

Policy Brief

Implications from the extent of vulnerabilities to national security from supply chain disruptions

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Executive Summary

Covid-19 highlighted that supply chain disruptions can become a matter of national security. This research shows that there are always security effects from supply chain disruptions, such as sabotage, but that societal effects can elevate normally non-security matters to a matter for national security.

The exploratory research that underpins this brief points to some key vulnerabilities for New Zealand's national security from supply chain disruptions. Such vulnerabilities are exacerbated by deep uncertainty, which is a state in which all usual methods to assess a situation no longer hold. In fact, deep uncertainty is a vulnerability in itself.

New Zealand governmental systems are vulnerable in several ways from major supply chain disruptions –from increased intentional threats to supply chains, from unpredictable ripple effects on supply chains and on government systems, from deeply held assumptions that affect policy and operational choices, from gaps in key relationships and from pressures on government capability and capacity.

These vulnerabilities point to further work in the following areas:

- Hardwire questioning of assumptions and inclusion of foresight work into supply chain strategy, policy and planning
- Research the effects of including assumptions in such work
- Research the contingency capability government needs to sustainably respond to major supply chain disruptions
- Map supply chain relationships between individuals, local government, industry and government and identify gaps.

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1. Introduction

This research project was triggered by the wide-reaching effects of supply chain disruptions on New Zealand society from Covid-19. That event created unprecedented disruptions to the flows of goods that affected people's health, livelihoods and even their ability to access food. How could New Zealand be better prepared in the future? Is it possible to develop early warning signs to front-foot future disruptions? As a first step towards answering these questions, this research sought to find out the extent of gaps and vulnerabilities in government from Covid-19's supply chain disruptions.

2. Overview of the problem

Covid-19 showed that the market failed to keep goods moving in a time of global disruption, and that keeping goods moving can be a matter of national security. The complexity and dynamics of supply chains are well-known to supply chain managers but less so to government officials, or to other actors that depend on supply chains, such as individuals and local communities. Even less knowledge exists on the extent to which supply chain disruptions affect national security.

Such knowledge is critical at a time when supply chain disruptions are likely to become more frequent and can have unpredictable effects. These sorts of disruptions include global pandemics, natural disasters, global economic recession, trade conflicts, terrorism and piracy, destruction of information systems, the destruction of transport infrastructure and disruption to energy supplies, (both of which can also be an effect from other disruptions) (Ivanov & Dolgui, 2021; Lawrence et al., 2020; Queiroz et al., 2020; Solingen, 2021).

This list highlights several points. The first is that the world is experiencing some of these disruptions right now. The second is that the interconnected nature of global trade and supply chain systems dictates that even if there is a disruption in one country alone, if that country is a major global supplier, supply chains everywhere will be affected. Third, the confluence of two or more disruptions will have a multiplier effect (Davis et al., 2021; Lawrence et al., 2020; Le, 2019; Matthewman, 2017). Climate change is intensifying existing weather events, such as cyclones, floods and droughts (The Royal Society, 2020). It is therefore likely that a financial crash coupled with climate change events in a major supplier country, such as China or the US, will have significant effects on New Zealand's supply chains and the supply of some goods. When disruptions converge, they result in unpredictability and uncertainty.

If future supply chain disruptions is a matter of national security, preparedness for such disruptions is critical for New Zealand, which is at the end of global supply chains.

Note that this research was exploratory, and so was not aimed at directly solving the problem. Rather its aim was to provide direction for further work to solve the problem.

The research was undertaken in three stages:

1. A literature review, completed on 5 May 2022
2. 20 interviews with officials from eight agencies that play a large part in policy and regulation relating to supply chains¹, conducted from June to December 2022.
3. A workshop to test the findings from the research held on 16 February 2023 (during Cyclone Gabrielle, ironically)

¹ Aviation Security Service, Civil Aviation Authority, Department of Prime Minister and Cabinet, Ministry of Business, Innovation and Employment, Ministry of Foreign Affairs and Trade, Ministry for Primary Industries, Ministry of Transport, New Zealand Customs Service.

I would like to acknowledge the funding received from the Multi-Agency Research Network, which helped me complete this research project.

