resulting in fuel price rises in New Zealand of up to 35 percent

Main national security objective at risk

Sustaining economic prosperity

Under this scenario the assets at risk would be

- standard of living
- employment
- effective international partnerships
- international reputation
- all assets in the economy domain

Future focus areas

- reducing long-term exposure to global oil price shocks by improving vehicle fuel efficiency, switching to electric vehicles, and using nonpetroleum fuels, such as biofuels and hydrogen
- diversification initiatives to reduce our vulnerability, including developing new export markets and products
- initiatives to help mitigate the impact of energy supply disruption

For more information see

- mbie.govt.nz/info-services/sectors-industries/energy/energy-strategies
- mbie.govt.nz/info-services/sectors-industries/energy/energy-security/oil-security



4.6.2 Financial crisis

Context

A financial crisis is the failure or disruption of a major financial institution or financial market structure—the channel through which payments, securities, derivatives, or other financial transactions are cleared, settled, or recorded. Major financial institutions include registered banks, large insurers, and large fund managers. A financial crisis can also broadly apply to stock market crashes and the bursting of other financial bubbles.

A financial crisis may be caused by a wide range of events (e.g., a large increase in bad debts from other national risks, a sharp loss of confidence in a financial institution by its creditors, or stresses due to a global financial crash). These can all lead to reduced availability of offshore credit, which could put pressure on a major financial institution.

New Zealand currently has a negative net international financial position³² of \$155.2 billion (54.8 percent of GDP). Global capital markets are important to service these liabilities, much of which are held by the country's financial institutions.

Likelihood

Large global economic crises occur approximately once every 15 to 50 years and are difficult to predict. New Zealand's prosperity has been affected throughout the decades by the 1929 Wall Street Crash, the Great Depression, the 1973 oil crisis that caused the 1973–1974 stock market crash, the 1987 Black Monday Stock Market Crash, and the 2007–2008 Global Financial Crisis.

Robust regulations in New Zealand and internationally should reduce the likelihood of a major financial crisis. More minor events (e.g., the failure of smaller nonbank deposit takers) could occur more frequently with more limited economic impacts.

Consequences

Financial crises have a direct impact on economic prosperity. They have both short-term and long-term impacts. Depending on the cause and nature of the financial crisis, household living standards could be affected by a loss of personal wealth or loss of access to transactional banking services, insurance, and other financial products.

A domestic shock has the potential to damage global financial market and investor confidence in New Zealand. It would also have the potential to damage some international relationships.

Household debt levels are currently rising, which increases potential vulnerability. However, stress testing of the core banking system shows a high level of resilience. The net level of government debt also allows the Government to absorb significant impacts of a crisis on behalf of New Zealanders.

Managing the risk

Financial market regulators are responsible for the stewardship of a robust regulatory regime to ensure financial stability. As summarised in the table below, there are a number of tools they can apply in pursuit of this goal.

Reduction

- International prudential banking requirements
- Application of macroprudential tools in the New Zealand context
- Increasing the resilience of the Government's balance sheet by reducing and maintaining net Crown debt to prudential levels
- Promotion of fair, efficient, and transparent financial markets by the Financial Markets Authority
- Pre-positioning major banks for open bank resolution processes

Readiness

- Stress testing the resilience of financial institutions
- Six-monthly Financial Stability Report assessing and reporting on the soundness and efficiency of the New Zealand financial system

Response

- Open Bank Resolution process
- Automatic fiscal stabilisers, including unemployment benefits and tax revenue challenges
- Monetary policy and fiscal policy adjustments

Recovery

- Financial institution recovery processes

Risk coordinating agency(s)

- Reserve Bank of New Zealand
- The Treasury
- Financial Markets Authority

Example Scenario

A financial crisis similar to the Global Financial Crisis, that occurs at the same time as a major natural hazard event.

Main national security objective at risk

Sustaining economic prosperity

Under this scenario the assets at risk would be

- standard of living
- employment
- international reputation
- all assets in the economy domain

Future focus areas

- improving understanding of our vulnerability and tolerance levels for financial risk
- understanding the relationship between financial risk and other types of national risk
- fuller consideration of the range of future treatments for management of financial and/or economic risk

For more information see

- rbnz.govt.nz/financial-stability
- treasury.govt.nz/information-and-services/financial-management-and-advice/fiscal-strategy
- fma.govt.nz
- imf.org/external/country/NZL

SECTION

5

Assessing
national risks

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Adoption of a robust risk assessment methodology is needed to support the improved management of national risks. Risk coordinating agencies assess national risks by determining the likelihood and consequences of hazards and threats and evaluating the main national security objective at risk.

The methodology used to assess national risks allows them to be considered objectively, which helps prioritise future actions needed to manage them.

