How effective are resilience-focused policies?

A literature review

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ABSTRACT

This literature review examines evidence about the effectiveness of policies that aim to enhance the resilience of economic systems to some shocks or trends to which New Zealand might be most exposed. There are many such policies – ones that aim to identify and manage risks, prepare for a shock, recover and regain lost functionality following a shock, and adapt and transform in preparation for future shocks. Evidence suggests that some policies are effective in enhancing the resilience of economic systems. However, evidence is patchy and depends on the specific definition of resilience used. Key insights from evidence include ensuring effective governance and institutional arrangements, avoiding crowding out private risk mitigation efforts, and balancing short- and long-term goals. Priority areas for New Zealand include strengthening governance (including clarifying roles of central and local government), improving data and tools, preparing for, and shaping, structural change, and reducing inequities to help build resilience capacities.

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Executive Summary

BACKGROUND

Aotearoa New Zealand is exposed to a range of disruptive shocks and trends. The ability of economic systems to weather, and thrive in the aftermath of, such shocks and trends partly depends on the effectiveness of policy settings.

This paper synthesises evidence about resilience-focused policies, based on the questions below. The focus is on resilience in an economic context – policies aimed at enhancing the resilience of economic systems. Despite this focus, the scope of the paper is broad, as many different policies are relevant to the resilience of economic systems, economic systems are exposed to non-economic as well as economic shocks, and economic systems are fundamentally connected to environmental, social and other systems. This paper therefore provides a general overview of relevant policies rather than detailed evidence about any specific policy.

The paper adopts the definition of resilience from New Zealand's 2019 National Disaster Resilience Strategy:

> *"The ability to anticipate and resist the effects of a disruptive event, minimise adverse impacts, respond effectively post-event, maintain or recover functionality, and adapt in a way that allows for learning and thriving".*

This wide definition of resilience includes long-term adaptation and learning which are crucial to a system's ability to cope with unexpected disruptions and challenges in the future.

TO WHAT TYPES OF DISRUPTIVE SHOCKS OR TRENDS MIGHT NEW ZEALAND BE MOST EXPOSED?

Fundamentally, resilience is about dealing with shocks, disturbances and long-term trends. New Zealand's distinctive features provide one way of framing these shocks, disturbances and trends, and suggest the country may be particularly exposed to:

- global recessions and disruptions
- supply chain disruptions
- earthquakes, tsunami, volcanic eruptions, and other natural disasters
- climate change – both the physical risks such as sea level rise, and the transition risks arising from lowering emissions and adapting to the effects of climate change.

Overall, New Zealand is among the 'top' few OECD countries regarding the number of natural and man-made disruptive events that it experiences.

Markets tend to cope quite well with relatively minor shocks. Policy is more concerned with larger or more novel shocks, and with known persistent trends. Climate change is an example of a persistent trend that generates further shocks, the frequency and severity of which are increasing. Resilience policy work therefore involves building the capacity to adapt to multiple shocks and trends over the long term.

WHICH POLICIES MAY ENHANCE RESILIENCE TO THOSE SHOCKS OR TRENDS?

Numerous policies are relevant to enhancing the resilience of economic systems to the shocks above:

1. Identifying and managing risks (risk mitigation) – including science about risks; monitoring emerging trends; information provision, disclosure and uptake.
2. Preparing for a shock (impact absorption) – including governance and institutional arrangements; planning and infrastructure that integrates risks; early warning systems;

stockpiling products; insurance and other risk transfer instruments; labour market and other framework policies that cushion a shock or reduce its persistence.

3. Recovering and regaining lost functionality (recovery) – including counter-cyclical monetary and fiscal policy; aid and emergency support for firms and households; locally-led responses to emergencies and disruptions.
4. Adapting and transforming for future shocks (adaptation/transformation) – including learning from previous shocks; building long-term capacities and capabilities in communities; policies to support structural transitions.

HOW EFFECTIVE ARE THOSE POLICIES?

International and New Zealand evidence suggests that some of the policies above are effective in enhancing resilience. However, evidence is patchy, often comprises case studies, and depends on the specific definition of resilience used. Key insights from evidence includes:

- **Ensuring effective governance.** Clarity around who has decision-making authority beforehand can be crucial for responding to fast-moving crises. Who has this authority varies by type of shock. For natural disasters and many other shocks, locally-led approaches are consistently found to be the most effective both in preparing for and recovering from the shock. Those closest to the ground have local knowledge and the highest stake in a strong recovery. However, communities may not always have the requisite capacities and capabilities, so these need to be developed over time. Trust and social cohesion are also vital. In practice, attaining the 'right' balance between national and local decision-making seems challenging.
- **Avoiding crowding out private risk mitigation efforts.** Well-functioning private insurance markets are important in preparing for a range of shocks. Insurance premiums and other price signals also play a key role in shifting activity and investment away from high-risk locations. A fundamental question is therefore whether policies enable more private risk mitigation or whether they act as a substitute; evidence on this point is mixed. Equity considerations are also important when considering potential public compensation for private losses.
- **Balancing short- and long-term goals.** Response measures need to be introduced quickly and efficiently, to enable people to 'get on with their lives'. However, resilience policy must also take a long-term view and have an eye to long-term goals. There is growing evidence that governments tend to favour short-term considerations. For example, regarding climate change, floodplains and other high-risk locations continue to be developed in New Zealand and elsewhere.

HOW EFFECTIVE HAVE RESILIENCE POLICIES PROVEN IN NEW ZEALAND?

New Zealand has in place many of the resilience policies above. Studies tend to conclude that the country coped reasonably well with the COVID-19 pandemic, the Global Financial Crisis, earthquakes and other shocks. This tentatively suggests that overall policy settings are fairly effective. Aspects of New Zealand's resilience policy settings that have worked particularly well include:

- strong trust, fundamental institutions and international reputation
- sound macro-economic and fiscal policy
- private mitigation measures including insurance uptake
- flexible labour markets and reallocation
- strong scientific base regarding certain risks.

Table 1 identifies aspects of New Zealand's resilience policy settings that have not worked so well (first column) and some priority areas that have been suggested in various post-disaster reviews and other reports (second column).

Table 1 Areas of improvement for New Zealand's resilience policy settings

What has not worked so well	Suggested priority
Unclear roles and accountabilities and patchy performance	Strengthen governance including clarifying roles of central and local government Proactively mainstream risk reduction
Fragmented data sources about risks, and tools that encourage short-termism	Improve data and tools, including the development of a comprehensive and authoritative risk information system
Inability to recognise and prepare for structural change eg an economy that is heavily reliant on emissions-intensive industries	Prepare for, and shape, structural change including that arising from the transition risks from climate change
Persistent inequities among groups that are overly exposed to downturns and other shocks	Reduce inequities to help build resilience capacities Uphold principles of Te Tiriti o Waitangi

Source: Author based on various studies included in this paper

CONCLUSIONS

Evidence suggests that some policies are effective in enhancing the resilience of economic systems.

For predictable shocks, disruptions and trends, the policy emphasis is on preparing for the specific risk in advance. For unpredictable ones, the emphasis is on flexible and adaptable institutions and accepted decision-making processes. Clearly, the benefits of resilience policy work need to outweigh the costs.

More emphasis could be placed on preparedness strategies and long-term adaptation, rather than on the immediate recovery from a shock which tends to be the current focus.

Building resilience often involves sufficient stocks of flexible assets and resources that can be readily leveraged in times of crisis. This requires ongoing investment. It also involves addressing persistent disadvantage among groups that have limited access to such assets and resources.

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1. Introduction

1.1. Background and motivation

Recent events such as the COVID-19 pandemic, the Russian-Ukrainian war, and Cyclone Gabrielle, have disrupted supply chains, food security and other activities, and affected the lives and wellbeing of many New Zealanders. These events, in combination with concerns about long-term trends like climate change (and other breaches of planetary boundaries like biodiversity loss), demographic change, technology change etc, have led to a heightened interest in 'resilience'.

One example of this recent interest is the New Zealand Productivity Commission's (2023) inquiry into the resilience of New Zealand's economy and living standards to supply chain disruptions. This present paper aims to inform, and be informed by, the Commission's inquiry.

As well as this recent interest, resilience has been a topic of enduring interest to New Zealand. This enduring interest reflects that a small, open economy like New Zealand, with limited influence on the world stage, and prone to earthquakes and other natural hazards, is particularly exposed to a range of shocks and disruptions.

New Zealand's ability to weather, and thrive in the aftermath of, such shocks depends in part on the effectiveness of policy settings. Therefore, understanding the successes (and failures) of resilience-focused policies seems valuable.

1.2. Research questions and purpose

This paper examines, and is structured around, the following questions:

1. To what types of disruptive shocks or trends might New Zealand be most exposed?
2. What types of policies may enhance the resilience of (economic) systems to those types of shocks or trends? What does available evidence tell us about the effectiveness of those policies and related policy processes?
3. How effective have resilience policies proven in New Zealand?

The aim is to identify policy-relevant insights on the topic of resilience and contribute to the evidence base about policies aimed at enhancing resilience in New Zealand.

1.3. Approach and scope

The approach consisted of a literature review based on the questions above.

The main focus was on resilience-related policies in an economic context – policies aimed at enhancing the resilience of economic systems.[1] Where relevant, resilience-related policies regarding social, environmental and other systems were also included, reflecting that an economic system is intrinsically linked with these other systems (Stern and Stiglitz 2023; Raworth 2012; Hynes, et al. 2022).

[1] By economic system we generally mean a system of production, resource allocation and distribution of goods and services within a society or a given geographic area. An economic system is a means to an end. For example, an economic system provides job opportunities and wages to its residents, and thus contributes to residents' material living standards and ultimately their wellbeing. As well as material living standards, an economic system affects outcomes like environmental sustainability (through the types of goods and services produced and the ways in which they are produced for example) and distribution (through access to resources and job opportunities for example). An economic system is dependent on the planet's resources and therefore linked to environmental, social and other systems.

For question 2 above, the focus was on high quality international studies (and New Zealand studies if available). By high quality we mean highly-cited studies from peer-reviewed journals containing robust (causal) evidence of the effectiveness of policies.

However, in practice the literature search about resilience-related policies was fairly challenging for a number of reasons. Firstly, there is not a neatly-defined class of policies associated with resilience and studies are fairly dispersed. For example, while there is an extensive economics literature looking at resilience, it has not historically been described that way, but more in terms of volatility and stability in growth, or in terms of responding to shocks. Secondly, for some policy areas, robust evaluative evidence about the effectiveness of policies was thin-on-the-ground. Thirdly, our framing of resilience was based on the evolutionary perspective (see section 2) which, while valuable, is hard to measure, and can be difficult to translate into policy contexts (Tanner, Bahadur and Moench 2017).

To make the literature search more tractable, we used New Zealand's distinctive features as a further lens for framing the search. These features are discussed in section 3 and imply that New Zealand may be particularly exposed to certain types of shocks and long-term trends – both economic and non-economic ones. We therefore focused on policies aimed at enhancing the resilience of economic systems to those particular shocks and trends. As a further way to make the search more manageable, we generally concentrated on overview studies.

Overall, this literature review can be characterised as wide and shallow rather than narrow and deep; it provides an overview of resilience-focused policies relevant to New Zealand rather than detailed evidence about any specific policy.

2. Resilience definitions and concepts

Resilience is about dealing with shocks, disturbances and long-term trends. Definitions and concepts about resilience are not yet settled. Despite this, resilience concepts can broadly be grouped into two perspectives – equilibrium and evolutionary. The evolutionary perspective of resilience is seen as particularly valuable in an economic context, as it emphasises the capacity of a system to adapt and fundamentally change over time in the face of numerous disturbances and shocks.

2.1. Definitions

At its core, resilience is about dealing with 'shocks' (unexpected large-scale events), perturbations and other disturbances such as recessions and natural disasters. Some authors – including of this present paper – argue that as well as one-off events, these disturbances should include long-term trends such as climate change, technological change, demographic change etc (see for example Canadian Centre for Community Renewal 2000).

However, resilience is a contested term. Definitions of resilience can include elements such as (Martin and Sunley 2020):

- Bouncing back – a system's speed of recovery or return to its pre-shock position.
- Absorbing shocks – how much disturbance a system can take and remain within critical thresholds.
- Positive adaptability/bouncing forward – learning, adaptation, and preparation for future shocks.
- System transformation – fundamental reorientation of a system in anticipation of, or in response to, significant shocks and trends.

Tensions across these definitional elements can affect the interpretation of resilience studies. One tension is the degree of change a system can undergo for it to be deemed 'resilient'. For example, the first two elements above generally see the retention of a system's structure and function as a goal of resilience, whereas this is not the case for the final element or possibly even the penultimate one.

Numerous alternative specific definitions of resilience are available. One New Zealand definition which covers most of the definitional elements above is that developed by the New Zealand Government (2019) in the National Disaster Resilience Strategy | Rautaki ā-Motu Manawaroa Aituā:

> *"The ability to anticipate and resist the effects of a disruptive event, minimise adverse impacts, respond effectively post-event, maintain or recover functionality, and adapt in a way that allows for learning and thriving".*

2.2. Concepts

The study of resilience is highly context-specific and begs the question: *Resilience of what, to what, by what means, and with what outcome?* (Martin and Sunley 2020). For example, concepts and theories about strategies to promote resilience ('by what means') vary depending on the type of system or entity that needs to be resilient ('of what'), the type of shock or disturbance that needs to be dealt with ('to what') and the desired goal ('with what outcome'). Some theoretical strategies – such as building variety, dispersity, redundancy and optionality – are common to a number of different systems and shocks (Pells 2023a). But often strategies vary with context.

Despite the range of resilience concepts, these concepts can broadly be grouped into two perspectives or schools of thought – equilibrium and evolutionary (Simmie and Martin 2009).

The equilibrium perspective of resilience emphasises the return to a previous state or equilibrium (or to alternative multiple equilibria) following a shock (Martin and Sunley 2020). This perspective covers the 'bouncing back' and 'absorbing shocks' definitional elements above and is particularly useful in situations where maintaining consistent performance is important, such as in an engineering context regarding bridges, aircraft and so on. The equilibrium perspective is also prominent in mainstream economics.

The evolutionary perspective emphasises the capacity of a system to adapt and fundamentally change over time in the face of numerous disturbances, shocks and trends (Simmie and Martin 2009). This perspective emphasises the 'positive adaptability/ bouncing forward' and 'system transformation' definitional elements above. Evolutionary tends to be seen as the more valuable of the two perspectives in an economic context, especially regarding regional economies, as it focuses on the ability to cope with multiple challenges and change over the long term and reflects the lived experience of systems in dynamic environments (see for example: Simmie and Martin 2009; Linkov, Trump and Hynes 2019; Davoudi 2012; Pendall, Foster and Cowell 2010; Bristow and Healy 2014). In particular, the evolutionary perspective seems useful when dealing with long-term challenges like climate change, areas of deep uncertainty, and a wide array of systemic threats (Hynes, et al. 2022). However, the evolutionary perspective is hard to measure as it involves a long-term, systemic view of performance. We used the evolutionary perspective to help frame this literature review.

For more information about the equilibrium and evolutionary perspectives of resilience see Pells (2023a). Risk and uncertainty are discussed further in section 3.

2.3. Why resilience is important

Despite ambiguity around definitions and concepts and challenges around its measurement (Rose 2007), resilience *is* a useful concept. Resilience makes us think carefully about the nature of disruptions, shocks and trends and how they affect the relevant system, how the system responds, and the essence of a system that needs to be maintained through time (Pells 2023a). Some even argue that resilience is a more important indicator of economic performance than traditional ones like economic growth, as one of the most basic functions of an economic system is its survival, and the ultimate test of that system is its long-term viability (see for example Aligica 2013).

3. To what types of shocks might New Zealand be most exposed?

New Zealand needs to be resilient to a range of shocks, disruptions and trends, per the evolutionary perspective of resilience. Some are hard to predict. However, New Zealand's unique economic geography and distinctive features offer insights about somewhat-predictable shocks and trends. These shocks and trends include global recessions, supply chain disruptions, earthquakes and other natural disasters, and climate change.

3.1. General policy considerations about shocks

3.1.1. Resilience involves dealing with multiple shocks over the long term

The evolutionary perspective of resilience is about building the capacity to deal with multiple unexpected shocks, disruptions and trends over the long term. Ideally, these various pressures should be considered in combination and over the longer-term (Linkov, Trump and Hynes 2019). This focus on the long-term ability to cope with numerous shocks reflects that that it is very hard to predict where the next shock will come from, and so maintaining the long-run health and performance of a system involves a dynamic process of adaptation and learning (Martin 2012).