3. Findings

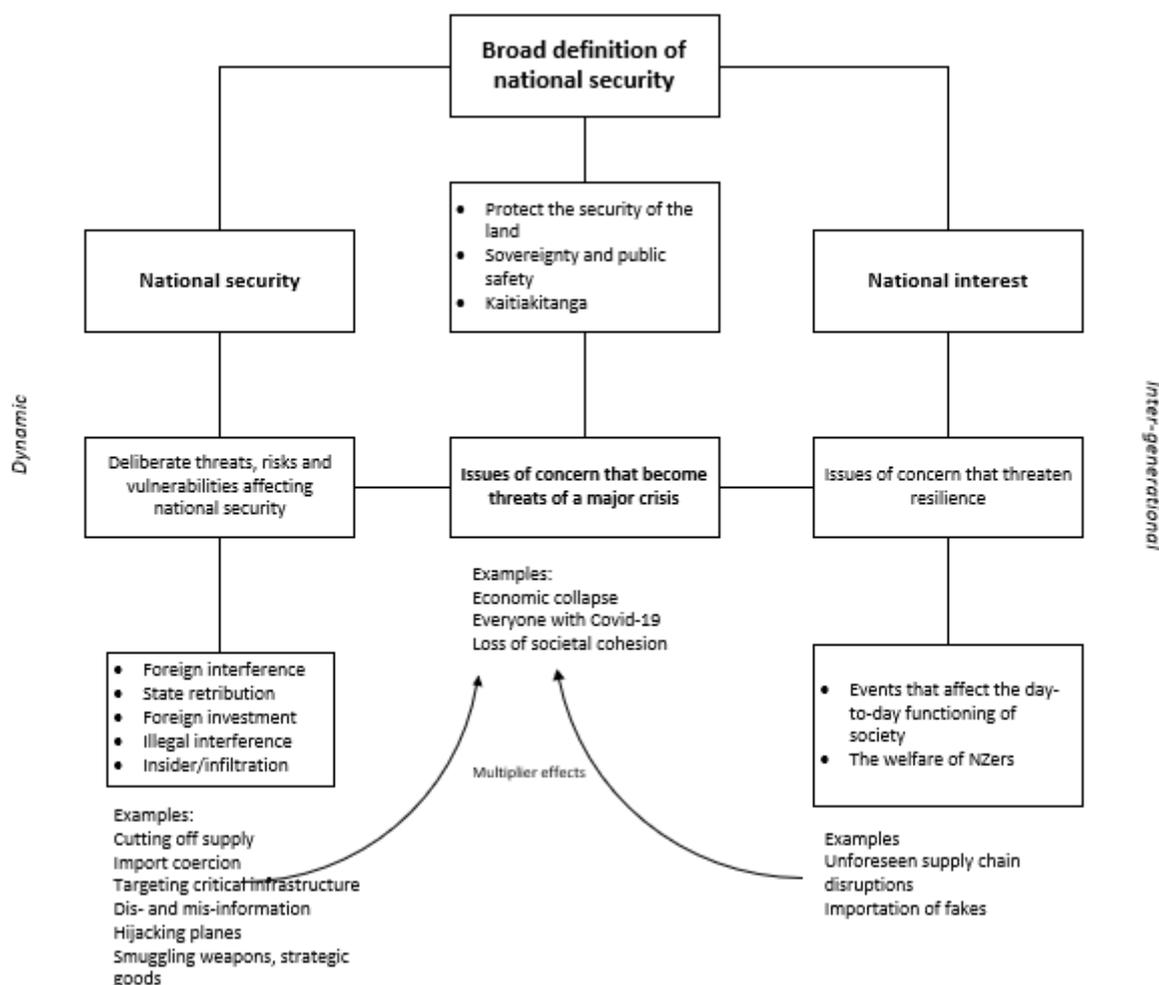
3.1 Supply chain disruptions as a matter of national security

New Zealand's geographical distance from most of its markets and its economic reliance on exports makes it particularly vulnerable to supply chain disruptions. But this research has revealed how supply chain disruptions are more than economic. From the interviews, it is clear that supply chain disruptions have multiple effects on national security. Unsurprisingly, they produce or magnify traditional security risks and vulnerabilities, but they also have a multiplier effect on societal interests such as the economy and social cohesion. Interviewees provided insights into these different aspects of national security - state-based threats, societal security, resilience, critical goods and economic security.