The methodology reflects international best practice, such as the International Risk Management Standard (ISO 31000),³³ which details a basic risk management process, involving

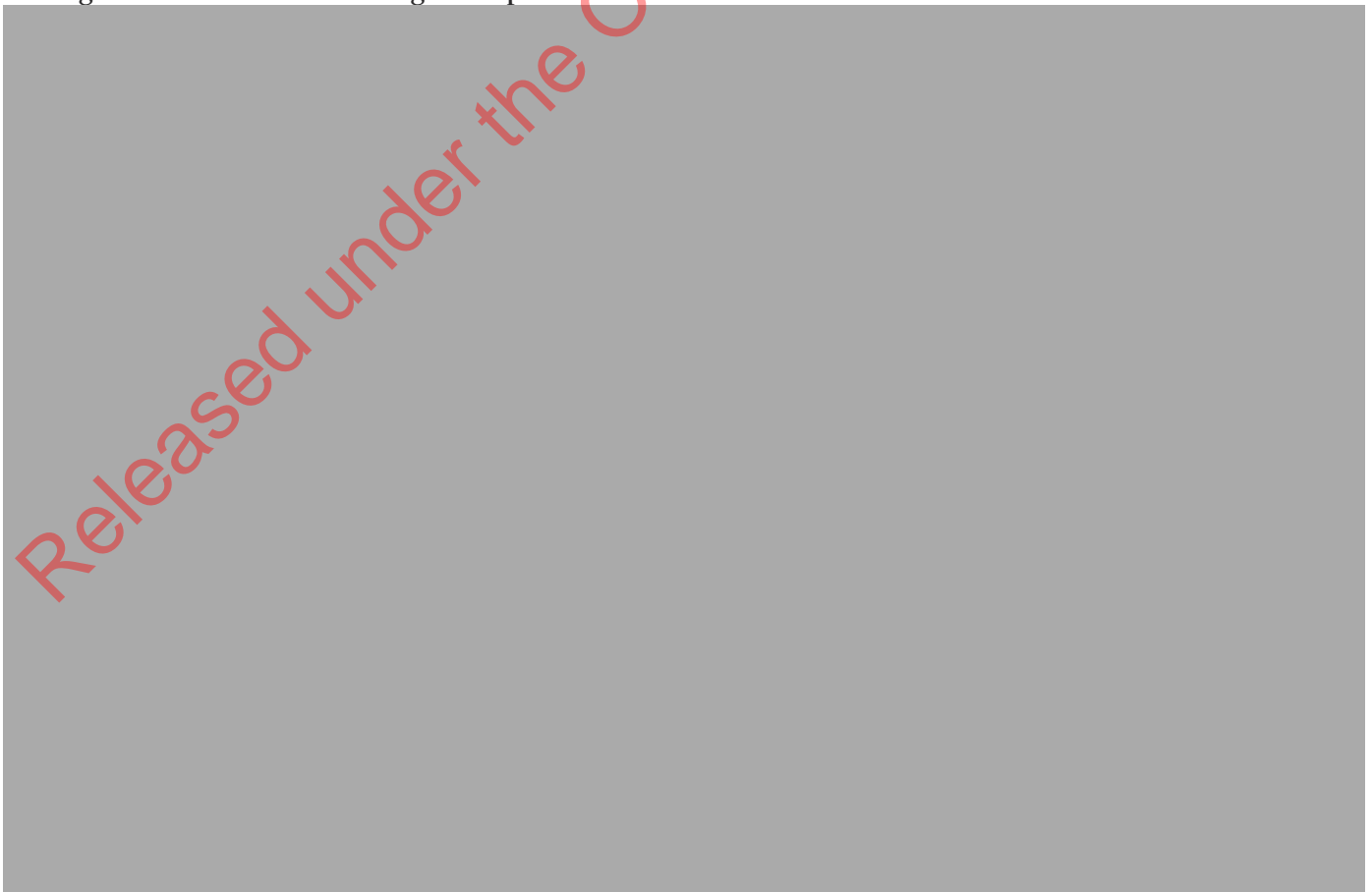
- establishing the context;
- identifying, analysing, and evaluating risks (i.e., risk assessment) in a timely manner;
- determining options to treat or modify risks; and
- putting in place mechanisms to monitor and review the effectiveness of risk treatment.

The methodology described below covers the first two steps in the basic risk management process—establishing the context and risk assessment. The methodology also considers the components of risk introduced in Section 2, through the following process

1. identifying and measuring a range of assets across different domains that are exposed and vulnerable to national risks;
2. reviewing past events and crises and choosing example scenarios for each hazard or threat to help achieve a consistent comparison;
3. determining the likelihood and consequences of each scenario; and
4. describing the confidence for individual assessments to show the understanding or evidence base for each national risk.

Section 5 discusses risk treatment along with the steps that the Government is taking to better manage national risks.

Figure 2. The basic risk management process



33 Standards New Zealand. AS/NZS ISO 31000:2009. *Risk Management – Principles and guidelines.*

5.1

Measuring assets

There is a range of tangible and intangible things that we value as a nation, including people, knowledge, and physical and other assets, as introduced in Section 2.1. Table 2 lists those assets.