3.1.2. However, some shocks may be more of a policy concern than others

Shocks can be categorised in many different ways, such as by their scale and duration (Martin and Sunley 2020). Treasury (2022) differentiated between shocks in terms of their predictability: normal risks are reasonably predictable in both their timing and impact, and so it is possible to defend against these risks by pre-planning or insurance etc; HIRE risks – high impact, inevitable, rare events – are risks like earthquakes that can somewhat be prepared for, but their precise timing and impact are unknown; 'black swans' or 'unknown, unknowns' come unexpectedly and there is no prior preparation.

Easton (2023) categorised shocks from a policy perspective:

- Category 1 (unimportant unknowns): small shocks which require little policy response, if any.
- Category 2 (known unknowns): medium shocks which may require some policy response, but can be largely prepared for, including designing policy responses.
- Category 3 (unknown unknowns): large novel shocks which require innovative policy responses. Often these shocks involve significant structural change.

Easton (2023) argued that policy should focus on Category 2 and Category 3 shocks, as markets can generally adjust and cope with Category 1 shocks. While Category 3 shocks are novel and (by definition) not possible to predict and plan, they can be prepared for to some extent, ameliorated and responded to after they happen.

As well as one-off shocks, policy should also respond to known trends (see section 2). These trends include slow-burn or 'boiling frog syndrome' pressures which, because they happen gradually, can be overlooked eg the ageing population. Another long-term trend, climate change, generates a series of physical shocks such as storms, floods and other weather events, and also policy-induced shocks and trends such as changes to the structure of the economy due to policies aimed at reducing emissions. The dynamic, recursive processes involved in climate change highlight some of the challenges around resilience policy work.

3.1.3. Policy is also concerned with hazard, exposure and vulnerability

The discussion above emphasises a distinction between risk and uncertainty. Risk refers to events that are subject to a known or knowable probability distribution, whereas uncertainty refers to events where it is not possible to specify a probability distribution (Knight 1921).

Risk can further be broken down into (Cardona, et al. 2012):

- hazard (the possible future occurrence of an event)
- exposure (the inventory of elements in an area in which hazard events may occur)
- vulnerability (the propensity of exposed elements such as human beings, their livelihoods, and assets to suffer adverse effects when impacted by hazard events).

While exposure and vulnerability are often conflated, they are distinct. Exposure is a necessary, but not sufficient, determinant of risk. It is possible to be exposed but not vulnerable, for example by living in a floodplain but having sufficient means to modify building structures and behaviours to mitigate potential loss. However, to be vulnerable to a shock, it is necessary to also be exposed.

3.2. New Zealand's exposure to shocks

The table below identifies some of New Zealand's distinctive features (first two columns) and the implications of those features for the country's resilience and exposure to shocks (final column).

Table 2 Implications of New Zealand's distinctive features for its exposure to shocks

Feature		Implications for exposure to shocks etc
Small	Small population and economy Many small firms, thin labour, product and other markets	Limited influence over international shocks and disruptions Limited capacities/capabilities/resources to deal with shocks
Long, thin mountain-ous islands	Complex and varied climate Dispersed population Long coastline	Prone to sea level rise, flooding and extreme weather events Communities can become isolated during disasters Difficult terrain for roading and infrastructure
Isolated	Thousands of kilometers from nearest neighbours Long distance from major markets Unique biodiversity	Isolation has benefits for some shocks (eg slowing onset of pandemics) High exposure to supply chain disruptions
Geologically active	On the boundary of two major tectonic plates	Prone to earthquakes, tsunami, volcanic eruptions, landslides
Indigenous population	Unique Māori culture Māori are concentrated in coastal and geologically-active areas Māori are over-represented in forestry and agriculture	'Resilience' for Māori includes protecting the culture Te ao Māori offers insights for resilience Māori may be over-exposed to natural disasters, the physical and transition risks of climate change, and other shocks
Economy based on agriculture and tourism	Persistent export strengths in agricultural products and tourism	Agriculture and tourism are dependent on natural capital which is under threat from climate change and other risks The persistency of export strengths implies that diversification could be challenging (see row below)

High emissions	High greenhouse gas emissions per capita Unusual emissions profile with c50% of emissions from agriculture (mainly dairy)	Significant structural change will be needed to lower emissions, including within the agriculture sector

Source: Author based on various studies including Easton (2023), ADPC and UNDRR (2020) and Pells (2022)

Table 2 suggests that New Zealand may be especially exposed to:

- Global recessions and disruptions – reflecting that New Zealand is a small, open economy. Bordo, Hargreaves and Kida's (2011) analysis supports this view and found that shocks to US real GDP (as a proxy for global output) and shocks to the terms of trade have significant impact on New Zealand's medium-term growth.
- Supply chain disruptions – New Zealand's physical remoteness – "the last bus stop on the planet" (Skilling 2022) – means that supply chains face unique physical connectivity risks, with long and thin servicing from shipping lines and airlines.
- Earthquakes, tsunami, volcanic eruptions, and other natural disasters – reflecting New Zealand's geological features.
- Climate change – New Zealand's geological features and economic structure means it is exposed to both the physical risks of climate change (arising from climate change physical impacts and hazards eg sea level rise, floods and extreme weather events) and transition risks (arising from policy, legal, technology, and market changes to lower emissions and adapt to climate change) (Task Force on Climate-related Financial Disclosures 2017).

The OECD (2014) found that over the period 1973-2012, Iceland, New Zealand and Australia were the OECD countries that experienced the largest number of natural and man-made disruptive events.

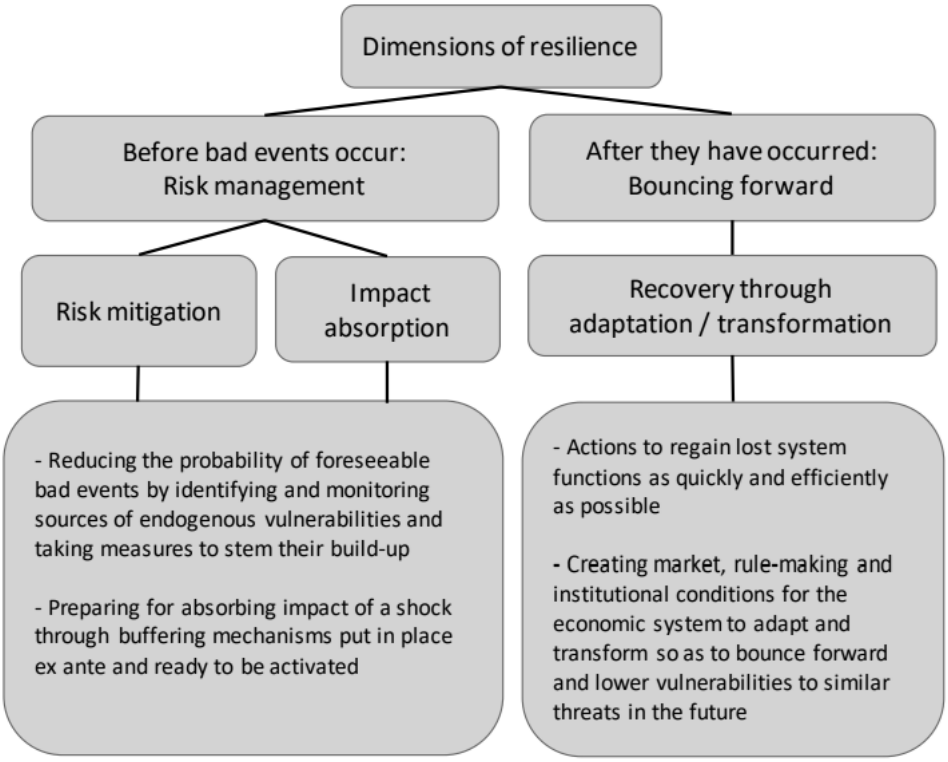
4. What types of policies may enhance resilience?

Numerous polices are relevant to resilience. These policies aim to identify and manage risks, prepare for a shock, recover and regain lost functionality following a shock, and adapt and transform in preparation for future shocks. Key considerations include ensuring effective governance and institutional arrangements, avoiding crowding out private risk mitigation efforts, and balancing short- and long-term goals.

4.1. Organising framework and summary of policies

The OECD (2021a) developed a conceptual framework about policies to support economic resilience – see Figure 1. The framework distinguishes between policies before and after 'bad events' occur and covers many of the definitional elements discussed in section 2. The framework includes adaptation and transformation in preparation for future shocks, and therefore seems to align reasonably well with the evolutionary perspective of resilience. We use the framework to structure the remainder of this section.

Figure 1 A conceptual framework of economic resilience policies



Source: OECD (2021a)

Table 3 summarises some of the main resilience-focused policies, grouped under the elements in Figure 1 and focused on the shocks and trends discussed in section 3. Note that the groupings are somewhat arbitrary. For example, absorption happens not just before a shock, but with and following the shock, such as relying on or using buffers or making decisions based on early warning systems. The final column provides our qualitative assessment of the (mainly international) evidence about the effectiveness of each policy in enhancing economic resilience.

Table 3 Summary of resilience policies by stage of resilience and type of shock

Stage of resilience	Policy examples	Relevance to shock				Evidence of effectiveness – quantity and type of evidence
		Global recessions & disruptions	Supply chain disruptions	Earthquakes & other natural disasters	Climate change & long-term trends	
Identifying and managing risks (risk mitigation)	1. Research and science to understand risks	✓	✓	✓✓✓	✓✓✓	Yes – some quantitative evidence
	2. Information provision, disclosure and uptake	✓	✓	✓✓✓	✓✓✓	Yes – some quantitative evidence
	3. Scenario planning, stress-testing, early detection of emerging trends etc	✓✓	✓✓	✓	✓✓✓	Limited evidence available
Preparing for a shock (impact absorption)	4. Governance, institutions and preparedness strategies	✓✓	✓✓	✓✓✓	✓✓✓	Yes – consistent case study evidence
	5. Macro-prudential and other policies to reduce risk of financial instability	✓✓✓	✓			Yes – emerging quantitative evidence
	6. Framework policies that either cushion a shock or reduce its persistence	✓✓✓	✓✓	✓✓		Mixed effects – quantitative evidence
	7. Early warning systems	✓✓		✓✓✓	✓✓	Yes – quantitative evidence
	8. Local planning and infrastructure investment that integrates risks		✓	✓✓✓	✓✓✓	Limited evidence available
	9. Stockpiling essential products, diversifying the supply of products and other supply chain measures		✓✓✓	✓	✓	Mixed effects – limited evidence available
	10. Risk transfer instruments such as insurance			✓✓✓	✓✓	Yes – limited evidence mainly case studies
	11. Job retention schemes, social insurance schemes and other passive labour market policies	✓✓✓		✓✓		Mixed effects – quantitative evidence

Stage of resilience	Policy examples	Relevance to shock				Evidence of effectiveness – quantity and type of evidence
		Global recessions & disruptions	Supply chain disruptions	Earthquakes & other natural disasters	Climate change & long-term trends	
	12. Support and education for jobseekers and other active labour market policies	✓✓✓			✓✓	Mixed effects – quantitative evidence
Recovering and regaining lost functionality (recovery)	13. Counter-cyclical monetary/fiscal policy	✓✓✓	✓✓			Yes – quantitative evidence
	14. Aid and emergency support for firms and households		✓	✓✓✓	✓✓	Mixed effects – quantitative evidence
	15. Locally-led responses to emergencies and disruptions		✓	✓✓✓	✓✓	Yes – mainly case studies
Adapting and transforming for future shocks (adaptation/ transformation)	16. Learning from previous shocks	✓✓✓	✓✓✓	✓✓✓	✓✓✓	Yes – mainly case studies
	17. Policies aimed at building long-term capacities and capabilities in communities	✓✓	✓✓	✓✓✓	✓✓✓	Yes – mainly case studies
	18. Policies to support structural transitions	✓	✓	✓	✓✓✓	Mixed effects – mainly case studies

Source: Author based on various studies including OECD (2021a), Vermeulen (2022), Sánchez, Rasmussen and Röhn (2015)

The remainder of this section discusses some of the main take-outs about the effectiveness of the policies in Table 3. **Appendix 1 provides more detailed information** about individual policies including the rationale for government intervention. Evidence about New Zealand's overall resilience policy settings is discussed in section 5.

4.2. Identifying and managing risks (risk mitigation)

4.2.1. Science about risks, the monitoring of emerging trends, and information provision and uptake, are relevant to risk mitigation

Understanding risks is a key stage in risk mitigation. Scientific advice plays an important role in understanding a wide range of risks and hazards. In addition to science about risks, scenario planning, stress-testing and other foresighting techniques can help detect emerging trends and be used in areas of uncertainty (OECD 2014).

Understanding and assessing risks does not just apply to natural disasters. For example, in an economic context, the OECD and other international organisations developed indicators to detect potential threats to economic and financial stability (Caldera-Sánchez, et al. 2016). The indicators covered: 1) financial sector imbalances 2) non-financial sector imbalances 3) asset market imbalances 4) public sector imbalances and 5) external sector imbalances. The key insights were that indicators of global risks consistently outperform domestic variables, and that among domestic indicators, those that reflect asset market misalignments (real house and equity prices, house price-to-income and house price-to-rent) come out top. Overall, the authors concluded that international developments are fundamental when assessing a country's vulnerabilities.

Communication strategies about risks need to take account of cognitive biases such as myopia and optimism bias. When communicating with local communities, cultural awareness and tailored strategies are also important, as cultural differences may lead to mistrust of information from government agencies (Chen, Craven and Martin 2021).

To be useful, risk information needs to be used in actual decision-making processes and be acted upon. This reflects that effective risk reduction requires awareness, the formation of an intent to act, the identification and selection of a plan of action, and the execution of that plan (UNDRR 2022). Risk assessment information for a range of hazards can inform decisions about land-use planning, infrastructure planning, building codes, early warning systems etc.

There is some evidence that the provision, and use, of risk information is effective in enhancing resilience. For example, in recent decades early warning systems have contributed to the reduction in loss of life from natural disasters, despite the increase in incidence of such disasters.[2] As well as this indicative evidence, some studies provide more direct empirical evidence about the effectiveness of early warning systems (see for example Escaleras and Register 2008; UNEP 2012; Sahana, et al. 2023).

4.2.2. Some suggest an under-investment in proactive risk assessment

The Sendai Framework for Disaster Risk Reduction 2015–2030 (Sendai Framework) stresses that proactive planning and investment in disaster risk reduction based on proper risk assessment is highly cost-effective and may prevent future disaster-related losses (Kawasaki and Rhyner 2018). However, to date countries' budgets for disaster risk reduction are mainly used for post-disaster emergency response, recovery, and reconstruction, rather than proactive risk identification and planning (Kawasaki and Rhyner 2018; UNISDR 2014). These authors argued that greater attention should be paid to the latter than is presently the case.

[2] https://library.wmo.int/index.php?lvl=notice_display&id=21930#.YS9CMNMzZBx

4.3. Preparing for a shock (impact absorption)

4.3.1. Governance and institutional arrangements, as well as a number of macro-economic and other policies, are relevant to impact absorption

Relevant policy settings and mechanisms are ones that can be put in place *ex ante* to enhance preparedness and help with the absorption of the impact of shocks (OECD 2021a). These include governance and institutional arrangements, framework conditions policies (the broad set of regulations, institutions etc that affect the business environment) and various other macro-economic and other policies.

One example is automatic budgetary stabilisers through the system of public taxes and transfers which act as buffering mechanisms that help with the absorption of negative economic shocks. These automatic stabilisers include increased unemployment benefits in a downturn which help to increase aggregate demand. Another example of an impact absorption policy is encouraging spare capacity or redundancy in production in areas of critical importance.

4.3.2. Strong governance and institutions, and locally-led approaches and preparedness strategies, are needed to prepare for shocks

Understanding who to connect with, what resources are available, and who has decision-making authority beforehand can be crucial for responding to fast-moving crises (New Zealand Productivity Commission 2023a). This highlights the importance of effective governance and institutional arrangements in preparing for a shock.

Governance models for resilience commonly introduce integrated, comprehensive and all-hazards-based policy and planning (Mamula-Seadon 2017). The governance model is tiered (ie central-regional-local government); central government sets national direction and policies and local government is responsible for implementation. Extensive co-ordination and co-operation among all levels of government, the private sector, community groups and other stakeholders is vital.

A first step in decision-making is defining the goals of resilience (Tanner, Bahadur and Moench 2017). A key challenge for resilience as a framing for policy is that the concept can be used to pursue a range of different goals, and to support a range of different values (see section 2).

Numerous studies have shown that more democratic, accountable government institutions can effectively reduce losses from natural disasters and other shocks (Davlasheridze and Miao 2021). For example, there is some evidence that, during the COVID-19 pandemic, countries that did well on measures of institutional resilience had relatively good health outcomes compared with those that had high levels of pre-pandemic preparation (Treasury 2022). This is because strong institutions allowed for rapid reactive decisions to be taken to a pandemic that was different from the one that was planned for. The importance of strong institutions was also one of the lessons that the OECD (2021a) drew from its review of the response to the 2010/11 Christchurch earthquakes.