Figure 1 below illustrates the relationship between national security and national interests, and where, at a high level, supply chain disruptions create the potential for significant national harm. In an event as far-reaching as Covid-19, national security threats and risks and national interests coalesce into a major issue. On the left are supply chain risks for national security that exist at any time. On the right are supply chain matters that are of national interest but do not reach the bar of national security. When these matters of national interest escalate at the same time that national security risks escalate, there is a multiplier effect that elevates supply chain disruptions to a matter of national security.

A significant feature of Figure 1 is the inherent characteristics of national security as dynamic and of national interest as intergenerational, and therefore slower to change. The dynamics come from changing patterns of risk and threat; the intergenerational aspect comes from the long-term nature of societal interests, such as a stable, functioning and cohesive society – something that transcends political differences. Where the two combine, as in Covid-19, the situation becomes both dynamic and intergenerational, creating a much higher level of vulnerability.

Figure 1: Relationship of supply chain vulnerabilities to national security



In the wide-reaching disruption of the pandemic, many more agencies were involved than ever before. One interviewee commented that at one stage there were 42 agencies around their table. It is extremely challenging to manage all the threads created by such broad interconnections, suggesting the need for some deep thinking on how to manage this sort of situation in the future. The interviews revealed that the national security system’s established processes worked to a point, but that also, each agency created its own Covid-19 response groups that interacted with response groups in other agencies.

3.2 Supply chain disruptions and national resilience

In times of stability, government’s role in supply chain resilience spans its stewardship of the flows of goods and transport, which includes having the right strategies and narratives and the right capabilities. Interviews highlighted the work needed to create resilience in the first place. One such area is a government stewardship and kaitiakitanga approach to oversight of freight/supply chain systems, reaching deep into communities and out to international connections. One interviewee connected kaitiakitanga with security and gave the example of repatriating ancestral remains, highlighting the fact that supply chains service community, as well as commercial, interests.

The interviews also confirmed the literature in that at times of significant disruption, the government may need to take a temporary ‘control’ approach. Getting the mix of control and

stewardship right is tricky. In part, the success and duration of control measures will depend on the level of social licence for such measures.

The third area of resilience highlighted in the interviews highlights the capabilities government has at its disposal to respond to major disruptions. First, the government has a contingency capability in its operational and regulatory agencies that deal with goods and transport flows, particularly across the border. These agencies have core control skills that can be deployed to the areas of most need. For example, Aviation Security staff were deployed to Managed Isolation and Quarantine facilities; New Zealand Customs Service's and Ministry for Primary Industry's border staff were redeployed from airports to maritime and trade functions. The other important area is the capability provided by strategic analysts. These analysts are used to working with ambiguity and uncertainty, and so are well equipped to respond to an emerging crisis situations, such as the pandemic.

While good news, these capabilities are not endless. When a disruption is sustained, as Covid-19 has been, officials are at risk of burn out. Another large disruption in the near future could see a diminished capacity to use this capability, raising questions about appropriate levels of government staffing. For New Zealand to be really resilient in the face of major disruptions, the private sector and government need to have enough surge capacity to respond, and enough overall capacity to sustain adaptation to the crisis over the medium term, as for Covid-19. Not all crises are short-lived, and while any sector of society can rise to the needs of an emergency, a lack of capacity will make that difficult for longer disruptions. Cost-benefit models may need to explicitly incorporate this sort of contingency capacity.

3.3 The scope of vulnerabilities and risks

Mirroring the two elements of national security illustrated in Figure 1, the interviews revealed two distinct types of vulnerabilities and risks arising from supply chain disruptions – strategic, which align with the dynamic national security strand and supply chain systems, which align with national interest. Combined, they paint a picture of the vulnerabilities to national security in the event of a major disruption – the middle strand in Figure 1. My interviews suggest that the strategic/national security strand of vulnerabilities and risks are being attended to as part of national security 'business as usual and will therefore not be covered here'.

Less obvious vulnerabilities that arise from supply chain systems and from the ripple effects of disruptions are also of concern for government. Specific government gaps and vulnerabilities also contribute to a lack of resilience in supply chain systems. Criminal activities further impact supply chain resilience. Below are some notable vulnerabilities.

3.3.1 Structural/wicked problems

The interviews revealed that New Zealand suffers from several structural problems:

- Dependence on international shipping (99% of trade by volume)
- The predominance of Small and Medium-sized Enterprises (SMEs). SMEs lack the resources, software and skills that enable resilience.
- Brittle supply chains that lack agility
- Lack of surge capacity in ports and transport

In addition, there is a lack of community awareness of the part all members of the population play in the movement of goods in and out of the country. These vulnerabilities are known, and are being addressed via the Supply Chain and Freight System strategy work. Less known are two different types of vulnerabilities – ripple effects for government and assumptions.