To understand the severity of different hazards and threats, government agencies have combined their knowledge to assess the consequences that a scenario would have on each identified asset. Consequences are assessed on a common scale, which ranges from 'insignificant' to 'extreme'. The use of this common scale means an extreme social consequence should be equally as challenging for the nation as an extreme economic consequence.

The scale is accompanied by measures that describe and place value on the consequences to each asset. For example, the measure used for an extreme consequence to economic growth is a decline of greater than 10 percent GDP or a significant break in economic growth. This is equivalent to the measure used for an extreme consequence to international reputation, which could result in permanent or near permanent damage.

To assist with risk assessment and understanding how best to manage the risk, the assets are grouped into domains. These domains help us to understand the overall consequences that may result from a national risk.

Table 2. The five asset domains

Domains	Assets
Social indicators	Public safety, health, and wellbeing standard of living habitation access employment social and cultural capital
Governance and sovereignty	ability of government agencies to provide services international influence effective international partnerships law and order compliance international reputation private and sensitive data territorial integrity
The economy	economic growth fiscal stability currency and price stability product demand financial system stability the value of government, businesses', and individuals' physical assets
The built environment	residential housing buildings and residential property commercial and industrial property public facilities and buildings critical lifeline utilities
The natural environment	air quality primary production (land and marine) biodiversity and ecosystems freshwater systems (lakes and rivers)

5.2

Scenario development

Many government agencies have legal requirements or policy directives to manage national risks. Officials from these agencies chose a range of scenarios and put them through a process of refinement and review. The scenarios typically describe a worst-case situation—also known as a ‘maximum credible event’—that could conceivably occur with long-term serious effects on New Zealand’s security and prosperity.

Scenarios are selected by reviewing historical and scientific data or reaching consensus that confirms they are plausible events or crises. In order not to overlook lesser events that could continually occur and may become a national risk, smaller scenarios for hazards and threats are also identified and put through the assessment process. Choosing any scenario does not mean that it is going to occur.

Only the assets at risk (and the main national security objective at risk) for selected maximum credible events have been listed in the risk summaries in Section 3.

Figure 3 is included to illustrate the relationship between the typical likelihood and consequences for maximum credible events and extreme events and smaller events (including day-to-day events). Importantly, it shows that the likelihood of extreme events occurring is very low. These extreme events would also require unrealistically high levels of effort

and resources to manage the consequences given their very low likelihood. Extreme low-likelihood, high-consequence events are also sometimes referred to as ‘black swans.’ Our best protection against these events is an agile and responsive system prepared to deal with any emergency. For this reason, the risk assessments mainly used maximum credible event scenarios rather than extreme events.

Examples of other maximum credible event scenarios for some hazards and threats are listed below.

A large meteorite collision on the Earth’s surface is an example of an extreme event, which might only occur once every million years. Although the consequences would be extreme, it would be impractical to prepare for this by redirecting important resources from other important government services.

Earthquake – Magnitude 8.0 earthquake on the Alpine Fault

Volcanic activity – Considerable volcanic unrest in the Taupo Volcanic Zone

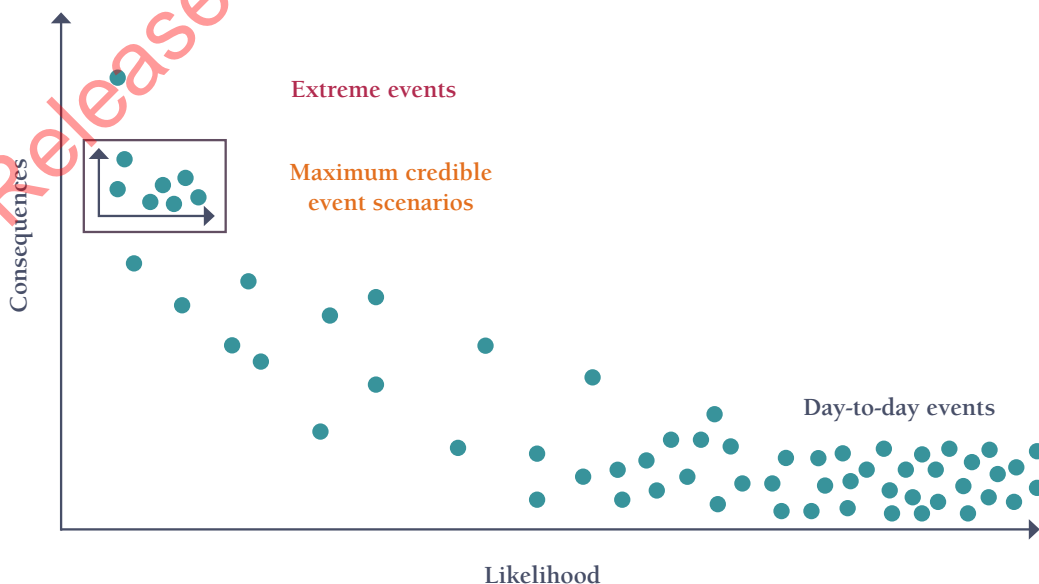
Wildfire – A large wildfire affecting many home and business in a New Zealand city or town