A consistent finding in the literature is that locally-led approaches, driven by community groups and supported and enabled by local (and national) government agencies, are required to build community resilience. Winkworth (2007) found that the literature gives universal support to community-based preparedness and mitigation strategies. Case study and other evidence suggests that when power is devolved to community members and local leaders, decisions will tend to have long-lasting effects (Chen, Craven and Martin 2021).

However, a particular challenge for governance is the balance between national and local decision-making. For example, in the context of the 2010/11 Christchurch earthquakes, Mamula-Seadon (2017) concluded that the question of how to integrate national intervention and local control remains open. These points are discussed further below and in section 5.

4.3.3. Risks need to be integrated into land-use planning, infrastructure planning, and other policy areas

Local planning and infrastructure decisions should take an 'all hazards' approach to various risks, and discourage development or intensification in areas and suburbs with high natural-hazard risks, such as flood plains, active faults, volcanic fields, coastal hazard zones and land vulnerable to instability (New Zealand Infrastructure Commission 2022).

Some of the main policy measures to enhance the resilience of infrastructure to climate and other risks are 1) support the provision of information about risks and the coordination within or between sectors 2) ensure risks are accounted for in public investments and transparently allocated between public and private partners in contractual arrangements 3) enable infrastructure resilience through spatial planning policy, sectoral regulation or technical standards and 4) encourage the financial disclosure of climate and other risks (Vallejo and Mullan 2017).

Building redundancy and spare capacity into infrastructure networks and distribution centres such as ports provides resilience to the domestic and international transport of goods (Vermeulen 2022). A comprehensive report on the experience of Japan following the earthquake and tsunami of 2011 indicated how essential it is to be prepared for severe disasters (Ranghieri and Ishiwatari 2014, cited in Vermeulen 2022). Alternative physical infrastructure (roads and railways) as well as slack capacity in ports offered resilience to the transportation system in the immediate aftermath of the disaster and during the medium-term recovery.

4.3.4. Policies should encourage private agents to manage risks

Well-functioning private insurance markets are critical in preparing for a range of financial shocks, natural disasters etc (Frieling and Warren 2018). In the context of climate change, insurance premiums and other price signals play a key role in shifting activity and investment away from high-risk locations (Pells and Howard 2022).

Governments intervene in insurance and risk reduction for reasons including that private actors tend to under-invest in mitigation from society's perspective because these actors may lack information about risks, have biased risk perceptions, be myopic about future gains, or lack the necessary resources (Davlasheridze and Miao 2021).

Evidence is emerging that, if properly designed, insurance can be useful in reducing risk (Warner, et al. 2009). However, the majority of empirical research relating to the link between insurance and disaster risk management is case-study based and focuses on factors like uptake and response/ recovery, instead of risk reduction (Le Quesne 2017).

Key considerations for policy are avoiding crowding out private risk mitigation efforts and moral hazard problems.[3] Therefore, an important question is whether resilience-related policies enable more private risk mitigation or whether they act as a substitute (Davlasheridze and Miao 2021). Specifically, private agents may decide not to insure or invest in mitigation measures if they expect the government to provide assistance to cover their losses.

Evidence from US studies about whether post-disaster relief crowds out, or complements, private mitigation efforts is somewhat mixed (see Davlasheridze and Miao 2021). In New Zealand, Easton (2023) argued that the Canterbury Earthquakes illustrated that there is a public tendency for the uninsured to expect the government to provide for them after a disaster. More recently, responses

[3] Moral hazard refers to situations where the incentives to minimise a risk are lacking because there is protection from the consequences (Boston 2023).

to the impacts of extreme weather events during Cyclone Gabrielle have reinforced this expectation, with central and local government buying out red-stickered properties.[4]

However, a counter-argument is that a strong focus on individual responsibility and self-dependence, such as via insurance, may harmfully affect those who cannot afford risk-transfers, and create conditions for 'victim-blaming' which does little to lessen vulnerabilities (ADPC and UNDRR 2020). This reflects that shocks tend to have disproportionate effects on those that already struggle in communities.

Traditional insurance may not be the appropriate tool for longer-term foreseeable risks like sea-level rise. In such cases, other measures including basic investments in risk reduction make more sense (Warner, et al. 2009). In New Zealand, Storey, et al. (2017) considered some of the challenges for insurance from climate change. Insurers are likely to retreat from coastal and other high-risk locations once risks are sufficiently probable. Insurance retreat could increase the unfunded fiscal risk faced by government and decrease house prices as mortgages become unavailable (or more costly). Potential policy responses to insurance retreat and related issues include:

- provide information to prospective and current homeowners about climate risk
- investigate the viability of a market in long-term residential insurance, which would likely involve a pre-agreed schedule of premiums which would increase over time and could be contingent on observed sea level rise
- develop rules for risk and cost allocation, for example the sharing of costs between homeowners, local government and central government
- present housing-related liabilities in financial statements, to ensure that organisations remain solvent after a climate-related disaster.

Boston (2023) considered the issues surrounding the provision of public compensation for private property losses due to managed retreat in New Zealand. The author came down heavily in favour of the use of public compensation schemes for managed retreat, partly because private insurance will not cover (many of) the costs of managed retreat, but also for a range of other reasons including equity considerations.

Overall, the extent to which government intervenes to cover private risks may involve weighing up efficiency and equity objectives. From an efficiency perspective, policy should aim to complement and crowd-in private risk mitigation efforts where possible, encourage personal responsibility, and focus on correcting market failures. From an equity perspective, policy should aim to protect and support those who lack the resources to take up insurance and other private measures. In practice, the relative emphasis is likely to reflect political economy considerations.

4.3.5. Policies need to balance cushioning a shock and adaptation

Some argue that policies and institutions that dampen the initial impact of a shock may actually increase its persistence, and vice versa (Duval, Elmeskov, and Vogel 2007). In other words, there may be conflicting effects on resilience – 'bouncing back/impact absorption' resilience may be at the expense of longer-term 'adaptability/bouncing forward'.

A particular concern is that policies may stifle 'reallocation' or the movement of resources in the economy as firms and jobs are created or destroyed during recessions ('creative destruction'). Evidence about this concern is mixed. Somewhat in support of this concern, a recent firm-level study found that social insurance schemes can negatively affect employment growth (Dahl and Knepper 2022). However, the same study found that such schemes improve the time for job searches and thus job match quality (a finding from previous studies), and increase earnings for new hires, thus

[4] https://www.nzherald.co.nz/nz/auckland-council-and-government-set-to-unveil-1-billion-plus-package-to-buy-out-700-homes-and-meet-other-storm-related-costs/73AUQGKWWFFW7BN2LGK5VLACRI/

potentially reducing the wage scarring effects of unemployment. Also somewhat in support for this concern around reallocation, countries with more flexible labour markets and stronger competition in product markets – which essentially encourage reallocation – have been found to suffer less volatility of output (Sondermann 2017).

In contrast, some cross-country evidence suggests that job retention programmes are effective in preserving jobs with only minor losses in reallocation (Vermeulen 2022). Similarly, in New Zealand, a firm-level evaluation of the COVID-19 Wage Subsidy Support programme found that the programme allowed more workers to remain in employment and more sole traders to remain in business, and that the programme did not unduly adversely affect reallocation (see Fyfe, Maré and Taptiklis 2023). Having said that, country-level evidence from the Global Financial Crisis and the COVID-19 pandemic suggests that, to avoid adverse effects on reallocation, job retention programmes should not be kept in place too long (OECD 2021b).

Partly in recognition of concerns about reallocation and some of the trade-offs identified above, the Danish notion of 'flexicurity' has been advanced to characterise the balance between flexibility of adjustment and security of income and employment (Fabling and Maré 2012). Historically, New Zealand's policy settings have tended to emphasise flexibility (see section 5).

4.4. Recovering and regaining lost functionality (recovery)

4.4.1. Post-disaster recovery involves balancing short- and long-term goals

When shock absorption is insufficient or infeasible, resilience focuses on recovery (Vermeulen 2022). Post-disaster recovery is highly complex. It occurs in an environment of high stress, involves multiple agencies and stakeholders, has multiple priorities that evolve over time, and has no clear end point (Ryan, Wortley and Shé 2016).

Response measures seek to maintain system functionality and need to be introduced quickly and efficiently. A key short-term consideration is therefore enabling people to 'get on with their lives' – an important lesson from the 2010/11 Christchurch earthquakes regarding key design principles for the red zone (Boston 2023).

However, policy work during the recovery phase must also have an eye to long-term goals. In practice, tensions often exist between the short-term, urgent relief needs of people and longer-term redevelopment aims (Bakema, Parra and McCann 2018). Evidence suggest that countries tend to struggle with attaining the 'right' balance between short-term recovery and long-term goals.

Climate change adaptation requires striking a balance between short- and long-term goals. Much case study and other evidence points to short-termism in policy such as the continuing development of floodplains and other high-risk locations (Davlasheridze and Miao 2021; Adger, et al. 2011; Wenger 2017). Other evidence suggests that flood control (eg levees and dams) can promote a false sense of security and thus reduce the perceived need to reduce risks (Davlasheridze and Miao 2021). Both New Zealand and overseas experience indicates that to date, governments have generally been more willing to fund short-term measures (eg seawalls and other flood defences) than long-term measures like managed retreat (Boston 2023). As well as short-termism, policy responses likely reflect political economy considerations, such as favouring the utility of current property owners and developers over the welfare of future residents.

4.4.2. Locally-led responses, and trust, are important for recovery

As well as playing a key role in preparing for shocks as discussed above, local community groups and local government are central to the recovery process. Compared with central government, local government is on the ground, closest to the people and communities affected (Winkworth 2007). In

recognition of this, most countries' emergency management frameworks and plans state that recovery should be locally-led (Owen 2017). This is the case in New Zealand (see section 5).

However, while local government and local groups have the highest stake in a quick response and strong recovery for affected communities, they may have the least capacity for effective response and recovery (Standing Panel on Intergovernmental Systems 2020). Large-scale disasters therefore challenge decentralised bottom-up approaches and can overwhelm local capacity whilst putting intense pressure on central government to deliver (Mamula-Seadon and McLean 2015). Experience from disasters suggests that clarifying roles, expectations and legal responsibilities of all parties are key success factors for policy. However, command and control issues recur repeatedly in large incidents, which suggests a failure to learn from previous incidents (Donahue and Tuohy 2006). Also, communities can lose resilience from repeated shocks. Therefore, while locally- and community-led responses might be more effective they come at a cost to those communities if resources are not renewed.

Strong social cohesion and networks, and high levels of trust and social capital, are consistently found to be critical elements of a community's recovery from a shock. For example, community organisations, marae, iwi, hapū, churches and mosques were critical social, organising and physical infrastructure during the COVID-19 response (Chen, Craven and Martin 2021; Inspiring Communities 2023). Similarly, in the 2010/11 Christchurch earthquakes, community organisations, such as churches, local Māori communities, self-organised community groups and volunteer 'armies', were of immense value in the response (Mamula-Seadon and McLean 2015).

4.4.3. Counter-cyclical monetary and fiscal policy are used in recessions

Monetary policy, such as raising or lowering interest rates, has been primarily responsible for cyclical stabilisation in response to recessions and some other shocks (Bernstein, Gaukrodger and Parkyn 2021). The conventional wisdom is that in a typical downturn, monetary policy is more effective for demand management purposes than discretionary fiscal policy, as, compared with discretionary fiscal policy, monetary policy does not suffer from implementation lags (Sánchez, Rasmussen and Röhn 2015).

International empirical research tends to support this conventional wisdom and finds that monetary policy *is* effective in managing demand and dampening cycles (Sánchez, Rasmussen and Röhn 2015). However, monetary policy is less effective in a financial crisis and when interest rates are persistently low (Borio and Hofmann 2017; Bernstein, Gaukrodger and Parkyn 2021). There are also limits about how long expansionary monetary policy can be kept in place to support recoveries, without fuelling additional risks such as inflation.

International evidence also supports the idea that discretionary fiscal policy tends to be less effective than monetary policy in dampening the cycle. This is because of the lags involved; even when the focus is on 'shovel ready' projects, by the time policy is implemented it may coincide with the peak of the cycle rather than the trough. However, fiscal policy in the form of 'automatic stabilisers', like unemployment-related expenditure etc that naturally varies with changes in economic activity, is found to be effective in smoothing the cycle (Bernstein, Gaukrodger and Parkyn 2021). There is also evidence that initial fiscal space – low government debt levels and sustainable public finances – provides room for fiscal policy to address large adverse shocks (Sánchez, Rasmussen and Röhn 2015).

Note that there is a distinction between supply shocks (which move output and inflation in opposite directions) and demand shocks (which move output and inflation in the same direction). Some shocks are more amenable to monetary policy, others to a reset of fiscal strategy and policy, and others require some sort of microeconomic or structural response, depending on the nature of the shock and its persistence.

4.5. Adapting and transforming (adaptation/transformation)

4.5.1. Adapting to future shocks involves learning from previous ones

To learn from the past, the conditions that contributed to the disaster or shock need to be identified, critically evaluated, and hopefully changed (Bakema, Parra and McCann 2018). Deeper learning involves truly institutionalising a new process and requires long-term commitment (Donahue and Tuohy 2006).

Evidence about the learning aspects of resilience and its enabling conditions is fairly scarce (Bakema, Parra and McCann 2018). This partly reflects that much resilience policy focuses on absorption and recovery, rather than capacity-building for learning.

Wide variation in the approaches used in, and the scope of, post-crises reviews and evaluations is one common finding from the literature (Donahue and Tuohy 2006; Ryan, Wortley and Shé 2016). For example, in New Zealand there is currently no existing national framework for monitoring or evaluating post-disaster recovery (Ryan, Wortley and Shé 2016). This variability can limit the identification of recurring lessons. Those reviews and evaluations that have been undertaken tend to focus on the process of recovery, as opposed to the impact and outcomes of that process.

A failure to deeply learn from previous crises is a key finding from case study and other evidence. Recurring lessons include uncoordinated leadership, failed communications, weak planning, resource constraints and poor public relations (Donahue and Tuohy 2006). One of the main reasons for the failure is a lack of will and commitment, reflecting factors like short-termism in decision-making. In addition, most big lessons are inter-agency lessons and require learning within and across agencies.

A further challenge is that past learnings may not be applicable to new challenges that are outside the realm of previous experience (Adger, et al. 2011). For example, regarding climate change, the frequency and intensity of weather events etc is increasing rapidly. The willingness to learn and experiment if therefore important.

4.5.2. Adapting to multiple shocks involves building long-term capabilities

Adaptable resilience depends on institutions with the capabilities to plan for shocks, take pre-emptive action and follow good decision-making processes when they occur (Treasury 2022). Resilience is also supported by sufficient stocks of flexible assets (including borrowing capacity) and resources (including human capability) that can be readily leveraged in times of crisis and high levels of trust among people (social cohesion) as well as in institutions. These factors require enhancement and investment over time because their resilience benefits may accrue over quite long timescales.

A focus on adaptation involves taking a broad view of the system as a whole and recognising that the system will evolve and modify itself over time, and that the appropriate policy would be to guide or influence that process to achieve desired goals (Hynes, et al. 2022). This means developing policies that will, by design, lead the system to self-organise itself so as to achieve the required goals. At the extreme, the system will achieve a performance *gain* when exposed to adversity, per Taleb's (2012) concept of 'anti-fragility'. This approach involves being clear about the long-term goals of the system and what constitutes the long-run health of the system (Pells 2023a).

Therefore, Hynes, et al. (2022) argued that achieving long-term resilience of complex economic systems involves resilience by design, as well as resilience by intervention. For example, during the Global Financial Crisis, governments in some countries allocated vast amounts of capital to aid a failing system by conferring enough resources to stave off systemic collapse (resilience by intervention), whereas economies with 'better' structures were better able to withstand shocks (resilience by design).

A focus on adaptation also involves building the capacities, capabilities, assets and resources to deal with multiple shocks. Some case study and other evidence supports this idea. For example, in the UK, Simmie and Martin (2009) found that Cambridge was a more resilient city than Swansea to multiple recessions and shocks. Compared with Swansea, Cambridge has a higher stock of human capital and other capitals/resources.

Some groups may lack the requisite wealth, resources and capabilities to deal with unexpected shocks. Therefore, policies aimed at enhancing community resilience often involve identifying and targeting under-served communities and strengthening their capabilities (Chen, Craven and Martin 2021) – discussed further in section 5.

4.5.3. Severe shocks and major trends may involve structural change

In some cases, the scale or nature of a shock, expected or experienced, is such that the very viability or sustainability of a system is brought into question, and requires nothing short of a wholesale transformation of the system's structure and function (Martin and Sunley 2020). Climate change is a prominent example.