3.3.2 Being able to front-foot ripple effects

Supply chain disruptions create ripple effects – secondary effects that are not so readily identifiable in advance. A particular vulnerability identified in this area is that of intermediate goods.

Intermediate goods are inputs to manufactured items – imported goods needed to make or maintain things, from key or replacement mechanical parts to the packaging required to disseminate the goods to the public. During Covid-19, government agencies introduced specific mitigations for some of these vulnerabilities but anticipating where exactly future vulnerabilities might fall is extremely difficult.

Gaps in government systems contribute to ripple effects. A strategic risk for the whole supply chain system is a lack of operational oversight in government. Just prior to the pandemic, there was an emerging realisation that the freight system as an interconnected whole needed a particular policy focus. At the border, the New Zealand Customs Service has long provided oversight of supply chain security, but there has never been any call for operational oversight of freight or supply chains as a whole. During the pandemic the Ministry of Transport stepped in, but the lack of ongoing operational oversight is a vulnerability. A part of this vulnerability is the absence of local government in both policy and operations. This research has confirmed the necessity for whole-of-society involvement in supply chain resilience. Local government can play an important connecting role.

Another gap occurs in the area of standards and due diligence processes for imported goods. Agencies closely involved with imports, such as Customs, MFAT, MBIE and MPI, are familiar with the importance of controls for ensuring the quality of goods, and the processes involved. Other agencies are not. Take the example of Rapid Antigen Tests (RATs). The public was able to see what other countries had approved, and assumed that what was approved in Australia was approved in New Zealand. New Zealand Customs Service officials found that the Ministry of Health, once alerted to the problem, did not respond quickly. A ripple effect for the New Zealand Customs Service was being required to seize (with all its associated administrative work) thousands of unapproved RATs, many of which would have been safe for people to use. This unproductive work diverted resources from providing important industry support and intercepting criminal offending.

A third vulnerability relates to data. First, the supply chain data used by Maritime NZ, Statistics NZ and other agencies comes from a single source – New Zealand Customs Service. While there are mitigations in place, it is important to keep this visible. A related vulnerability is inadequate data to understand the freight system. A part of the issue is that the trade data that the New Zealand Customs Service collects is not connected to the movement data that Ministry of Transport is gathering. So the vulnerability arises from knowing which specific goods are moving and where goods in general are moving but not how these two pieces of information relate to each other. This problem has been identified in the supply chain strategy, so is likely to be remedied in the future.

A dynamic to reflect on is the ripple effects from supply chain disruptions triggered by government policies. For example, risks seen as unacceptable, such as pests and diseases, or concerns over military supply chains, could result in bottlenecks at ports or general unavailability of some goods prioritised for the military. Government policy processes may need to contain a check on potential effects to supply chains.

3.4 Assumptions – a particular type of vulnerability

A particular type of vulnerability is the effect of incorrect assumptions on resilience and responses to disruptions. A widely publicised incorrect assumption early in the pandemic was the framing of the national Pandemic Plan, which focused solely on influenza, and therefore contained many incorrect

assumptions. One such assumption was that the government would never close the border. While the Pandemic Plan had some actions for closing the border, they were not detailed and did not anticipate long periods of quarantine. Some of the effects of these assumptions were short supplies of PPE and lack of preparation for quarantine (Controller and Auditor General, 2020). The interviews, though, revealed a variety of assumptions that affected government work and left officials unprepared for the unexpected dynamics at play.

Underpinning assumptions about free trade and the resilience of markets were deeply challenged by the pandemic. Prior to the pandemic, at the international trade policy level, trade agreements kept goods moving relatively smoothly. However, during Covid-19, some markets became less open, requiring a government rethink of international trade relationships. The behaviour of large states led to blockages in ports; the cessation of passenger flights led to the loss of important trade links. These things all stopped goods moving. The salient point is that officials were surprised by these events. New Zealand's economic settings and trade practices had been a given that Covid-19 forced officials to question. The Trade Recovery Strategy is already responding to some of these challenges.