Industrial accident – A major transport incident in the air, at sea, or on land resulting in more than 15 fatalities

Maritime security threats – A fishing vessel operating illegally in New Zealand’s exclusive economic zone

Trade problems – Indefinite closure of a major overseas New Zealand export market (unspecified cause)

Figure 3. The relationship between likelihood and consequences in various possible risk scenarios



5.3

Assessing likelihood

Government agencies assess the likelihood of each scenario using a five-point scale. Each point corresponds to the likelihood of an event or crisis occurring in the next five years. For each step on this scale, the chance of an event happening in the next five years increases by 10 times.

A five-year timeframe is used because it is a reasonable amount of time to plan for. It also allows flexibility, as assessments will be updated regularly and priorities may change. As time passes and new information becomes available, the assessment of the likelihood of an event may decrease or increase.

The likelihood for chosen scenarios can be classified as







- rare
- unlikely
- possible
- likely
- almost certain

For some hazards and threats, assessments can use historical data or scientific modelling to estimate likelihood. This is especially true for natural hazards and some industrial accidents, but less so for malicious threats. For example, earthquakes have a detailed historical and geological record going back centuries in New Zealand. In comparison, there is a shorter period during which we have good data on major cyber incidents.

Hazards and threats occur every year (e.g., small earthquakes, single catchment floods, seasonal influenza outbreaks, and minor electricity outages), however their consequences do not always reach the level that would equate a national risk.

None of the chosen scenarios have an assessed likelihood of 'almost certain.' The majority of the chosen scenarios are assessed to occur in the next 10-100 years or so.

Figure 4. The likelihood of example scenarios

Rare Once every 1,000 or more years	Unlikely Once every 100-1,000 years	Possible Once per 10-100 years	Likely Once per 1-10 years	Almost Certain Once per year
 Tsunami	 Food safety	 Biodiversity loss, ecosystem disruption, and resource depletion	 Plant and animal pests and diseases	Nil
 Volcanic activity		 Terrorism		

5.4

Assessing consequences

Consequences are rated on a five point scale for each of the assets. Much the same as the likelihood scoring method, each step on this scale represents an increase in possible consequences by 10 times.

To assign a consequences score, the exposure and the vulnerability of people and assets is considered. Exposure is a description or measure of the number and type of things we value that could be affected by a hazard or threat (e.g., the number of people, the number and type of buildings, and the financial cost). The vulnerability of each asset is determined by looking at the factors that make them more or less likely to be affected.

The consequences for each asset are classified as

- insignificant
- minor
- moderate
- major
- extreme

While minor consequences should not be dismissed, it is generally only those that are major or extreme that become challenging to manage and become national-level risks. Because they likely relate to rarer and more complex events or crises, these risks also become harder to measure. This increases the uncertainty about that event or crisis, making it more difficult to determine the best management options.³⁴

A specialised formula is used to determine the overall consequences for example scenarios. The formula

1. combines all the consequence scores for each asset;
2. reflects the importance of all of the major and extreme scores; and
3. maintains consistency with international research that suggests methods for measuring the consequences of events.

³⁴ Office of the Prime Minister's Chief Science Advisor. 2016. *Making decisions in the face of uncertainty: Understanding risk.* Part 1 & Part 2.

5.4.1

Understanding overall consequences

While all of the scenarios affect multiple aspects of society, they affect the five asset domains in different ways.

The influenza pandemic scenario has the greatest overall **social indicators** consequences of all of the national risks because of the potential effects on public health and safety. It is followed by the tsunami, armed conflict, and financial crisis scenarios, which are expected to result in a wide range of societal consequences.

The major cyber incident scenario has the potential to be the most destructive for **governance and sovereignty**.