While the need for transformation is widely acknowledged in international discourse around resilience to climate change for example, concrete transformation pathways are less well articulated (Nohrstedt 2022) and policy prescriptions vary. The OECD (2020) took a fairly narrow view and argued that to improve transformative capacity regarding climate change, the role of government includes ameliorating the primary obstacles to transformation such as uncertainty about future climate conditions, institutional or behavioural barriers that impede change, and high costs associated with transformative actions.

But others argue that the urgency around climate change requires a more active, or market shaping, role for government. This involves a whole-economy approach with strong, co-ordinated and long-term policies and institutions (Stern and Valero 2021). As well as tackling various market failures, governments can use 'missions' to help align actors around a common goal, achieve the necessary pace and scale, and kick-start emerging clean industries (Mazzucato 2021; Stern and Valero 2021; Sharpe 2023).

4.5.4. Adapting to inevitable structural change is a feature of resilient regions

Structural change does not affect places and sectors equally. A range of policies aim to support regions and sectors facing decline during periods of structural change. Evidence from regions in the US facing 'chronic distress' suggests that human capital strategies such as relating to school and education, and investment or reinvestment in major components of the region's public infrastructure, can improve a region's economic resilience (Wolman, et al. 2017).

Evidence from the UK regarding the shift away from coal mining highlights the long-term scarring effects of some structrual change. UK regions in which mines closed in the 1970s/80s still have higher unemployment levels relative to comparable regions (Vermeulen 2022). The author argued that slow recovery in employment is partly explained by the lack of alternative jobs, and insufficient policy initiatives to address this situation. The slow recovery also indicates that labour mobility does not fully offset these types of structural shocks. The author recommended policies to diversify the regional economy early, and the formulation of strategies to make the transition in a sustainable and equitable fashion. The UK coal mines were closed down very rapidly which gave communities little time to adjust.

The experience of UK coal mining potentially has some important lessons for policy, as the shock was in part driven by the government of the day. To the extent that scarring effects reflect market failures from coal mining such as negative externalities like air pollution and global warning, or that

'the losers from economic or structural transformation are not compensated by the winners', there is an argument for an enhanced role for government including addressing equity concerns.

The term 'just transition' originated in the US in the 1970s regarding workers affected by the shift away from fossil-fuel based industries (Emden, et al. 2020). The term originally related to ensuring support for workers in industries undergoing transitions. Since then, the term has been used to include other equity considerations regarding the transition to a low-emissions economy, such as developed countries decarbonising in a way that supports developing countries, acting now to avoid putting a greater burden of responsibility on future generations, and ensuring that the costs of policy responses to climate change are not disproportionately imposed on low-income households etc. In New Zealand, the Taranaki 2050 Roadmap (see Venture Taranaki 2019) is one example of a just transition-type approach. The Roadmap was developed by the region – which historically has relied on oil, gas and dairy farming – to help it transition to a low-emissions future. Responding to inevitable trends and structural change is a key feature of resilient communities.

4.5.5. The inherent endowments and characteristics of a region affects its long-term growth prospects and resilience

New Zealand and overseas studies highlight the role of local amenities, local endowments and proximity to large cities in the economic development and long-term resilience of regions. For example, Grimes, et al. (2014) found that, over the period 1926 to 2006, four dominant factors have impacted positively on urban growth in New Zealand, especially since 1966: nearby land-use capability, human capital, sunshine hours and proximity to the country's dominant city, Auckland.

Regarding the impact of negative shocks, Grimes and Young (2009) examined the effects of two major freezing works closures in New Zealand, one in Patea (1982) and one in Whakatu (1986). The key finding was that, while both towns experienced negative population and employment impacts, the effects on Whakatu (which is located close to Auckland) were mainly temporary, whereas the effects on Patea (which is relatively isolated) were more permanent. One implication is that, when trying to improve the resilience of regions, while it is important to connect regions to large centres, care needs to be taken not to create 'white elephant' infrastructure investments in remote locations. Overseas case studies also highlight the role of proximity to major centres in a region's resilience. For example, presumably one of the reasons that Cambridge is found to be a more resilient city than Swansea (see Simmie and Martin 2009) is Cambridge's proximity to London.

Similarly, Badenhorst and Zheng (Forthcoming) found that, while some New Zealand regions have weathered specific shocks, they may face more fundamental challenges regarding their long-term growth prospects. For examle, the West Coast and Manawatu-Whanganui fared fairly well during the Global Financial Crisis, but, compared with other New Zealand regions, experienced muted employment growth over the last 20 years or so.

The retention of skilled workers following major shocks is generally considered a feature of resilient regions. At a national level, worker reallocation across locations and industries following a shock or in response to the decline of a traditional industry may be a positive outcome from a resilience perspective, as it helps the economy to adapt. But at a local level, if skilled people are quick to move out of an area following a shock, a region may struggle to reinvent itself. Cities with attractive natural amenities, or with attractive cultural environments, tend to be better able to retain skilled workers and therefore tend to be more resilient (Coleman, Maré and Zheng 2019).

Some studies shed insights into some of these workforce dynamics and their implications for policies about the resilience of regions. For example, Coleman, Maré and Zheng (2019) analysed the changing nature of jobs in regional New Zealand between 1976 and 2013. They found three key developments:

- The decline of manufacturing and the growing importance of service industries has tended to favour large cities, especially Auckland. Global trends like agglomeration (the tendency for businesses and people to locate in close proximity to one another in cities) are unlikely to be overcome by regional interventions aimed at encouraging development in locations where agglomeration benefits do not exist.
- The speed at which urban areas recover from negative employment shocks to their specialist industries depends on the type of industry receiving the shock. For instance, it seems to be much more difficult to recover from adverse shocks that hit rural processing industries than shocks that hit other types of manufacturing industries. If the government wishes to help regional economies recovering from employment downturns, it should recognise that the transition path out of some industries is harder than others.
- All towns produce similar non-tradeable goods (local retail and hospitality, construction etc), whereas they produce different tradable specialities. For this reason, government programmes aimed at enhancing the performance of non-tradeable businesses are likely to produce the widest regional benefits, as they have the potential to improve performance in many sectors everywhere – a principle widely recognised in regional development strategies around the world.

Overall, the findings above imply that some regions face real challenges regarding their long-term resilience and growth prospects. These include regions that are remote, have limited natural amenities, and have an industry structure exposed to structural decline. Building the resilience of such regions might involve the region understanding the impact of inevitable trends like climate change and agglomeration, developing a collective and forward-looking position on how to survive disruptions and respond to inevitable trends, and making the best use of the region's resources and strengths.

4.6. General considerations and conclusions

4.6.1. Robust evidence about the effectiveness of resilience policies is sparse

In New Zealand and internationally, there is limited robust empirical evidence on the impact of resilience-focused policies (OECD 2020; Healy 2020; Chen, Craven and Martin 2021). Evidence about the effectiveness of such policies often comprises case studies which, while useful, do not provide robust causal evidence of impacts (OECD 2020). Much evidence tends to be descriptive and anecdotal, and many initiatives are ad hoc and highly contextual, so it can be difficult to extract what might work in New Zealand (Chen, Craven and Martin 2021). There is little peer-reviewed literature; the bulk is in the grey literature (Owen 2017)

The lack of robust evidence partly reflects that resilience is often regarded as a secondary objective of policies, something that is considered after primary objectives, such as promoting economic growth, are met (Healy 2020). Much of the evidence focuses on the immediate emergency period and less on long-term institutional and policy adaptation (Johnson and Mamula-Seadon 2014). Also, the effectiveness of policies depends on the specific definition of resilience and measure of success. For example, some policies may be effective in achieving immediate recovery from a shock and short-term resilience goals, but they may work against adaptation and longer-term resilience goals.

4.6.2. While resilience policies are often those related to economic development in general, there may be some trade-offs

Many policies aimed at enhancing resilience are those related to economic development in general. For example, improving access to financial, human, and other 'capitals' enhances not only economic resilience, but also contributes to wider living standards and wellbeing per the Treasury's Living Standards Framework (Pells 2023a). Also in support of the link between resilience and wider economic development, the number of casualties from natural disasters tends to be strongly related

to a country's income levels, which suggests that economic development is crucial to limit the cost of and resilience to natural disasters (Vermeulen 2022). The channels include the quality of infrastructure networks, quality of physical structures and building codes, planning for emergency relief, and internationally co-ordinated early warning systems.

However, some resilience-focused policies may face a trade-off with other long-term growth objectives. For example, at the macro level, higher ratios of capital to assets within banks can help weather a crisis, but beyond a certain point, a large storage of capital may hinder growth by limiting the funds available for lending (Sánchez, Rasmussen and Röhn 2015). Similarly, maintaining stocks of products and back-up production capacity for essential goods provides buffer or slack in a system that supports resilience, but potentially at the cost of productivity through reduced efficiency (Vermeulen 2022). However, trade-offs between resilience and productivity tend to operate in the short term. In the longer-term, the relationship is more complex via mechanisms like innovation (Pells 2023a).

Building resilience is seldom free. Building resilience in the form of investing in wealth as a buffer against potential future adverse events comes at the cost of wellbeing now (Treasury 2022). For example, enhanced building standards may increase resilience but also increase the costs of housing and other buildings. Therefore, the benefits of resilience policies need to be weighed against their costs; resilience policies need to be efficient as well as effective. Assessing the benefits and costs can be challenging, as the benefits of some long-term policy actions like those aimed at addressing climate risks may be hard to measure, and existing tools may have a status quo bias (see Pells 2023b).

4.6.3. Greater emphasis could be placed on longer-term adaptation

A range of policies aim to enhance resilience. Each policy has a different rationale. For predictable shocks and disruptions, the emphasis is on preparing for the specific risk *ex ante* and managing it through targeted policies (Treasury 2022). For 'black swans' and unpredictable risks, the emphasis is on flexibility and adaptable institutions and on robust, responsive and accepted decision-making processes and crisis management mechanisms, all of which support *ex post* recovery and adaptation.

In terms of the balance between different types of policies, most countries place more effort and resources on the immediate recovery from a shock or crisis, rather than on preparedness strategies or on long-term adaptation. This probably reflects a lack of political incentives to dedicating resources designed to insulate the economy from low frequency or unknown shocks. The evolutionary perspective of resilience suggests that greater emphasis should be placed on long-term adaptation, as the likelihood of economic success being sustained over the long term crucially depends on the ability to adapt to changing circumstances and adjust to external shocks as and when these occur (Christopherson, Michie and Tyler 2010).

5. How effective have resilience policies proven in New Zealand?

New Zealand has coped reasonably well with the various shocks it has faced historically, which suggests that overall policy setting are effective. However, weaknesses include unclear roles and accountabilities, patchy performance across regions, an inability to recognise and prepare for major structural change, and persistent inequities in resilience capacities and outcomes.

5.1. Overview of New Zealand's resilience policy landscape

New Zealand has committed to the Sendai Framework for Disaster Risk Reduction 2015–2030 (Sendai Framework), the Paris Agreement on Climate Change (Paris Agreement), and the Sustainable Development Goals (SDGs) (Saunders, et al. 2020).

New Zealand has developed a National Risk Register for nationally significant risks.[5] The register groups 38 risks under different headings, and identifies the lead agency co-ordinating each risk.

Various statutes are relevant to resilience, such as the Resource Management Act 1991 (under review), the Civil Defence Emergency Management Act 2002, the Local Government Act 2002, the Building Act 2004 and Climate Change Response (Zero Carbon) Amendment Act 2019 (Saunders, et al. 2020). However, while these statutes are relevant to resilience, the term 'resilience' is not included in their purpose.

The National Disaster Resilience Strategy (see New Zealand Government 2019) sets out New Zealand's approach to disasters and hazardous events. The Strategy is based on a shared approach between governments (central and local), relevant stakeholders, and the wider public.

New Zealand has in place many of the policies identified in Table 3.

5.2. What has worked well?

5.2.1. Strong trust, fundamental institutions and international reputation

New Zealand is frequently assessed as having strong fundamental institutions such as the rule of law, based on various cross-country surveys of competitiveness etc (Pells 2022). Compared with other countries, New Zealand also ranks highly in terms of social capital/trust, and the broad policy and regulatory environment.

New Zealand's strong institutions have served it well during various shocks. International comparison suggests that during the 2008 Global Financial Crisis, New Zealand did quite well in avoiding serious financial stress – particularly serious banking crises – due to its sound institutions and policies (Bordo, Hargreaves and Kida 2011).

New Zealand has a good reputation for its fiscal and monetary management (Easton 2023).
New Zealand has a strong international reputation more generally, based on various brand surveys about how other countries perceive the country (Pells 2022).

[5] https://www.dpmc.govt.nz/our-programmes/national-security/national-risk-approach/new-zealands-nationally-significant-risks

5.2.2. Sound macro-economic and fiscal policy

International assessments of New Zealand's macro-economic policy over recent decades are consistently positive (Pells 2022). Greater Christchurch Group, DPMC (2017) found that New Zealand's low government debt and strong Crown balance sheet, strong financial sector, and sound macro institutions provide the flexibility required to manage crisis situations. Low government debt and strong balance sheets provide the capacity to respond to unexpected crises.

For example, New Zealand coped comparatively well with the 2008 Global Financial Crisis (Easton 2023). The author commented that the Reserve Bank was not unprepared for a global financial crisis, and has since made some other changes including requiring the trading banks to borrow offshore for longer periods than three months.

New Zealand also coped reasonably well with the COVID-19 pandemic and disruptions from the Russian-Ukrainian war regarding monetary policy (RBNZ 2022a). Successes included agile and nimble decision-making in response to the pandemic, the avoidance of worst-case economic scenarios and the success of monetary policy stimulus. However, by providing additional stimulus, monetary policy tools contributed to higher-than-otherwise economic activity and inflation.

It may be that being a small, open economy has helped build New Zealand's resilience to external shocks. This phenomenon is termed the 'Singapore paradox' (Briguglio 2003, cited in Briguglio, et al. 2008). The idea is that although Singapore is a small island economy highly exposed to exogenous economic shocks, it has managed to attain, and more importantly maintain, high levels and rates of economic growth. This ability to adapt and learn in the face of multiple shocks is in line with the evolutionary perspective of resilience.

In a highly cited study, Briguglio, et al. (2008) constructed an index of a country's economic resilience which covered macroeconomic stability, as well as microeconomic market efficiency, good governance and social development. The index drew on data sources from 2004-5. Based on this index, New Zealand was ranked second out of 86 countries in terms of its resilience, partly due to its sound macro-economic policy.

5.2.3. Private mitigation measures including insurance

New Zealand has very high insurance penetration across residential property compared with other countries – around 98% (New Zealand Government 2019). This likely reflects New Zealand's exposure to a range of disasters and hazards, as discussed above and in section 3, as well as the Earthquake Commission. Numerous studies find that countries and regions with higher levels of hazard exposure are better adapted and therefore experience fewer damages from natural disasters (Davlasheridze and Miao 2021). Essentially, over time these countries build up experience in dealing with shocks, per the evolutionary perspective of resilience and the 'Singapore paradox' described above.

New Zealand households are reasonably prepared for some natural disasters and know what actions they should take in the event of an earthquake or a tsunami (ADPC and UNDRR 2020). The National Emergency Management Agency (2020, cited in ADPC and UNDRR 2020) conducted a survey in mid-2020 (ie during the COVID-19 pandemic) and found that nearly nine in ten New Zealanders have taken at least one action to be prepared for an emergency, with emergency supplies being the most common action.

5.2.4. Flexible labour markets and reallocation

In New Zealand, labour market policies are directed more towards fostering flexibility and maintaining work incentives than in many other countries (Fabling and Maré 2012). New Zealand also has relatively light regulatory controls, making it one of the easiest countries in the world to start a new business and to do business. This flexibility encourages the reallocation of resources following a recession or shock, and thus improves the adaptability of the economy (see section 4).

However, New Zealand has less extensive active labour market policies than European countries and has income support policies that emphasise in-work benefits, with only moderate replacement rates for unemployment benefits, providing limited scope for income smoothing (Fabling and Maré 2012). New Zealand has therefore prioritised flexibility of adjustment over security of income and employment. The downside of flexible labour market regulations is that the costs of economic restructuring largely fall on to individual workers (OECD 2017a). The OECD recommended that New Zealand strengthen the policy framework for displaced workers and extend income support, active employment measures and training programmes to a broader range of workers to help workers maintain their job quality and living standards.

5.2.5. Strong scientific base regarding certain risks

New Zealand has an internationally-connected science community, including several platforms specifically targeting natural hazards (New Zealand Government 2019). This knowledge has helped the country cope with various shocks.

For example, geological research helped New Zealand understand and cope with the 2010/11 Christchurch earthquakes (Easton 2023). This follows a long history of integrating risk information about earthquakes into decisions about construction etc, dating from the mid-19th century. The New Zealand building stock is designed to protect life, and while buildings may lose functionality, collapse or structural damage resulting in loss of life during earthquakes is rare (ADPC and UNDRR 2020).