Border agencies assumed the policy agencies involved in the pandemic response would know how goods move, and the related import and export regulatory processes. The interviews showed that many agencies have an interest in keeping the goods moving but their own responsibilities in the goods ecosystem are not recognised. As outlined in 3.3.2 above, underlying the Ministry of Health's slow response to changing import regulations for RATs came from a lack of understanding about how goods move. This lack of understanding suggests Ministry of Health officials assumed that knowing how goods move and are regulated is not their job. This may not be correct, but the key point is that such assumptions need to be surfaced before a disruption occurs so that its ripple effects can be examined and mitigated.

The overarching question raised by this section is 'do these assumptions serve New Zealand well for the future?' For example, a key assumption that the disruptions would not last for as long as they did pointed to a desire to return to 'normal'. While some interviewees recognised that post-Covid was going to be different from pre-Covid, there was an underlying assumption that at some point, New Zealand would recover and government processes would return to the way they had been. There is a lesson here. Long-held assumptions can become so ingrained that they are perceived as facts, and as such, do not need to be questioned. This is a vulnerability that needs to be, at the least, kept visible and preferably investigated.

3.5 Other notable findings

Two findings that went beyond the scoping exercise are important for thinking about resilience against supply chain vulnerabilities. The first is deep uncertainty; the second is critical goods.

3.5.1 Deep uncertainty

The literature review identified that when uncertainty falls into the realm of unknown-unknowns, it becomes 'deep uncertainty' – a space where no single actor has the necessary data or analytical models or knows which outcomes are the most desirable (Ivanov & Dolgui, 2021). The literature review also indicated that deep uncertainty generally falls within the middle phase of a supply chain disruption, as ripple and bullwhip effects begin to be felt. The interviews suggest that for government, the deep uncertainty occurs in the early stages of a disruption, when the data is absent and policy decisions have to be made on best guesses. For example, it was not until about four months into the pandemic that trade data became available, through the creation of a data clearing house. If government decision-making is affected by deep uncertainty in the early stages of a

disruption and supply chain managers' decision-making is affected by deep uncertainty in the middle stages of a disruption, there seems to be a need for a mechanism that connects the two.

The interviews reinforced the need for foresight rather than forecasting as a resilience measure. One interviewee indicated a need for 50-year foresight work – what are the issues now that in 50 years' time, people will look back and say 'if only we'd listened'? Two interviewees gave examples of Māori businesses that have 500-year strategic plans. This extreme timeframe suggests a completely different way of thinking about foresight and resilience that could be transformational. For example, such thinking must go well beyond profit and data analytics. It knowingly steps into deep uncertainty, where values such as the wellbeing of future generations become the focus.

The effects of deep uncertainty apply not only in the future but in the present. Deep uncertainty exists because the world we are in is uncertain. Foresight tools can help create resilience in such an uncertain world by helping us to focus on what is truly important. Unfortunately, such tools are often seen as nice to have rather than as essential. Hardwiring foresight work into government processes would help improve this situation.

3.5.2 Critical goods

In a major supply chain disruption, prioritising critical goods might seem logical but is in practice difficult. There are two inherent problems. The first is how to decide what is a critical good so it can be prioritised; the second is how to isolate it from non-critical goods. Interviewees agreed that at a high level, critical goods are critical to human health, life and security.² The interviews suggest that goods CAN be (and were) prioritised. For Covid-19, there were two phases of prioritisation – first, pandemic-specific goods (PPE, RATs, and later, vaccines) were prioritised early in the response, and second, during lockdown, essential goods were identified. However, this work was during the pandemic. Preparing for future disruptions is more complex, with so many interdependencies, particularly between the many imported components (intermediate goods) needed to produce exports or to keep essential infrastructure and security mechanisms functioning. These interdependencies make identification of the critical imported component parts of essential goods problematic.

The second problem is operational but needs to be more widely understood. Container ships contain a mix of goods. New Zealand's small market makes it unlikely that a single ship could carry critical goods only. Containers often contain a mix of goods, making the separation into critical and non-critical impractical. Prioritisation can occur but only in limited cases. An example is the fast-tracking of Pfizer vaccines into New Zealand. This was made possible by two elements:

- Pfizer's tightly controlled supply chain that made it easy to negotiate facilitated entry into New Zealand
- New Zealand Customs Service's skill at facilitating the border clearance of pre-approved goods.

Identifying critical goods ahead of an unknown disruption is difficult. What Covid-19 did show, though, is that the private sector as well as government need to find out what inputs, and the format of those inputs, are critical to keeping their businesses and society running in the face of goods shortages. Resilience depends on being well-informed about goods in different sectors.