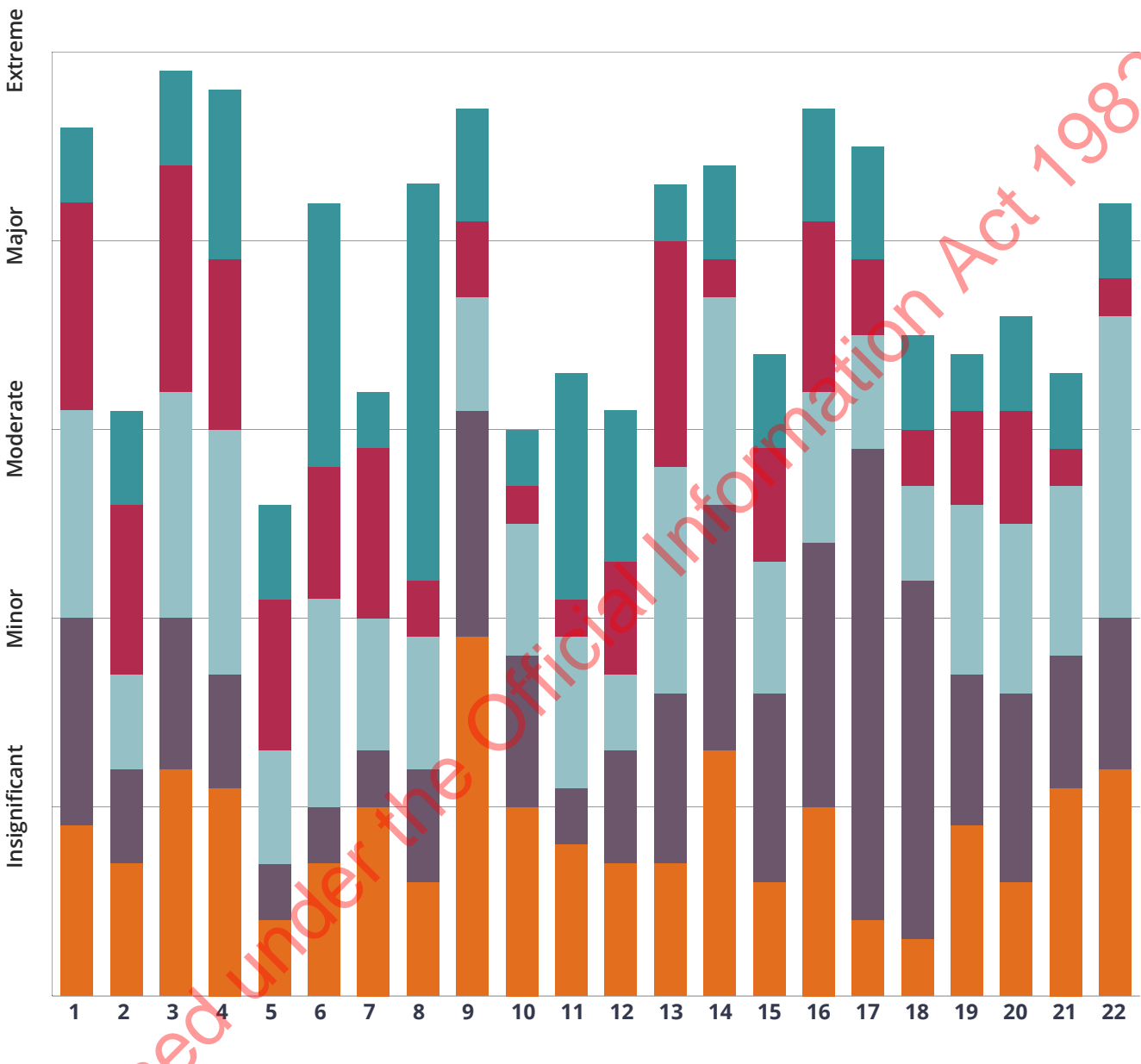
A financial crisis would naturally have the greatest overall **economy** consequences.

The geological natural hazards (especially earthquake and tsunami) and infrastructure failure scenarios have the greatest overall **built environment** consequences. This is often due to the failure of critical lifeline utilities and widespread effects on social functions, employment, and houses, buildings and public facilities.

The loss of the North Island west coast snapper fishery scenario (biodiversity loss) has the greatest consequences for the **natural environment**, as the fishery could potentially be lost for a long time and have secondary consequences on the marine ecosystem. The Natural Environment consequences are also high for a prolonged, severe drought or a significant biosecurity incursion that affects either agriculture or aquaculture.

Other scenarios may not have such distinguishable individual consequences, but when all consequences are considered they could have a serious effect on national wellbeing. If other scenarios were chosen and plotted for each national risk, the effects on the five asset domains and overall consequences would be different. The likelihood of occurrence of the chosen scenarios is not shown in Figure 4; however, such plots can help determine where to direct risk management efforts.

Figure 5. Overall consequences for chosen scenarios



Key		
■	Social Indicators	1 Earthquake
■	Governance and Sovereignty	2 Landslide
■	the Economy	3 Tsunami
■	the Built Environment	4 Volcanic activity
■	the Natural Environment	5 Coastal hazards
		6 Drought and wildfire
		7 Severe weather and flooding
		8 Biodiversity loss, ecosystem disruption and resource depletion
		9 Communicable diseases
		10 Food safety
		11 Plant and animal pests and diseases
		12 Industrial accidents
		13 Infrastructure failure
		14 Armed conflict
		15 Corruption
		16 Espionage and foreign interference
		17 Major cyber incident
		18 Maritime security threats
		19 Terrorism
		20 Transnational organised crime, smuggling and irregular migration
		21 Commodity price shocks and trade problems
		22 Financial crisis

5.4.2

Confidence in the assessments

The assessments are based on the best available knowledge, including historical data and scientific modelling. However, knowledge is never absolute and randomness is a feature of many hazards and threats. Therefore, each assessment retains a degree of uncertainty.