Similarly, COVID-19 highlighted the critical role of medical schools in New Zealand's response (Easton 2023). The medical schools' capacity, good overseas connections, and understanding of the history of pandemics, enabled them to deal with the novel virus.

5.3. What has not worked so well?

5.3.1. Unclear roles and accountabilities and patchy performance

Marked variations in practice, patchy capability across the country, and different understandings about roles, responsibilities and authority were key findings in a Ministerial review of responses to natural disasters and other emergencies (see Sowry 2017). The authority to act in an emergency, or the authority to task someone, either does not exist or is not clear. This situation can lead to a lack of coordination, no one really in charge, and the risk of poor outcomes for the community. Note that since this review a number of policy settings have changed, including the development of a National Disaster Resilience Strategy (see start of this section). Also note that the Emergency Management Bill (which, as at November 2023, has had its first reading) aims to clarify roles and responsibilities across the emergency management system.[6]

A lack of an integrated approach to risk management in New Zealand was also found by ADPC and UNDRR (2020). The authors argued that New Zealand's static and unrevised legislative instruments for responding to complex and evolving challenges renders the government's approach as simply doing 'more of the same'. For example, while the Public Finance Act of 1989 guides and directs the management of public assets, disaster and climate risks have not been integrated into the policy statement and remain absent from the Treasury's strategic frameworks. Similarly, the OECD (2021) argued that disaster risk management frameworks in New Zealand are fragmented, and lead responsibility for managing the risks of different types of hazards falls under different agencies. Tensions between central government policies and local authorities implementing legislative

[6] https://www.civildefence.govt.nz/cdem-sector/legislation/emergency-management-bill/emergency-management-bill-overview-of-proposed-changes

provisions arise from this lack of integrated approach and from unclear mandates regarding the management of climate change and other risks (ADPC and UNDRR 2020).

There are therefore ongoing questions about whether New Zealand has struck the right balance between top-down and bottom-up decision-making when crises occur. In the context of the 2010/11 Christchurch earthquakes, Greater Christchurch Group, DPMC (2017) found that, despite the fact that public engagement into decision-making was provided for in the legislative framework and extensively practiced by the Canterbury Earthquake Recovery Authority (CERA), there remains a perception that participation and community engagement in the recovery did not meet the public's expectations. Similarly, Bakema, Parra and McCann (2018) argued that CERA was too powerful, not independent and not engaged enough with local tiers of government or with the people. Also in the context of the 2010/11 Christchurch earthquakes, Mamula-Seadon and McLean (2015) concluded that the question of central control versus local empowerment remains as yet unanswered in New Zealand.

Institutional arrangements that are not fit for purpose was highlighted as an 'extreme' risk in New Zealand's first assessment of the physical risks from climate change (see Ministry for the Environment 2020). In particular, uncoordinated and inconsistent governance between and within agencies contributes to maladaptation and other risks. Similarly, in its resilience framework, Waka Kotahi (2018) identified poor co-ordination across government for adapting to emergent issues, especially climate change, as a key challenge to the resilience of the transport system.

Variable performance and capability at the local level are identified as significant issues in various risk assessments. For example, ADPC and UNDRR (2020) found that a lack of local human capital, technological capacity and funding often contributes to disparities between New Zealand's disaster governance, especially in smaller, rural local government areas.

Multiple organisations and agencies are responsible for monitoring hazards including several Crown research institutes. There are challenges around increasing the availability of all collected information and assessments to the people and planners across levels of government. For example, the integration of climate risks into local planning and asset management decisions was found to be patchy across local government agencies in New Zealand (Pells and Howard 2022).

New Zealand is not alone in these challenges. Many other countries appear to struggle regarding governance and institutional arrangements to enhance resilience, including striking the 'right' balance between central control versus local empowerment (see section 4). Therefore, it might be useful to work with other countries to develop solutions to what seems to be a common issue.

5.3.2. Fragmented data sources and tools that encourage short-termism

Disaster risk data systems in New Zealand are maintained by a plethora of actors, and a comprehensive system is not yet available (ADPC and UNDRR 2020). A lack of a single authoritative data source about climate risks, for example, can lead to inconsistent decision-making, and undermine councils' abilities to make challenging decisions like managed retreat (Pells and Howard 2022). Even where data do exist, they are not always easily accessible and may be behind a paywall.

As well as data challenges, some analytical tools and frameworks may work against long-term resilience. Government decision-making frameworks and well-established practices in law, economics, engineering and planning continue to rely on static assumptions of risk and historical parameters (Ministry for the Environment 2020). One example is that using single flood standards (eg a 1 in 100-year event) to plan land use and design infrastructure results in decisions that are inflexible to changing flood risk. Existing analytical tools for climate change may encourage short-termism and so work against long-term investment (Pells and Howard 2022). Barriers to the uptake of new tools by New Zealand agencies include a lack of analytical capability and deeply held views about specific tools (Pells 2023b).

As discussed above, even when risk information is available it is not always integrated into decision-making. In the past, including in the 2010/11 Christchurch earthquakes, policy targeted replacement of existing infrastructure, leading to missed opportunities for recovery activities to address underlying risks (ADPC and UNDRR 2020).

5.3.3. Inability to recognise and prepare for structural change

New Zealand seems to struggle to deal with major structural changes in the economy. In Easton's (2023) assessment of New Zealand's economic history of shocks, the author found that, arguably, the fall in the structural price of wool in the 1960s was the greatest shock to the economy in modern history. Initially, the shock was treated as a large, but temporary, price shock. New Zealand was impacted by a major change in its terms of trade, which policy analysis did not pick up.

Easton (2023) argued that, typically, it has proved difficult for New Zealand to adjust smoothly to structural change because there is considerable political, policy and public inertia, and the incumbent political system tends to protect the past economic structure. More generally, New Zealand tends to rank poorly in international comparisons about the future orientation of government (see Schwab 2019). Future-orientation is presumably important in detecting and dealing with structural change.

Transition risks from climate change are a significant challenge for New Zealand and one that the country seems slow to recognise, given that emissions have yet to trend downwards significantly.[7] The OECD's most recent economic survey of New Zealand (see OECD 2022) stated that New Zealand is not on track to meet either its 2030 abatement commitment or its 2050 net zero carbon emissions target, the carbon price is too low, and efficient complementary measures still need to be taken.

New Zealand faces a major structural challenge in lowering emissions, given the reliance on emission-intensive industries such as agriculture (ADPC and UNDRR 2020). New Zealand's growth model, largely based on exporting primary products, has started to show its environmental limits, with increased emissions, freshwater pollution and threats to biodiversity (OECD 2017b). Muirhead and Campbell (2012) argued that New Zealand's powerful dairy industry has favoured productivity goals over environmental ones, the structure of the sector has created ecological fragility, and the sector lacks resilience to future shocks such as climate change.

5.3.4. Persistent inequities among groups exposed to shocks

Some population groups are much more exposed to downturns and labour market fluctuations than others. RBNZ (2022b) found stark differences in the exposure of different ethnic groups in New Zealand to downturns. On average over the period 1986-2020, European unemployment increased by 1.3 percentage points during labour market contractions, whereas Māori unemployment increased by 6.9 percentage points, and Pasifika unemployment increased by 11.7 percentage points.

Some people may lack the wealth, resources and capacities to deal with different shocks and so may be particularly vulnerable.[8] Such groups might include young people, migrants, ethnic minorities, non-standard workers, and people who lack strong support networks (Chen, Craven and Martin 2021). Kaye-Blake (2022) found that New Zealand communities that scored lower on a resilience index have lower average income, and lower levels of educational achievement and employment.

[7] https://climateactiontracker.org/countries/new-zealand/

[8] The use of the term 'vulnerable' to describe population groups has been criticised by some (Chen, Craven and Martin 2021). Similarly, 'resilience' has negative connotations among some in Māoridom. For example, Penehira, et al. (2014) argued that, by definition, resilience theories assume an acceptance of responsibility for disadvantage.

In addition, some population groups may be ill-served by resilience policies. For example, Chen, Craven and Martin (2021) found that the effectiveness of immediate post-disaster strategies for Māori is impacted by tensions that arise from confusing communications, civil servants gatekeeping information and resources, culturally insensitive leadership styles, disregard for local knowledge, and little investment in relationship building with whānau, hapū and iwi who have mana whenua.

5.4. Priority areas for policy

5.4.1. Strengthen governance including clarifying roles

A number of reviews and reports have recommended that New Zealand strengthens its governance arrangements and clarifies roles around risk management, especially the roles of central and local government.

For example, the recommendations of the Ministerial review of responses to natural disasters and other emergencies (see Sowry 2017) included that mayors should have primary authority for declaring states of local emergency and a proactive national emergency management agency be established. The agency would provide national co-ordination and support in local emergencies and national control in national emergencies, and would have a far stronger role in setting and enforcing national standards. Both these recommendations have subsequently been picked up.

Similarly, in the context of disaster risk reduction, ADPC and UNDRR (2020) suggested that improved co-ordination and collaboration strategies must be supported by updated and harmonised policymaking, which seeks to reduce overlapping responsibilities and budgeting, and maintains a holistic understanding of the interlinkages between national development, disaster risk reduction, climate change adaptation and sustainable growth.

The Ministry for the Environment (2020) suggested that anticipatory governance and effective decision-making in the context of uncertainty is necessary to reduce exposure to climate adaptation risk. Improved local planning and decision-making is needed to ensure communities do not develop in areas prone to climate change hazards that may lead to displacement.

5.4.2. Proactively mainstream risk reduction

Disaster risk reduction and climate adaptation requires an integrated whole-of-society approach. ADPC and UNDRR (2020) argued that New Zealand's 2019 Disaster Resilience Strategy should be supported by a wider policy agenda, seeking to mainstream disaster risk, climate risk and sustainable development throughout the spectrum of policy. The authors suggested that, overall, the onus must move away from inherently reactive emergency management and civil defence which dominates New Zealand's institutional landscape towards proactive risk reduction. The authors concluded that more focus is required at all levels on addressing risks and uncertainties.

5.4.3. Improve risk information and tools

ADPC and UNDRR (2020) recommended that New Zealand establishes a comprehensive Disaster Information Management System which combines various existing platforms and databases to harmonise and synergise available information. As well as disaster risks, the system should cover the dimensions of potential climate change impacts. Data should be made publicly accessible to local governments, planners and the public, and stored in a manner which can be easily analysed and compiled by harmonising cross-platform compatibility and interoperability.

Similarly, the need to collect and share granular (highly localised) data on climate risks in a comprehensive and harmonised way, based on a single authoritative source, was a key finding in MBIE's study about climate investment (see Pells and Howard 2022).

As well as risks, it also important for decisions to account for uncertainty. There is a growing set of analytical tools to help deal with risk and uncertainty, including scenario analysis, real options analysis and risk-opportunity analysis (see Pells 2023).

5.4.4. Prepare for, and shape, structural change

To reduce New Zealand's reliance on high-emissions agricultural exports, the OECD (2017) suggested that New Zealand should build on its well-developed knowledge and innovation system for exporting higher value primary export products and decouple growth from natural resource use. New Zealand has acquired a competitive advantage in several environmental technologies and could lead international research efforts to find solutions that reduce the environmental impacts of agriculture.

In addition to reducing emissions *within* the agricultural sector, reducing emissions may also involve diversifying New Zealand's export base. This is likely to require concerted, co-ordinated and focused policy effort, as "getting off the grass" has long been suggested (see for example Hendy and Callaghan 2013), but has proven challenging to achieve in practice. This likely reflects New Zealand's strong and enduring comparative advantage in agricultural products (Baigent 2022), and strong path dependence in New Zealand's economic trajectory (Pells 2022). It may also reflect that New Zealand's institutional arrangements tend to favour the primary sector (New Zealand Productivity Commission 2021). In addition, previous attempts to encourage a structural shift to higher-value and knowledge-based industries have lacked materiality; Skilling (2020) characterised most of these recent sector initiatives as delivering a "sub-therapeutic dose".

5.4.5. Reduce inequities to help build resilience capacities

The findings earlier in this paper highlight that building the resilience capacities of communities and individuals requires access to a range of financial and other resources. However, some population groups in New Zealand face persistent disadvantage, and so may struggle to build the requisite wealth and resources. For example, Chen, Craven and Martin (2021) argued that resilience efforts need to consider how to effectively engage and support marginalised, under-served, and under-represented populations. This involves addressing structural inequities that may reduce the resilience capacities of such groups.

In its inquiry about persistent disadvantage, the New Zealand Productivity Commission (2023) suggested that addressing persistent disadvantage involves tackling powerful system barriers including policy short-termism, power imbalances, and the ongoing impact of colonisation. Clearly, these are important long-term challenges for policy.

Where possible, policy should support community-led resilience efforts. For example, during the COVID-19 pandemic, proactive responses from Māori, Pasifika and other community groups were effective in distributing food and resources, providing information, and raising vaccination rates (Chen, Craven and Martin 2021; Inspiring Communities 2023). Similarly, during the 2010/11 Christchurch earthquakes, Māori initiatives were found to be highly effective (Kenney and Phibbs 2015).

5.4.6. Uphold the principles of Te Tiriti o Waitangi

As with all policy areas, resilience policy must uphold the principles of Te Tiriti o Waitangi – partnership, participation, active protection, and redress (Chen, Craven and Martin 2021). Government has a responsibility to honour the principles and intent of Te Tiriti, and to formulate resilience policies on that basis with Māori communities.

Iorns (2022) considered Treaty of Waitangi duties relevant to adaptation to coastal hazards from sea-level rise. The author concluded that Treaty duties require the respect of iwi and hapū as Treaty partners to substantive active protection of their coastal assets and their kaitiakitanga over those assets, as well as recognition of their authority to preferably control, but at least share in, decisions

over those assets. The author argued that central and local government need to keep in mind the wider picture of upholding not only the Treaty principles – interpreted generously – but also tikanga and active protection of taonga, rather than solely minimum conditions in legislation.

Māori hold wide-ranging perspectives on the topic of resilience (Pells 2023a). These perspectives include stewarding cultural resilience ie the survival of Māori people's way of life. Despite the effects of colonisation, iwi and hapū have survived and found ways to maintain their culture and way of life. The need to be resilient *against* the impact of government policies may be some of the reasons the term 'resilience' has negative connotations among some in Māoridom (see above).

Te ao Māori potentially holds important insights for community resilience in general, not just for the resilience of Māori communities themselves (Chen, Craven and Martin 2021). Important characteristics of whānau resilience, which protect whānau in relation to economic and other shocks, include access to resources, the presence of support networks, and good communication within the whānau. Similarly, the New Zealand Productivity Commission (2023) found that Māori organisations demonstrate a strong focus on the long-term, on relationships and place, and on the needs of the collective, all of which are relevant to long-term resilience.

6. Conclusions

Many different policies aim to enhance the resilience of economic systems. These policies include ones to identify and manage risks, prepare for a shock, recover and regain lost functionality following a shock, and adapt and transform in preparation for future shocks. Relevant policies often support wider economic development goals in general, not just resilience goals.

The effectiveness of these policies partly depends on the definition of resilience being used. For example, some policies that dampen the initial impact of a shock may actually increase its persistence, and vice versa – 'bouncing back/impact absorption' resilience may be at the expense of longer-term 'adaptability/bouncing forward'.

Important policy considerations regarding resilience include ensuring effective governance including locally-led approaches, avoiding crowding out private risk mitigation efforts, and balancing short- and long-term goals. These considerations are likely to be linked. For example, locally-led approaches require information about broader system effects to provide appropriate incentives for long-term planning and risk mitigation.

Historically, New Zealand appears to have coped fairly well with the many different shocks the country has faced. Learnings from previous shocks suggest that potential areas for improvement include strengthening governance (including clarifying roles of central and local government), proactively mainstreaming risk reduction, improving risk information and tools, preparing for and shaping structural change, and reducing inequities for some groups. Many other countries struggle with similar issues.

Looking ahead, possibly some of the biggest resilience challenges that New Zealand faces relate to climate change. New Zealand is likely to see an unprecedented increase in the frequency and severity of climate-related weather events etc. These events require not just an immediate policy response, but also the ability to recognise the changing risk profile regarding climate change, and to build that changing risk profile into longer-term planning and adaptation.

In addition to the physical effects of climate change, structural change arising from the transition to a low-emissions economy is a major challenge for New Zealand. Reducing gross emissions is likely to involve significant changes within emissions-intensive sectors like agriculture, as well as diversifying New Zealand's export base. History suggests that supporting such structural change will be difficult and will require concerted effort. A future-orientation for government is also likely to be important, and seems to be something New Zealand has struggled with in the past.