² It was not clear if non-humans also fit into this category eg animals.

4. Implications and recommendations

This research is a starting point, and as such, points to areas for further government work, rather than providing solutions to the presenting problem. Neither does it suggest who might lead these areas of work. Even so, the recommendations do suggest, in the first instance, the Department of Prime Minister and Cabinet, as lead for national security.

Supply chain disruptions that affect national security have complex effects that take government into spaces where there are absences of knowledge. Mechanisms that will fill those gaps in knowledge are therefore needed. As mentioned earlier, government work on increasing the resilience of supply chains and freight systems is underway. The contribution of my research is to point to areas that may be under-rated or overlooked. A starting point is deep uncertainty.

Deep uncertainty can be an uncomfortable and stressful space. Increasing understanding about what happened during Covid-19's time of deep uncertainty, particularly in relation to supply chains, but also for national security more generally, will help prepare governments for the next event. One of the contributors to deep uncertainty was deeply held assumptions, or 'facts' about how markets and supply chains work.

Spending time to deeply interrogate these assumptions will provide fresh material for scenario and foresight work and will reduce the risk of closed loop thinking. There is a risk that such work will be seen as a 'nice to have', and that its importance will be diluted over time. However, Sir Peter Gluckman and Dr Anne Bardsley (2021) have already pointed to the need for better futures thinking processes. There is also a risk that results of such interrogations be misinterpreted by the media and the public. Further research on the effects of including such work systematically into government processes would therefore be valuable.

Recommendation 1:

Systematically build the questioning of deeply held assumptions about markets, supply chains, and how government and society work into policy work.

Recommendation 2:

Hard-wire foresight work into supply chain strategy, policy and planning processes, including:

- **Resilience and vulnerabilities over the very long term (e.g. 100 or more years)**
- **Questioning deeply held assumptions.**

Recommendation 3:

Conduct research to evaluate the effect of interrogating assumptions on strategy and planning.

There are implications for national security from government's lack of resilience. The first is that continuing to operate during major disruptions and times of deep uncertainty includes the day-to-day security practices, such as conducting due diligence and monitoring goods flows for risks. In other words, during a major disruption, government has to maintain business as usual at the same time as it has to respond to the disruption.

The second relates to contingency – whether there is enough 'give' in government systems to be able to flex during disruptions and then continue to operate after the disruption has settled. As one official put it, the capacity needs to be in place prior to a disruption, not during.

The third is understanding what to expect in times of unprecedented disruption. Covid-19 highlighted how major disruptions play havoc with the availability of accurate data. In a completely new situation like Covid-19, there were unknown-unknowns, such as the economic effects of closing the border to most people movements. As a result, in the initial phases of the pandemic, officials were basing their advice on “best reckons”.

Together, these implications point to a need for work on government capacity and capability needs for resilience against deep uncertainty. This research points to the need to better understand the contingency capability needed – the amount of ‘give’ the public sector needs to have to be able to ‘bounce back better’ from disruptions. Such work includes but goes beyond supply chains in protecting New Zealand’s national security.

Recommendation 4:

Research be conducted into the contingency capability needed for the public sector to sustainably address future disruptions, with a special focus on deep uncertainty.

Another implication from deep uncertainty is the need for as many diverse voices as possible in both preparation and response and recovery from disruptions. This research has revealed some actors, such as individual consumers and local government, are not usually involved in supply chain and freight system discussions. When a situation is deeply uncertain, collective wisdom from multiple and diverse world views and experiences can help us see what we cannot see on our own. Together with the gaps in knowledge identified in this research, the need to operate in deep uncertainty in the future points to the need for specific work to map potential and existing supply chain relationships across New Zealand communities, industry and government and identify gaps in relationships. This would enable systematic development of relationships where gaps are identified. One way of developing relationships would be co-design and co-discovery exercises, where multidisciplinary and diverse groups of actors came together to decipher supply chain threads and interconnections. This could be done on a sector by sector basis for practical purposes, but in reality, sectors do not operate independently of one another. Sectors with the largest consequences from supply chain disruptions, such as primary industries, transport, energy and defence could be the starting point.

Recommendation 5:

Map potential and existing supply chain relationships across New Zealand communities, industry and government

Recommendation 6:

Systematically develop supply chain relationships where gaps are identified.

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