To determine the degree of uncertainty, a subjective description of confidence is made about the assessment of each national risk. It is subjective because some of the example scenarios are unlikely to occur and there is limited evidence about the impact they would have on today's society. The details of some assets will also continue to change, so the exact consequences may not be known until the event or crisis occurs.

The confidence for the assessment of different hazards and threats varies:

- Natural and biological hazard assessments have a high level of confidence.
- Technological hazard, environmental pressures, and economic crises assessments have moderate to very high levels of confidence.
- Malicious threat assessments have moderate to lower levels of confidence.

Corruption and foreign interference are examples of two areas where government agencies are working to better understand the likelihood and consequences of such conditions. These conditions include corrupt practices in New Zealand businesses and links with widespread overseas corruption as well as lost opportunities due to foreign interference in commercial activities.

New Zealand has a long oral and written history and scientific records of natural hazard events. This information can help determine what the consequences could be today. Studying recent biosecurity incursions and their costs also allows a higher level of confidence in the assessments for pests and diseases.

Because of the complex nature of modern infrastructure and the rapid development of information and communications technology, there is generally less confidence in the technological hazard assessments than for natural and biological hazards. In contrast, there is a high level of confidence in the assessments for an industrial accident because there is a lot of historical information on their consequences.

Malicious threats are continually being reassessed by government agencies, but changes can occur quickly that escalate into a security crisis. For example, a hacker who has previously not had the capability for malicious cyber activity against New Zealand could develop that capability. This may change the assessment of a major cyber incident. Historical data may not always assist in such changes to threat levels.

Severe space-weather events are recognised in other countries as a national risk because they can cause widespread damage to infrastructure both in space and on the ground. National electricity grids are particularly vulnerable, as are satellites, radio communication, and aircraft navigation. New Zealand cooperates with international organisations to monitor space weather, but this is an area where government agencies are working to better understand increasing vulnerability due to increasing digital connectivity.

SECTION

6

Managing
national risks

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The risk assessments show that managing national risks is complicated. National risks come from a wide range of hazards and threats, have different likelihoods of occurrence, and have many types of potential consequences. To effectively manage all these variables, a structured approach to risk management is required across a range of government agencies and external partners.

This section sets out some of the steps that the Government is taking to better manage national risks. It explains the governance and management roles, structures, and frameworks that have been put in place within the National Security System. These identify and assess national risks, carry out risk reduction, and set in place the means to prepare for, manage, and recover from the consequences of events and crises that do occur. This process links all of the actions required to better manage national risks. This approach reflects the principles of good risk management, as per the International Risk Management Standard (ISO 31000), which includes determining the best options to manage each risk and monitoring and reviewing the effectiveness of those options. This approach also helps with enabling good governance and decision making.

6.1

Governance of national risks and decision-making

New Zealand's arrangements for dealing with national security are referred to as the National Security System. The National Security System needs to be functioning well to support the achievement of the national security objectives. It also recognises that much of the detail on policy advice, decision making, and implementation of risk reduction and risk treatment is managed more widely through other government processes. The National Security System Handbook provides more information on the National Security System, including national governance structures and decision making processes for national security.

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6.1.1 National security and risk governance bodies

The Cabinet External Relations and Security Committee (ERS), or another Cabinet Committee should circumstances require, governs the management of national risks in New Zealand. The Deputy Prime Minister chairs the ERS committee, which includes a majority of the Ministers responsible for government agencies that manage national risks and any national security or related crises.

To support that process, the Officials' Committee for Domestic and External Security Coordination (ODESC) oversees New Zealand's national security and resilience. ODESC has oversight of risk assessment, various aspects of the 4 Rs for different national risks, and general intelligence and security. ODESC can come together to oversee management of the National Security System or as an ad hoc committee to manage a particular event or crisis. Two smaller boards meet regularly to support ODESC:

- Hazard Risk Board (mainly for natural, biological, and technological hazard issues)
- Security and Intelligence Board (mainly for malicious threats and intelligence and security issues)

Specific Watch Groups made up of senior officials from relevant government agencies can also be put together for keeping an eye on any event or crisis.

The ODESC structure helps organise the right people and procedures to identify national risks. It makes sure that arrangements are made to efficiently and effectively deal with those risks across the National Security system.

6.1.2 Agencies with risk management responsibilities

The management of national risks requires the involvement of multiple government agencies. Multiagency input enables ODESC to maintain its oversight function, both in response to events and crises or in coordination of risk treatment options across the 4 Rs.

The National Security System Handbook defines lead agency responsibilities that include management of crises and proactive risk management.

Some lead agencies have explicit legislative mandates to manage particular events or crises. A lead agency may also have specialised capabilities that mean they naturally lead a whole-of-government approach in an event or crisis; for example, Fire and Emergency New Zealand would lead in the event of wildfire. Fire and Emergency New Zealand also plays a central role in reducing the likelihood of wildfire. Yet some risk reduction measures may require management outside of Fire and Emergency New Zealand's usual range of functions. Local government, for example, may take up responsibility under its land-use planning function for particular risk treatments that minimise the development of new properties and infrastructure in wildfire prone areas.