As well as preparing for known trends like climate change, preparing for the future involves building the capacity of economic systems to adapt to multiple and unexpected shocks. This reflects that it is hard to predict where the next shock will come from, so ongoing investment in flexible assets and resources, and ongoing adaptation and learning, are required.

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Appendix 1 – Policies in more detail

This appendix provides further evidence about resilience-focused policies, broken down by stage of resilience (see bullets immediately below) and broad type of policy:

- identifying and managing risks (risk mitigation)
- preparing for a shock (impact absorption)
- recovering and regaining lost functionality (recovery)
- adapting and transforming (adaptation/transformation).

Identifying and managing risks (risk mitigation)

These policies include the development of tools to detect the types of vulnerabilities that create the conditions for shock events to turn into severe crises, while taking timely actions to stem the build-up of such vulnerabilities (OECD 2021a).

Understanding disaster risk is a key stage in risk mitigation. Increasing the understanding of disaster risks is fundamental to successful land-use planning, risk identification and prioritisation, informing risk and vulnerability assessments and early warning systems, and maintaining a comprehensive overview on disaster trends for future preparedness (ADPC and UNDRR 2020).

Research and science to understand risks

The Sendai Framework for Disaster Risk Reduction 2015–2030 (Sendai Framework) stresses that proactive planning and investment in disaster risk reduction based on proper risk assessment is highly cost-effective and may prevent future disaster-related losses (Kawasaki and Rhyner 2018). Investment by the public and private sectors in research and science promoting the understanding, prevention, and reduction of disaster risks is a key component of this proactive planning. Scientific advice plays a prominent role in informing policy responses to crises, as well as helping to identify and anticipate future crises. However, to date countries' budgets for disaster risk reduction are mainly used for post-disaster emergency response, recovery, and reconstruction in many countries, rather than proactive risk identification and planning (Kawasaki and Rhyner 2018).

The COVID-19 crisis highlighted the importance of science for resilience, as shown by the high speed with which the genome of the virus was sequenced by scientists, and the velocity at which promising vaccines and treatments were developed and deployed, in several cases using new techniques (OECD 2021a). In New Zealand, the country was able to call upon resources in the university medical schools; an integral part of the quality of this resource was an ongoing study of past pandemics and a dialogue with overseas colleagues (Easton 2023). Another key element was that compared to some other countries, New Zealand's general public seemed to have a higher level of scientific understanding and so was more willing to accept vaccination and other preventative measures.

Information provision about risks

Effective risk reduction requires awareness, the formation of an intent to act, the identification and selection of a plan of action, and the execution of that plan (UNDRR 2022). However, cognitive biases affect people's understanding and acting on risk information. People order the world based on simple, rule of-thumb decisions (heuristics) that reinforce their basic psychological motives and expectations, even though they are not aware this is happening. One commonly used short cut is to simplify complexity by attempting to determine a linear cause and effect. Other relevant cognitive biases include a tendency for people to focus only on what is in front of them (myopia) and the belief that bad things will not happen to them (optimism).

Incentives and information provision need to recognise and be aligned with these heuristics or biases. For example, studies show decision makers are much more likely to undertake loss reduction measures if they are told there is more than a one in five chance of having at least one severe wildfire, flood or other disaster causing damage to their property over the next 20 years, rather than being told there is a 1 in 100 annual probability of such a disaster (UNDRR 2022).

Cultural differences may lead to some communities mistrusting government agencies and tend not to rely on them as sources of information (Chen, Craven and Martin 2021). Communication strategies and content should acknowledge community norms, beliefs, and values that shape expectations of what should be done before, during and after the adverse event. For example, during the COVID-19 pandemic community organisations were conduits of communication, reaching traditionally hard-to-reach communities.

Scenario planning, stress-testing, early detection of emerging trends

Long-term resilience tends to rely on a process that continuously reviews the current state of affairs against future trends (Vermeulen 2022). The failure to spot changing trends early may have severe long-term costs and may make eventual transitions harder. In evaluating risk exposure, countries should not only consider past disruptive shocks and linear risk modelling, but also evolving risk patterns, including demographic, economic, technological, and environmental drivers and trends, as well as their inter-dependencies and potential cascading impacts (OECD 2014).

Established resilience measures should be adapted to keep pace with the evolving changes in the risk landscape (OECD 2014). Strategic foresight is useful to increase resilience in the face of uncertainty. Strategic foresight capacity helps governments to anticipate uncertain events through creative reflection processes, supported by methodologies such as foresight-scenarios, conditional projections, simulations and trend analyses.

Preparing for a shock (impact absorption)

Relevant policy settings and mechanisms are ones that can be put in place *ex ante* to enhance preparedness and help with the absorption of the impact of acute shocks (OECD 2021a). One example is automatic budgetary stabilisers through the system of public taxes and transfers which act as buffering mechanisms that help with the absorption of negative economic shocks. Another example is encouraging redundancy or spare capacity in production in areas of critical importance for the absorption of shocks.

Macro-prudential and other financial policies

Vulnerabilities in the financial sector mainly arise for two reasons: under-pricing of risk in boom times; and the interconnectedness and common exposures of the financial sector can make individual institutions systemically important (Sánchez, Rasmussen and Röhn 2015). Vulnerabilities in the financial sector can spill over to other sectors via credit and asset price booms, capital inflow surges and risks of potential bailout.

Before a financial crisis emerges, macro-prudential measures can lean against systemic threats to financial stability arising for example from excessive credit, leverage and asset price growth. These measures include countercyclical capital buffers, dynamic provisioning, caps on loan-to-value (LTV) and debt-to-income (DTI) ratios, and increasing risk weights on particular asset exposures. Macro-prudential policies affect economic resilience through at least two channels: firstly, by reducing systemic threats to financial stability arising for example from excessive credit, leverage and asset price growth; secondly, via an increase in the shock absorption capacity of the financial sector eg capital and liquidity buffers increase the distance to default in the case of an adverse shock (Caldera-Sánchez, et al. 2016).

Experience with macro-prudential tools is still limited, but some evidence on their beneficial effects has started to emerge (Sánchez, Rasmussen and Röhn 2015). Despite this encouraging evidence about their effectiveness, macro-prudential tools face implementation challenges in practice. Given that macro-prudential policy is primarily aimed at containing systemic risk, it has to be employed pre-emptively and so the timing of its introduction is critical. Moreover, little is known about how various macro-prudential tools interact and about their interaction with micro-prudential tools, monetary policies and fiscal policies. International spillovers may also affect the effectiveness of the tools.

More generally, frontloading financing of disaster recovery is an important aspect of *ex ante* resilience planning (OECD 2020). To avoid having to rely on ad hoc budgetary measures, governments have various *ex ante* options when it comes to financing disaster relief, including budgeting reserve funds or market-based tools like pre-approved contingent lines of credit, pooled insurance, and catastrophe (CAT) bonds. The broader evidence base for these approaches remains thin since they are a relatively recent phenomenon. However, a few OECD countries have long-running experience with these tools. Mexico has a long history of using CAT bonds to insure against earthquakes and hurricanes, and other OECD countries using these tools include Australia for cyclones, Chile and Europe for floods, and Japan for typhoons. In New Zealand, Toka Tū Ake EQC has also recently entered the CAT bond market.[9]

Framework conditions

Framework conditions are the broad set of regulations, institutions etc that affect the business environment. In broad terms, these regulations and policies affect resilience by either cushioning the initial impact of a shock (impact absorption/bouncing back) or reducing the persistence of the shock by encouraging the reallocation of resources for example (adaptation). Importantly, policies and institutions that dampen the initial impact of a shock may actually increase its persistence, and vice versa ie they may have conflicting effects on resilience (Duval, Elmeskov, and Vogel 2007). For example, strict employment protection legislation may reduce the extent to which firms lay off workers in the short run in response to a negative shock, thereby supporting employment and private consumption. At the same time, it may slow down the wage adjustment process as well as workers' reallocation towards other productive jobs.

Regarding reallocation, flexibility in labour markets, competition in product markets, framework conditions that facilitate the entry and exit of firms, as well the quality of government services (eg rule of law, absence of corruption) are often considered to be important to high shock absorption capacity (Sondermann 2017). There is some empirical support for the claim that strong and flexible institutions and framework conditions help absorb shocks. For example, Acemoglu, et al. (2003) found that countries with weak institutions suffer substantially more volatility as measured by the standard deviation of per capita output. Similarly, Sondermann (2017) found that strong and flexible institutions increase a country's resilience to adverse shocks. This author used a broad range of indicators to identify the well-functioning of economic structures and a large panel dataset of OECD countries over nearly 35 years. Caldera-Sánchez, et al. (2016) found that countries with higher-quality institutions (more effective government, greater voice and accountability, better control of corruption, etc) benefit from both higher growth and fewer occurrences of severe recessions.

Conversely, any policy or institution that increases wage and/or price stickiness would be expected to lead to a smaller but more persistent output reaction to certain shocks (Duval, Elmeskov, and Vogel 2007). Among the many theoretical underpinnings of price stickiness, imperfect competition in product markets features prominently. There is fairly strong evidence at the microeconomic level that firms tend to reset their prices more frequently in more competitive markets, lending some support to the view that low product market competition increases price stickiness.

[9] https://www.eqc.govt.nz/news/catastrophe-bonds-added-to-new-record-high-reinsurance-portfolio/

Governance, institutions and preparedness strategies

Understanding who to connect with, what resources are available, and who has decision-making authority beforehand can be crucial for responding to fast-moving crises and therefore for increasing resilience over time (New Zealand Productivity Commission 2023a).

Governance models for resilience and sustainability commonly introduce integrated, comprehensive and effects (all-hazards)-based policy and planning (Mamula-Seadon 2017). This approach presumes democratic systems with decentralised and deliberative planning and decision-making processes that integrate risk management into broader sustainable development strategies. The governance model is tiered (ie central-regional-local government); central government sets national direction and policies and local government is responsible for implementation. The supporting legislation, policies, guidelines and plans are commonly based upon sustainable development principles, favouring local empowerment and bottom-up approaches to management. The approach demands extensive coordination and cooperation among all levels of government, private sector, community groups and other stakeholders, with a particular emphasis on the inclusion of affected communities into decision-making.

A first step in decision-making about resilience is defining the goals of resilience. Without defining goals, conflicts over resources, resilience-building and the importance of power asymmetries may be overlooked (Tanner, Bahadur and Moench 2017). A key challenge for resilience as a framing development goal is that the concept can be used to pursue a range of different goals, supporting a range of different values.

The planning phase is most effective if it brings together various stakeholders in a participatory approach, clearly delineates the responsibilities and actions of each, including who will be protected, under what conditions, and who will pay for the protection (OECD 2020).

Institutions influence the way individual actors decide about whether or not to invest in resilience (OECD 2014). For example, the decision of an individual household not to build protection against floods around their house may depend on the household's expectation of the government doing so for them. A local government decision not to invest in a protective dam may be the result of other neighbouring jurisdictions freeriding on the provision. At the central government level, for example, actors may be reluctant to invest more in resilience, because *ex ante* investments are not visible, and hence levels of rewards too low. It is therefore crucial to identify such institutional barriers to reforms for boosting resilience.

Numerous studies have shown that more democratic, accountable government institutions can effectively reduce natural disaster losses (Davlasheridze and Miao 2021). There is some evidence that, during the COVID-19 pandemic, countries that did well on measures of institutional resilience had relatively good health outcomes rather than those that had high levels of pre-pandemic preparation (Treasury 2022). This is because strong institutions allowed for rapid reactive decisions to be taken to a pandemic that was different from the one that was planned for. This was also one of the lessons that the OECD (2021) drew from its review of the response to the 2010/11 Christchurch earthquakes.

A consistent finding in the literature is that community-led approaches, supported and enabled by national, regional, and local agencies, are required to build community resilience. The literature gives universal support to community development approaches including the enabling of community capacity building through mitigation, preparedness and recovery strategies (Winkworth 2007). Communities are best placed to mobilise local resources and have local knowledge and key relationships. Case study and other evidence suggests that when power is devolved to community members and leaders, decisions will tend to have long-lasting effects (Chen, Craven and Martin 2021).

However, a particular challenge for governance is the balance between national and local decision-making. For example, an analysis of the changes to disaster management arrangements in New Zealand following the Christchurch earthquakes concluded that the question of how to integrate national intervention and local control remains open (Mamula-Seadon 2017).

Early warning systems

Early warning is the provision of timely and effective information, through identified institutions, that allows individuals exposed to hazard to take action to avoid or reduce their risk and prepare for effective response (UNEP 2012). Early warning systems integrate risk knowledge, monitoring and predicting, disseminating information and response.

The Sendai Framework stressed the need for countries to set up early warning systems as part of their disaster risk management strategies. Similarly, the IPCC (see Lal, et al. 2012) considered early warning systems as a 'low-regrets' measure that provides benefits under current climate and a range of future climate change scenarios.

There is some evidence of the effectiveness of early warning systems in terms of reducing loss of life from disasters. For example, the World Meteorological Office estimated that the number of disasters globally increased by a factor of five over the 50-year period 1970-2019, driven by climate change, more extreme weather and improved reporting. But, thanks to improved early warnings and disaster management, the number of deaths decreased almost three-fold.[10] In addition to this indicative evidence, other studies provide more direct empirical evidence about the effectiveness of early warning systems (see for example Escaleras and Register 2008; UNEP 2012; Sahana, et al. 2023).

An effective early warning system delivers accurate, timely, and meaningful information, with its success dependent on whether the warnings trigger effective responses (Lal, et al. 2012). Early warning technologies have greatly benefited from recent advances in communication and information technologies and an improved knowledge of natural hazards and the underlying science (UNEP 2012). More recently, advances in satellite image-based forecasting of cyclone and storm surges have improved early warning system capacity and management in coastal areas worldwide (Sahana, et al. 2023). Nevertheless, many gaps still exist in early warning technologies and capacities, especially in the developing world.

Early warning systems do not just apply to natural disasters. The OECD and other international organisations developed indicators to detect potential threats to economic and financial stability (Caldera-Sánchez, et al. 2016). The large number of indicators covered in the dataset are grouped into five domestic areas: 1) financial sector imbalances 2) non-financial sector imbalances 3) asset market imbalances 4) public sector imbalances and 5) external sector imbalances.

Hermansen and Röhn (2016, cited in Caldera-Sánchez, et al. 2016) analysed which indicators are most useful in assessing the likelihood of severe recessions. The key insight was that indicators of global risks consistently outperform domestic variables in terms of relative usefulness. In particular, measures of the global credit-to-GDP ratio (growth and gaps from a trend), a global equity price gap and a global house price gap perform well. Among indicators measuring domestic developments, those that reflect asset market misalignments (real house and equity prices, house price-to-income and house price-to-rent) come out top. Overall, and as the authors noted, these findings highlight the importance of taking international developments into account when assessing a country's vulnerabilities.

[10] https://library.wmo.int/index.php?lvl=notice_display&id=21930#.YS9CMNMzZBx

Local planning and investment in critical infrastructure that integrates risks and minimises disruption

Land-use planning has a critical role in building sustainable and resilient communities, not only in terms of location, but also in urban design, quality of infrastructure and mechanisms which do not negatively impact already-sensitive and fragile ecological systems (ADPC and UNDRR 2020). Local planning should take an 'all hazards' approach to various risks, and discourage development or intensification in areas and suburbs with high natural-hazard risks, such as flood plains, active faults, volcanic fields, coastal hazard zones and land vulnerable to instability (New Zealand Infrastructure Commission 2022).

Infrastructure assets and networks are long-lived – decisions made now about the location, design and operation of these assets will determine their longer-term resilience to the effects of climate change and other risks. Infrastructure owners, operators and investors have an incentive to manage these risks, but a range of barriers may prevent them from doing so. These barriers include a lack of awareness or information, short-termism and misaligned regulatory incentives (Vallejo and Mullan 2017).

Some of the main policy measures to enhance the resilience of infrastructure to climate and other risks are therefore 1) support the provision of information about risks and the coordination within or between sectors 2) ensure risks are accounted for in public investments and transparently allocated between public and private partners in contractual arrangements 3) enable infrastructure resilience through spatial planning policy, sectoral regulation or technical standards and 4) encourage the financial disclosure of climate risks (Vallejo and Mullan 2017).

Building redundancy and spare capacity into infrastructure networks and distribution centres such as ports provides resilience to the domestic and international transport of goods (Vermeulen 2022). While such redundancy may imply an opportunity cost of unused production capacity, it can significantly reduce disruption during disasters. A comprehensive report on the experience of Japan following the earthquake and tsunami of March 2011 indicated how essential it is to be prepared for severe disasters (Ranghieri and Ishiwatari 2014 cited in Vermeulen 2022). Alternative physical infrastructure (roads and railways) as well as a slack capacity of ports offered resilience to the transportation system in the immediate aftermath of the disaster and during the medium term of recovery.