Responsibility for risk management also includes coordinating a wider group of supporting agencies to assess and treat risks when no particular event or crises has occurred. Fire and Emergency New Zealand, for example, also plays a central role in reducing the likelihood of wildfire. Some risk reduction measures, however, may require management outside of Fire and Emergency New Zealand's usual range of functions. Local government, for instance, may take up responsibility under its land-use planning function for particular risk treatments that minimise the development of new properties and infrastructure in wildfire prone areas.

As noted in the risk summaries, ODESC has identified one or more agencies to take responsibility for coordinating national risk management activities for each hazard or threat. This responsibility includes reporting to ODESC on progress with risk management over time. Risk coordination or ownership forms a crucial element of the risk management cycle that is consistent with the Organisation for Economic Co-operation and Development recommendations and international standards.³⁵ There is often more than one agency taking the lead in coordinating management of particular risks. Importantly, they are supported by other government agencies and private stakeholders, particularly when responsibilities break into national, regional, and local roles.

Risk coordination includes stewardship or direct involvement in analysis and setting policy. Its aim is to manage national risks and align risk management priorities between government agencies, local government, non-governmental organisations, and the private sector. The Hazard Risk Board and the Security and Intelligence Board look to oversee a system where risk managing agencies optimise existing capabilities and capacities.

Major cyber incident example: Three dedicated groups lead and coordinate action across central government and wider society to manage the risk of a major cyber incident. The National Cyber Policy Office (NCPO) within the Department of Prime Minister and Cabinet leads advice to the Government on cyber security policy and investment. The National Cyber Security Centre (NCSC) within the Government Communications Security Bureau leads engagement with critical national infrastructure entities to improve their cyber security resilience. CERT NZ leads engagement with businesses and individuals, building cyber security resilience and raising awareness of threats in the wider community. CERT NZ also works with the international CERT community, supported by the broader international engagement and rules-based advocacy of the Ministry of Foreign Affairs and Trade.

6.1.3

Academia and research organisations

Risk management is most effective when underpinned by sound scientific evidence. Crown Research Institutes (CRIs), such as GNS Science, NIWA and MetService, along with Crown entities, such as the Earthquake Commission, play important roles by carrying out scientific research for the benefit of New Zealand. In the context of national risks, the contribution of CRIs is most frequently seen in relation to natural hazards. However, increasing consideration is being given to building the evidence base for analysis of threats as well as hazards.

The academic community also plays an important role in improving analysis across a range of national risks and providing independent expertise based on long-term specialisation in particular fields.

35 Organisation for Economic Co-operation and Development. *OECD Recommendation on the Governance of Critical Risks*. URL: www.oecd.org/gov/risk/recommendation-on-governance-of-critical-risks.htm (accessed 30 April 2018).

6.1.4

Local government, non-governmental organisations, and the private sector

While central government agencies have responsibility for establishing national risk management frameworks, local government, non-governmental organisations, and the private sector have critically important roles to play. This is because they are often the closest to events and crises when they occur, meaning they are vital to readiness, response, and recovery, and they are often in the best position to implement risk reduction or risk treatment.

For example, local government owns and manages approximately \$120 billion of fixed assets, including the three waters network (drinking, waste, and storm water) and most roads. A review is underway to look at how to improve the management of the three waters to better support New Zealand's prosperity, health, safety, and the environment. Local government also has responsibility to manage natural hazards through resource planning mechanisms such as regional policy statements and regional and district plans. Many sections of critical lifeline utilities are also privately owned and operated (e.g., power generation, telecommunications, and oil).³⁶ Therefore, private companies play an important role in identifying and upgrading vulnerable infrastructure and restoring services as soon as possible after an event.

Involvement from non-governmental organisations, the private sector, and iwi was important in contributing to the response after the Canterbury earthquakes, where there were wide-reaching impacts that initially overwhelmed the ability of the Government to respond. Canterbury's recovery also relied on the private sector (particularly insurance and construction) and many non-governmental organisations, including Te Rūnanga o Ngāi Tahu—the organisation that services the main South Island Māori tribe's statutory rights.

6.2

Promoting societal resilience

Many of New Zealand's hazards and threats are relatively well understood. However, the future is uncertain, and some major events and crises will occur unexpectedly. Given our susceptibility to natural hazards and exposure to developing threats, such as malicious cyber activity and transnational organised crime, it is important to continue improving societal resilience so that we can cope with a range of possible events.

Societal resilience relies on accepting that national risks will change and unexpected occurrences are part of daily life. Society may not always return exactly to the way things were before an event, but with resilience and good risk management it can adapt and even thrive.