Supply chain measures

A number of *ex ante* measures are targeted at ensuring the provision of essential goods in times of crisis and minimising supply chain disruptions. These include stress tests and addressing concentration and bottlenecks in supply chains, stockpiling, and advance agreements with firms to adapt production lines to increase supply. Another measure is 're-shoring' or building domestic production capacity for certain goods, using subsidies, incentives and possibly trade protection. Other policies can reduce the degree of geographical concentration of supply chains by shielding domestic production from foreign shocks. For example, industrial policies can affect the cost of domestic production relative to production abroad, and trade policies can affect the relative costs of suppliers from different countries.

Empirical analysis across countries suggests that strategies based around a reliance on domestic production are unlikely to ensure supply of essential goods (OECD 2021a). Indeed, such strategies can remove important risk management strategies and adjustment channels, such as the diversification of supply offered by the global economy. Rather than posing a trade-off between efficiency and security of supply, global sourcing can help to ensure both. Similarly, some scenario analysis conducted by the OECD (2021a) found that generalised localisation and re-shoring – through tariffs and production subsidies – are unlikely to result in increased certainty or stability of supply.

Other recent evidence also found a limited role for onshoring. Schwellnus, Haramboure and Samek (2022) developed new indicators of global value chain dependencies to estimate the effects of supply disruptions abroad on domestic output. The results suggested that the adverse effects of supply disruptions are particularly large when concentration of supplying countries and supplying firms is high. Counterfactual simulations of the model suggest that diversification of suppliers would have sizeable benefits in terms of shielding domestic production against country-specific supply shocks. In contrast, partial onshoring of production had only small additional benefits and must be balanced with potentially large costs in terms of economic efficiency. Technological innovation that reduces foreign dependencies, such as the substitution of renewable energies for fossil fuels, can have similar benefits as diversification.

Instead, the OECD (2021a) argued for international co-operation when dealing with supply chain disruptions. Examples of such co-operation include cross-border sharing of information on risk-management intelligence, availability of essential goods, prices, market research and contacts and brokers, which can inform procurement strategies and smooth over global supply chain disruptions. Regional or bilateral standardisation of procurement procedures, joint procurement agreements and lending agreements can help smooth over temporary disruptions in the flow of goods by simplifying cross-border transactions. Regulatory co-operation and harmonisation of approaches can help avoid unnecessary frictions.

Stockpiling can be part of an effective risk-management strategy for both firms and governments (OECD 2021a). However, not all products can readily be stockpiled and there is a risk of 'generals fighting the last war' (stockpiling products based on previous experience when the next crisis might call for different products). Experience with stockpiling food has shown that the management of stockpiles is not straightforward; even beyond issues of perishability, are decisions about access and release (OECD 2021a). Stockpiling can benefit from international co-operation, partly because if countries simultaneously build stockpiles they can compound problems by causing price surges and shortages, while simultaneous release can cause prices to collapse and producers to exit the market, undermining future supply. In addition, regional stockpiles of some essential goods may be a cost-effective solution.

The OECD (2021a) also highlighted the many ways in which the private sector prepares for and deals with supply chain disruptions, and the need for the public sector to collaborate with the private sector to promote standards of conduct that both reduce the risks of supply chain disruptions and minimise the negative social and environmental impacts of such disruptions when they do occur.

In New Zealand, the New Zealand Productivity Commission (2023) found that supply-chain resilience policies in large, diversified economies focus on strategic autonomy in specific imports through re-shoring, near-shoring or friend-shoring. However, the Commission also noted that New Zealand's resilience strategy needs to reflect its unique circumstances including the small size and isolation of the economy. These circumstances limit the transferability of resilience-enhancing policies from other countries.

Risk transfer instruments such as insurance

For centuries, insurance and other risk transfer mechanisms have been used to manage risks that would be too large for people and businesses to bear on their own. By transferring some exposure to third parties in exchange of a premium, insurance has historically helped spread risk.

Well-functioning insurance markets are critical for enabling adaptation to a range of financial shocks, natural disasters etc (Frieling and Warren 2018). Insurance premiums and other price signals play an important role in discouraging activity and investment in high-risk areas (Pells and Howard 2022).

Government may shape and regulate private insurance to encourage private agents to manage risks (Easton 2023). Governments intervene for reasons including that private individuals tend to under-

invest in mitigation because they may lack information about risks, have biased risk perceptions, be myopic about future gains of mitigation, or lack the necessary resources (Davlasheridze and Miao 2021).

Evidence is emerging that if properly designed, insurance can also be useful in reducing risk (Warner, et al. 2009). However, the majority of empirical research relating to the link between insurance and disaster risk management is case-study based and focuses on factors conditioning uptake and impacts on response and recovery, instead of risk reduction (Le Quesne 2017).

Insurance has limitations in a resilience context: it does not prevent the loss of lives or assets (Warner, et al. 2009). Insurance is not always the most appropriate option to manage risks, in terms of cost-effectiveness or affordability. With climate change, insurance tools will be challenged to cover increasingly frequent and intense events. Furthermore, traditional insurance may not be the appropriate tool for longer- term foreseeable risks like sea-level rise. In such cases, other measures including basic investments in risk reduction make more sense.

In New Zealand, Storey, et al. (2017) considered some of the challenges for insurance from climate change. Insurers are likely to retreat from coastal and other high-risk locations once risks are sufficiently probable. Insurance retreat from coastal and other high-risk locations could increase the unfunded fiscal risk faced by government and decrease house prices as mortgages become unavailable (or more costly). Potential policy responses to insurance retreat and related issues include:

- provide information to prospective and current homeowners about climate risk
- investigate the viability of a market in long-term residential insurance, which would likely involve a pre-agreed schedule of premiums which would increase over time and could be contingent on observed sea level rise
- develop rules for risk and cost allocation, for example the sharing of costs between homeowners, local government and central government
- present housing-related liabilities in financial statements, to ensure that organisations remain solvent after a climate-related disaster.

In addition to policy directly about private insurance, other government policies may affect the uptake of private insurance. A key question relates to moral hazard problems,[11] and whether polices enable more private investments in risk mitigation or whether it acts as a substitute for private mitigation (Davlasheridze and Miao 2021).

Specifically, private agents may decide not to insure or invest in mitigation measures if they expect the government to provide assistance to cover their losses. Several US studies have investigated the effect of post-disaster relief on disaster insurance purchases and found that receiving disaster relief reduces household insurance coverage, thus providing support for this concern. Similarly, in New Zealand Easton (2023) argued that there is a public tendency for the uninsured to expect the government to provide for them after a disaster – well illustrated following the Canterbury Earthquakes. More recently, responses to the impacts of extreme weather events during Cyclone Gabrielle have reinforced this expectation, with central and local government buying out red-stickered properties.[12]

[11] Moral hazard refers to situations where the incentives to minimise a risk are lacking because there is protection from the consequences (Boston 2023).

[12] https://www.nzherald.co.nz/nz/auckland-council-and-government-set-to-unveil-1-billion-plus-package-to-buy-out-700-homes-and-meet-other-storm-related-costs/73AUQGKWWFFW7BN2LGK5VLACRI/

However, a counter-argument is that a strong focus on individual responsibility and self-dependence, such as via insurance, may harmfully affect those who cannot afford risk-transfers, and create conditions for 'victim-blaming' which does little to lessen vulnerabilities (ADPC and UNDRR 2020).

Boston (2023) considered the issues surrounding the provision of public compensation for private property losses due to managed retreat in New Zealand. Regarding private insurance, the author argued that insurers will not cover (many of) the costs of managed retreat. When managed retreat occurs immediately after a major flood, some of the costs will likely be borne by insurers. But insurers do not provide cover for lost land, only the built structures on the land. In the case of proactive managed retreat, unless there are fundamental changes to property insurance markets, insurers will not bear any of the costs. Nor, in most cases, will insurers cover the costs of inundation due to sea level rise. For these and other reasons the author came down heavily in favour of the use of public compensation schemes for managed retreat. The author acknowledged the risk of moral hazard associated with such schemes, such as the lack of incentives for households and businesses to take precautionary steps to lower risks, or for councils to inhibit further development in high-risk areas. However, the author concluded that these and other objections are more relevant to the question of how a compensation scheme should be designed (eg the level of, and eligibility criteria for, financial assistance) than whether or not any such scheme should be developed.

Overall, the extent to which government intervenes to cover private risks may involve balancing efficiency and equity objectives. From an efficiency perspective, policy should aim to complement and crowd-in private risk mitigation efforts where possible, encourage personal responsibility, and focus on correcting market failures. From an equity perspective, policy should aim to protect and support those who lack the resources to take up insurance and other private measures. In practice, the balance between these two perspectives is likely to reflect political economy considerations.

Job retention schemes, social insurance schemes and other passive labour market policies

Job retention schemes provide employment support with the aim to keep workers in employment (Vermeulen 2022). These are generally considered 'passive' labour market instruments – they are adaptable to changing circumstances and can be scaled and targeted, including to specific places or firms. Such schemes are known under different names (furlough, short-time work, job retention schemes, and wage subsidies) and countries may operationalise them differently. However, their aim is largely the same: to retain the relation between employer and employee during a shock or period of low activity, with governments covering partly for lost income to employees for hours not worked, or cost of employment to employers for retaining workers.

Some evidence suggests that job retention schemes have positive labour market effects. For example, robust firm-level evidence from France, Italy and Switzerland suggests that firms which used the job retention schemes during the Global Financial Crisis experienced stronger employment growth during the recovery period compared to those that did not use the schemes (Vermeulen 2022). Similarly, the emerging empirical evidence from micro-data in various countries provides support on the effectiveness of the economic support policies during the COVID-19 pandemic. Credit guarantees appear to have aided disproportionally the smaller, financially weaker firms or less productive firms, according to evidence from Italy, Portugal and the US (Vermeulen 2022). The support allowed many firms to stay in business including those that are quite viable in normal times.

Concerns have been expressed about job retention schemes in terms of their effects on reallocation. This concern relates to such schemes potentially propping up firms and jobs that might otherwise have failed, thereby inhibiting the movement of resources to more productive firms/jobs (Schumpeterian 'creative destruction'). However, cross-country evidence from OECD countries suggests that the programmes are effective in preserving jobs with only minor losses in allocative efficiency (Vermeulen 2022). Having said that, there is some evidence that programmes should not

be prolonged too long, as necessary changes that competitively select firms and allocate workers to better jobs must be allowed to happen sooner rather than later (OECD 2021b).

In New Zealand, the COVID-19 Wage Subsidy Support programme allowed more workers to remain in employment and more sole traders to remain in business, than was predicted would occur without a wage subsidy (Fyfe, Maré and Taptiklis 2023). This evaluation found that the wage subsidy did not unduly influence reallocation and creative destruction. Although job retention and firm survival were overall greater for subsidised firms, employment and individual earnings growth was lower. The wage subsidy helped subsidised firms remain viable rather than thrive, during the pandemic.

In recognition of concerns about reallocation, the European Commission has advanced the Danish notion of 'flexicurity' to characterise the balance that needs to be struck between flexibility of adjustment and security of income and employment (Fabling and Maré 2012).

Social insurance (and related schemes such as income insurance and unemployment insurance) involves government intervention in providing insurance against adverse shocks to individuals. Social insurance programmes began by providing limited coverage for risks such as injury at work and unemployment, but more recently governments provide substantial insurance for a broad range of risks, including health (Chetty and Finkelstein 2013). These schemes aim to smooth incomes and expenditure for people who are affected by the relevant shock. By avoiding large drops in income, these schemes aim to provide people with a protective buffer against stress of worrying about income and work, and related adverse health and other consequences. The schemes also aim to increase match quality and worker bargaining power by affording individuals more time to find a job (Dahl and Knepper 2022). However, by subsidising a lengthier job search and allowing workers to substitute leisure for work without enduring a steep loss in income, these schemes could lower employment growth.

International evidence unequivocally suggests that more readily available and generous unemployment insurance results in an extended period of job search (Tatsiramos 2014). Regarding income smoothing, evidence clearly demonstrates that consumption does fall when individuals are hit with shocks, but the consumption-smoothing role of social insurance is less clear and the range of estimates is wide (Chetty and Finkelstein 2013). Regarding labour market impacts, previous studies have not generally found sizeable employment and wage responses to changes in unemployment insurance. However, recent firm-level studies such as Dahl and Knepper (2022) suggest that large changes in scheme generosity are positively associated with changes in starting salaries for the same job and negatively associated with employment growth. The latter suggests that such schemes may adversely impact reallocation.

Active labour market policies

Active labour market policies (ALMPs) refer to a collection of policy instruments such as incentivising and aiding job seekers to find new employment, subsidised and alternative employment, and education opportunities. As well as aiming to improve the functioning of labour markets by addressing skill mismatches and integrating disadvantaged groups, these policies can assist workers to gain employment following a recession or other shock.

There is some evidence that ALMPs are effective in assisting the long-term unemployed into employment following a recension (Card, Kluve and Weber 2018). These authors conducted a meta-analysis of impact estimates from over 200 evaluations of ALMPs from around the world and found that:

- average impacts are close to zero in the short run, but become more positive 2-3 years after completion of the programme
- the time profile of impacts varies by type of programme, with larger gains for programmes that emphasise human capital accumulation

- there is a wide variation in impacts across participant groups, with larger impacts for females and participants who enter from long term unemployment
- ALMPs are more likely to show positive impacts in a recession.

A further consistent finding from the literature is that ALMPs need to be carefully targeted to the circumstances of the individual worker (OECD 2017).

In New Zealand, a number of studies have identified a lack of connection between displaced workers and employment services as a key barrier for re-employment. The OECD (2017) recommended that New Zealand explores ways to reach out to displaced workers in need of support.

Recovering and regaining lost functionality (recovery)

When shock absorption is insufficient or infeasible, the focus of resilience concentrates on the recovery from a negative shock (Vermeulen 2022). Post-disaster recovery is highly complex. It occurs in an environment of high stress, involves multiple agencies and stakeholders, has multiple priorities that evolve over time, and has no clearly demarcated end point (Ryan, Wortley and Shé 2016).

Response measures seek to maintain system functionality and need to be introduced quickly and efficiently. A key short-term consideration is therefore enabling people to 'get on with their lives' (Boston 2023). One lesson from the 2010/11 Christchurch earthquakes is that key design principles in relation to the red zone were: firstly, the desire to give certainty of outcome for property owners as soon as practicable; secondly, to create confidence for property owners to move forward.

However, policy work during the recovery phase must also have an eye to long-term goals. In practice, tensions often exist between the short-term, urgent relief needs of people and longer-term redevelopment aims (Bakema, Parra and McCann 2018). Evidence suggest that countries struggle with attaining the right balance between short-term recovery and long-term goals. Dynamic and context-sensitive governance arrangements that ensure a good balance between short- and longer-term needs and aspirations are still rare.

Getting the balance right between short-term recovery and long-term goals is particularly important for long-lived investments such as infrastructure. Post-disaster aid potentially provides an opportunity to undertake hazard mitigation measures in a cost-effective way, since such modifications are easier to make on destroyed assets than on sound structures. Also, to the extent that a disaster may update their risk perception, people are more likely to incorporate hazard mitigation in the reconstruction (Davlasheridze and Miao 2021).

But some evidence suggests that governments struggle to balance short- medium term and long-term resilience goals. This was a key finding in Adger, et al.'s (2011) analyses of various case studies about climate change policies and their implications for the resilience of social–ecological systems. The authors found a clear trade-offs between policy objectives focused on efficient and effective climate adaptation, narrowly defined, and those strategies which seek to retain resilience by investing in the underlying capacity to adapt both to climate and to other stresses that affect social–ecological systems. The authors commented that there are various reasons why adaptation is narrowly focused. These include the desire for readily observable metrics, political and election structures, as well as a history and culture of dealing with social–ecological problems in this manner.

Also regarding climate change, Wenger (2017) argued that a particular concern is that policies may support the continuing development of floodplains, placing more people at risk and damaging natural resources on which societies depend. In a feedback loop that could be described as an undesirable resilience regime, this fuels future demand for structural mitigation, which in turn supports additional development of hazardous areas. To avoid this maladaptive feedback loop, policy should focus on long-term desirable outcomes and the development of long-term adaptation pathways. There is

some evidence that flood control (eg levees and dams) can promote a false sense of security and thus reduce the perceived need to reduce risks (Davlasheridze and Miao 2021). Previous research suggests that government investments in protective structures tend to encourage more population movement and development into floodplains, thereby increasing local disaster risks and compromising long-term community resilience. Both New Zealand and overseas experience shows that to date, governments have generally been more willing to fund or co-fund protective structures (eg seawalls and other flood defences) than managed retreat (Boston 2023).