As described in the National Disaster Resilience Strategy, improved management of national risk is an important element to increasing community resilience or tolerance for disruption. Societal resilience cannot be the sole responsibility of government agencies. It is a shared responsibility and aspiration for central and local government, non-governmental organisations, the private sector, individuals, communities, and iwi.

6.3

Risk treatment

Once a national risk has been assessed, the next step in a basic risk management process is to determine options to treat or modify the risk. National risks all require some form of risk treatment, and there are a lot of mechanisms in place for this. For example

- building regulations help ensure that people can use buildings safely, that those buildings are sustainable and safe from earthquakes and meteorological hazards
- the healthcare system includes initiatives that would help manage disease outbreaks, such as having stockpiles of vaccines and broad spectrum antibiotics available
- government agencies gather information on emerging malicious threats, such as terrorism or irregular migrations, so potential issues can be addressed early.

Risk treatment also involves expanding or improving the options available for managing risks across the 4 Rs, and assessing and implementing those options.

Various factors influence why particular risk treatment options may be put in place, including costs, benefits, likelihood of success, and any trade-offs that may be involved. Some level of risk will remain after treatment options have been implemented; this is referred to as residual risk. For example, national wellbeing is dependent on having an open society, with people, goods, and ideas flowing in and out of the country. However, these flows also increase exposure to risks, such as transnational organised crime and plant and animal pests and diseases. Eliminating these risks entirely would damage the openness of our society, resulting in lost opportunities for New Zealand.

Similarly, the benefits of access to and living by the ocean generally outweigh the potential of exposure to tsunami and coastal inundation. Many risks come with a corresponding benefit, making exposure to that risk worthwhile for many people. Sometimes a degree of financial risk can be transferred to another party through insurance, as is the case for earthquakes. However, most risk treatment options focus on achieving an acceptable level of risk, rather than attempting to eliminate or transfer it.

Managing the costs of national risks

Events and crises can be costly for the economy of New Zealand. The economic response will typically be influenced by the specific hazard or threat and its impact on the economy and the fiscal and financial position of the country.

The state of government finances is reported in monthly financial statements. Additionally, every four years the Treasury's publication 'The Investment Statement' describes and calculates the value of government assets and liabilities. It also documents

changes in the previous four years and foreseeable changes in the coming four years. The calculations consider the sustainability, resilience, and adaptability of all significant government assets. New Zealand's approach to funding the potential costs of national risks is to run a strong fiscal position with low debt levels.

Assessment information is also used for decisions on risk financing. One risk financing strategy available in New Zealand is primary natural hazard insurance cover for owners of residential properties, which is provided by the Earthquake Commission.

SECTION

7

Conclusion

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Making appropriate decisions on how to manage risk in an evolving environment requires foresight and cooperation across government agencies, the private sector, and across the public domain.

New Zealand has an experienced and responsive National Security System prepared to deal with a range of hazards and threats. The National Security System is focused on becoming as effective at reducing risk as it is in responding to events. Having a national risk management framework can help a country understand the risks they face so they can be more proactive in the management of those risks. This includes developing capabilities when gaps in risk management are identified, reducing exposure and vulnerability, and building societal resilience. Understanding national risks puts New Zealand in the best position to build the capabilities or increase the 'capitals' underpinning sustained national wellbeing.























Although national risks can be assessed and managed, they cannot be entirely eliminated and there will be some exposure that we as a nation must tolerate or accept. There will also always be some level of

uncertainty associated with the future regarding how national risks may evolve. As a nation, we need to think about and plan for the challenges that may arise from national risks, which include development of an agile system of response that will serve us when events cascade or combine and result in threats or hazards we had not anticipated. At the same time, there is a need to be aware of trends and transitions or new developments, such as climate change, shifts in the international order, advancements in the space industry, and water security issues (including waterborne disease) that affect national risks.

The New Zealand National Risk Report is forward-looking and paves the way for assessments of a full range of hazards and threats. By encouraging open discussion and a common understanding of national risks, current and future assessments will help inform New Zealand's broader priorities, infrastructure and capability investments, and long-term community plans.

New Zealand has a strong track record as a safe, resilient, and prosperous nation. A sound approach to national risk management will help ensure it stays that way.

Table 3. Hazards and threats contributing to national risks

 Earthquake	 Communicable diseases	 Major cyber incident
 Landslide	 Food safety	 Maritime security threats
 Tsunami	 Plant and animal pests and diseases	 Terrorism
 Volcanic activity	 Industrial accidents	 Transnational organised crime, smuggling, and irregular migration
 Coastal hazards	 Infrastructure failure	 Commodity price shocks and trade problems
 Drought and wildfire	 Armed conflict	 Financial crisis
 Severe weather and flooding	 Corruption	
 Biodiversity loss, ecosystem disruption and resource depletion	 Espionage and foreign interference	



**DEPARTMENT OF THE
PRIME MINISTER AND CABINET**
TE TARI O TE PIRIMIA ME TE KOMITI MATUA

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