Counter-cyclical monetary policy

Monetary policy, such as raising or lowering interest rates, has been primarily responsible for cyclical stabilisation (Bernstein, Gaukrodger and Parkyn 2021). The conventional wisdom is that in a typical downturn monetary policy is more effective for demand management purposes than discretionary fiscal policy, as monetary policy does not suffer from implementation lags compared to discretionary fiscal policy (Sánchez, Rasmussen and Röhn 2015). Note, however, that there is a distinction between supply shocks (which move output and inflation in opposite directions) and demand shocks (which move output and inflation in the same direction). Some shocks are more amenable to monetary policy, others to a reset of fiscal strategy and policy, and others require some sort of microeconomic or structural response, depending on the nature of the shock and its persistence.

Empirical research does tend to support this conventional wisdom and finds that monetary policy is effective in managing demand and dampening cycles (Sánchez, Rasmussen and Röhn 2015).

However, monetary policy is less effective in a financial crisis, when private sector balance sheets and the monetary policy transmission channel are impaired (Sánchez, Rasmussen and Röhn 2015). Therefore, during a financial crisis short-term interest rates might need to be sharply reduced and, in some cases accompanied by unconventional monetary policy and discretionary fiscal policy, to effectively boost aggregate demand, as during the Global Financial Crisis. There are also limits about how long expansionary monetary policy can be kept in place to support recoveries, without fuelling additional risks such as inflation. Finally, international evidence suggests that monetary policy transmission is weaker when interest rates are persistently low (Borio and Hofmann 2017).

Counter-cyclical fiscal policy

Fiscal policy can contribute to mitigate a downturn through two main channels (Sánchez, Rasmussen and Röhn 2015). First, fiscal policy mitigates shocks without any deliberate action through the so-called ‘automatic stabilisers’, which arise from parts of the fiscal system that naturally vary with changes in economic activity, most notably unemployment-related expenditure. Second, through discretionary fiscal policy governments can deliberately adjust government spending, taxes or transfers to stimulate aggregate demand and mitigate a downturn.

Evidence of the effectiveness of the automatic stabilisers comes largely from cross-country studies (Bernstein, Gaukrodger and Parkyn 2021). This evidence suggests that the size of government is negatively correlated with output volatility in advanced economies. In other words, automatic stabilisers are effective in dampening the cycle.

Compared with monetary policy and automatic stabilisers, discretionary fiscal policy suffers from lags in the design and implementation which typically means that fiscal measures come too late (Sánchez, Rasmussen and Röhn 2015). There is also a concern that policymakers may respond in an asymmetric manner, easing fiscal policy in downturns and not tightening sufficiently in upturns, implying a permanent increase in the public debt-to-GDP-ratio with potentially adverse consequences for fiscal sustainability and long-term growth.

In brief, other insights from recent OECD evidence about the effectiveness of fiscal policy in dampening cycles (see Sánchez, Rasmussen and Röhn 2015) include:

- initial fiscal space – low government debt levels and sustainable public finances provide room for fiscal policy to address large adverse shocks
- the more open an economy is, the less it will benefit from the domestic demand expansion as the expansion will 'leak out' through higher imports
- for stimulus spending to affect the economy during a downturn, policymakers have to be quick to identify the downturn and to approve additional stimulus spending (eg 'shovel-ready' projects)
- among discretionary fiscal measures, evidence suggests public investment is the most powerful instrument, as there is no offset of public investment via private agents' saving
- when interest rates are constrained by the zero lower bound, discretionary fiscal policy can be highly effective as a stabilisation too.

Aid and emergency support

Post-disaster aid to local households, businesses and local government can aid recovery and reconstruction in the disaster-stricken area (Davlasheridze and Miao 2021). If done well, it can ensure that a range of hazard risks are taken into account in the rebuild of assets and infrastructure. Concerns include mismanagement of funded projects and inefficient use of public funding, political capture and crowding out private investment, and failing to account for the needs of socially vulnerable groups.

A key question is whether public disaster aid enables more private investments in hazard mitigation or whether it acts as a substitute for private mitigation (Davlasheridze and Miao 2021). The former argument is supported by the fact that a significant amount of government mitigation aid directly serves private individuals—for example, government funded buyouts of properties located in high-risk areas help to move people out of harm's way and reduce their exposure to future disaster shocks.

However, there have been growing concerns that disaster relief, particularly transfer payments for individuals and households to offset their actual disaster damage, may create a moral hazard problem (Davlasheridze and Miao 2021). Specifically, private agents may decide not to insure or invest in mitigation measures as they expect the government to provide assistance to cover their losses in future disaster events. Several US studies provide support for this concern.

However, Davlasheridze and Miao (2021) found limited evidence that aid crowds out private mitigation measures. These authors examined multiple post-disaster aid programmes implemented by the US federal government to support state and local governments as well as households and private businesses. Specifically, the authors estimated the risk-mitigating effects of these programmes by linking programme spending with reported economic losses from flooding and using panel data at the county level over the period from 1992 through 2015. They found that low-interest disaster loans lead to the largest reduction in subsequent flooding damage, and grants targeting public infrastructure restoration and flood control measures also reduce future flooding loss. Importantly, the results suggest limited net crowing out of private mitigation measures. On aggregate, estimating reduced damages in response to increased funds toward public disaster programs implies that the total risk mitigation benefits may outweigh a potential crowding-out effect.

Also in the US, Ji and Lee (2021) provided some evidence that disaster mitigation strategies reduce economic losses caused by natural hazards in the US. The grants and projects contributed to long-term solutions designed to diminish disaster risk and included purchasing property in flood-prone areas, adding shutters to windows to prevent damage by hurricane winds and rain, and rebuilding culverts in drainage ditches to prevent flooding damage. The study compared natural hazard losses in

counties that received funds in the wake of a disaster with those in other counties within the same state that did not receive funding over the period 2010−15. The authors controlled for various attributes of the counties. The findings suggested that the counties that obtained funds were likely to experience less property damage owing to future natural hazards.

Locally-led responses

Communities themselves are central to the recovery process (Winkworth 2007). In recognition of this, most countries' emergency management frameworks and plans state that recovery should be locally- and community-led (Owen 2017). Local governments are on the ground level, closest to the people and communities affected. However, while local governments have the highest stake in a quick response and strong recovery for affected communities, they may have the least capacity for effective response and recovery (Standing Panel on Intergovernmental Systems 2020). Large scale disasters therefore challenge decentralised bottom-up approaches and can overwhelm local capacity whilst putting intense pressure on central government to deliver (Mamula-Seadon and McLean 2015). Experience from disasters suggests that clarifying roles, expectations and legal responsibilities of all is a key success factor for policy. However, command and control issues recur repeatedly in large incidents, which suggests a failure to learn from previous incidents (Donahue and Tuohy 2006).

Strong social cohesion and networks within communities, and high levels of trust and social capital, are consistently found to be critical elements of a community's response to an adverse event, based on numerous case studies and other evidence. For example, a New Zealand review of community resilience (see Chen, Craven and Martin 2021) found that community organisations, marae, iwi, hapū, churches and mosques are critical social, organising and physical infrastructure, as illustrated in the early COVID-19 response phase. Similarly, in the 2010/11 Christchurch earthquakes, the work done by community organisations, such as churches, local Māori communities, self-organised community groups and volunteer 'armies', was of immense value in the response (Mamula-Seadon and McLean 2015). This implies that recovery efforts should utilise trusted, local providers where possible.

Owen (2017) suggested that for locally-led recovery to be effective, governments should be transparent with communities about possibilities and constraints, listen to the diversity of views in a community, ensure that those who are vulnerable have a voice and are looked out for and that community strengths and assets are acknowledged and built upon. These suggestions were based on interviews with stakeholders involved in locally-led recovery in Australia.

Adapting and transforming (adaptation/transformation)

Learning from previous crises

Relevant policies aim to enhance the capacity to learn from previous crises so as to better deal with future threats of a similar nature. This implies not only the need to avoid responding to shocks through policy actions that could sow the seeds of future crises but also to allow for taking advantage of new opportunities revealed by the crisis to improve resilience to a still broader range of threats moving forward (OECD 2021a).

After every significant shock, a report needs to be prepared as a matter of routine with the objective of identifying learnings from the experience (Easton 2023). To learn from the past, the conditions that contributed to the disaster or shock need to be identified, critically evaluated, and hopefully changed (Bakema, Parra and McCann 2018). Deeper learning involves truly institutionalising a new process and requires long-term commitment (Donahue and Tuohy 2006). The lesson learning and change process iterates through several steps: identify the lesson → recognize the causal process → devise a new operational process → practice the new process → embed/institutionalize and sustain the new process.

Evidence about the learning aspects of resilience and its enabling conditions is fairly scarce (Bakema, Parra and McCann 2018). This partly reflects that much resilience policy work focuses on absorbing and coping with a disturbance, rather than capacity-building for learning.

Wide variations in the approaches used in, and the scope of, post-crises reviews and evaluations is one common finding from the literature (Donahue and Tuohy 2006; Ryan, Wortley and Shé 2016). For example, in New Zealand there is currently no existing national framework for monitoring or evaluating post-disaster recovery (Ryan, Wortley and Shé 2016). This variabaility can limit the identification of recurring lessons. Those reviews and evaluations that have been undertaken tend to focus on the process of recovery, as opposed to the impact and outcomes of that process.

A failure to deeply learn from previous crises is a key finding from case study and other evidence. For example, Donahue and Tuohy (2006) used various qualitative approaches to examine lessons learned from disasters in the US and found that many problems and mistakes are repeated in subsequent events. These recurring lessons include uncoordinated leadership, failed communications, weak planning, resource constraints and poor public relations. One of the main reasons for the failure is a lack of will and commitment, reflecting factors like short-termism in decision-making. In addition, most big lessons are inter-agency lessons and require learning within and across agencies.

A further challenge is that past learnings may not be applicable to new challenges that are outside the realm of previous experience (Adger, et al. 2011). This is particularly relevant to climate change policy where the frequency and intensity of climate-related weather events etc is increasing rapidly. A key consideration in this context is the willingness to continue learning and to experiment.

Building long-term capacities and capabilities in communities

Adaptable resilience depends on institutions with capability to plan for shocks, take precautionary and pre-emptive action and follow good decision-making processes when they occur (Treasury 2022). Resilience is also supported by sufficient stocks of flexible assets (including borrowing capacity) and resources (including human capability) that can be readily leveraged in times of crisis and high levels of trust among people (social cohesion) as well as in institutions. These factors require enhancement and investment over time because their resilience benefits may accrue over quite long timescales.

A focus on adaptation involves taking a broad view of the system as a whole and recognising that the system will evolve and modify itself over time, and that the appropriate policy would be to guide or influence that process to achieve desired goals (Hynes, et al. 2022). This means developing policies that will, by design, lead the system to self-organise itself so as to achieve the required goals. At the extreme, the system will achieve a performance *gain* when exposed to adversity, per Taleb's (2012) concept of 'anti-fragility'. This approach involves being clear about the long-term goals of the system and what constitutes the long-run health of the system (Pells 2023a).

Hynes, et al. (2022) argued that achieving long-term resilience of complex economic systems involves resilience by design, as well as resilience by intervention. Structuring systems in a manner that promotes their self-organization around post-disruption recovery will ultimately better position systems to minimise the resources required to rebuild affected systems, and simultaneously generate greater system stability. For example, during the global financial crisis, governments in some countries allocated vast amounts of capital to aid a failing system by conferring enough resources to stave off systemic collapse (resilience by intervention), whereas economies with 'better' structures were better able to withstand shocks (resilience by design).

There is some case study and other evidence to support the idea that building various 'capitals' enhances resilience. For example, in the UK, Simmie and Martin (2009) found that Cambridge is a more resilient city than Swansea to multiple recessions and shocks. Compared with Swansea, Cambridge has a higher stock of human capital (and other capitals).

Policies aimed at enhancing community resilience often involve identifying and targeting under-served communities and strengthening their capabilities (Chen, Craven and Martin 2021). For rural communities and communities that depend on a single employer or sector, a focus has been diversifying the local economy and strengthening the community's financial capability.

Following a disaster, institutions often suffer from: insufficient capacity to solve problems, provide resources and take actions; excess demands for information and stakeholder deliberation to make timely decisions; greater needs for organisational integration and coordination; and immediate demands for large amounts of money with existing distribution systems (Johnson and Mamula-Seadon 2014). As a result, new organizations, both governmental and non-governmental, typically emerge to help provide more capacity, information, money, and other resources.

Supporting structural transformations

In some cases, the scale or nature of a shock, expected or experienced, is such that the very viability or sustainability of a system is brought into question, and requires nothing short of a wholesale transformation of the system's structure and function (Martin and Sunley 2020).

Markets on their own do not tend to manage large structural transformations well, for reasons including that resources must move out of old sectors into new one (Stern and Stiglitz 2023). While the need for transformation is widely acknowledged in international discourse around resilience to climate change for example, concrete transformation pathways are less well articulated (Nohrstedt 2022). This probably reflects that developing effective policies about transformative change is challenging. Transformative change involves action today in a world in which future preference sets, risks and opportunities are fundamentally unknown (Pells 2023b).

Unsurprisingly, policy prescriptions about structural transformations vary. The OECD (2020) took a fairly narrow view and argued that to improve transformative capacity regarding climate change, the role of government includes ameliorating the primary obstacles to transformation such as uncertainty about future climate conditions, institutional or behavioural barriers that impede change, and high costs associated with transformative actions.

But others argue that the urgency around climate change requires a more active, or market shaping, role for government. This involves a whole-economy approach with strong, co-ordinated and long-term policies and institutions (Stern and Valero 2021). As well as tackling various market failures, governments can use 'missions' to help align actors around a common goal, achieve the necessary pace and scale, and kick-start emerging clean industries (Mazzucato 2021; Stern and Valero 2021; Sharpe 2023).

Structural transformations do not affect places and sectors equally. A range of policies aim to support regions and sectors facing decline during periods of structural change. Evidence from regions in the US facing 'chronic distress' suggests that human capital strategies such as relating to school and education, and investment or reinvestment in major components of the region's public infrastructure, can improve a region's economic resilience (Wolman, et al. 2017).

Evidence from the UK regarding the shift away from coal mining highlights the long-term scarring effects of some structrual change. UK regions in which mines closed in the 1970s/80s still have higher unemployment levels relative to comparable regions (Vermeulen 2022). The author argued that slow recovery in employment is partly explained by the lack of alternative jobs, and insufficient policy initiatives to address this situation. The slow recovery also indicates that labour mobility does not fully offset these types of structural shocks. The author recommended policies to diversify the regional economy early, and the formulation of strategies to make the transition in a sustainable and equitable fashion. The UK coal mines were closed down very rapidly which gave communities little time to adjust.

The experience of UK coal mining potentially has some important lessons for policy, as the shock was in part driven by the government of the day. To the extent that scarring effects reflect market failures from coal mining such as negative externalities like air pollution and global warning, or that 'the losers from economic or structural transformation are not compensated by the winners', there is an argument for an enhanced role for government including addressing equity concerns.

The term 'just transition' originated in the US in the 1970s regarding workers affected by the shift away from fossil-fuel based industries (Emden, et al. 2020). The term originally related to ensuring support for workers in industries undergoing transitions. Since then, the term has been used to include other equity considerations regarding the transition to a low-emissions economy, such as developed countries decarbonising in a way that supports developing countries, acting now to avoid putting a greater burden of responsibility on future generations, and ensuring that the costs of policy responses to climate change are not disproportionately imposed on low-income households etc. In New Zealand, the Taranaki 2050 Roadmap (see Venture Taranaki 2019) is one example of a just transition-type approach. The Roadmap was developed by the region to help it transition to a low-emissions future. Responding to inevitable trends and structural change is a key feature of resilient communities.

New Zealand and overseas studies highlight the role of local amenities, local endowments and proximity to large cities in regional economic development and long-term resilience. For example, Grimes, et al. (2014) found that, over the period 1926 to 2006, four dominant factors have impacted positively on urban growth in New Zealand, especially since 1966: nearby land-use capability, human capital, sunshine hours and proximity to the country's dominant city, Auckland.

Regarding the impact of negative shocks, Grimes and Young 2009) examined the effects of two major freezing works closures in New Zealand, one in Patea (1982) and one in Whakatu (1986). The key finding was that, while both towns experienced negative population and employment impacts, the effects on Whakatu (which is located close to Auckland) were mainly temporary, whereas the effects on Patea (which is relatively isolated) was more permanent. One implication is that, when trying to improve the resilience of regions, while it is important to connect regions to large centres, care needs to be taken not to create 'white elephant' infrastructure investments in remote locations. Overseas case studies point to similar conclusions. For example, presumably one of the reasons that Cambridge is found to be a more resilient city than Swansea (see Simmie and Martin 2009) is Cambridge's proximity to London.

Similarly, Badenhorst and Zheng 9Forthcoming) found that, while some New Zealand regions have weathered specific shocks fairly well, they may face more fundamental challenges regarding their long-term growth prospects. For example, the West Coast and Manawatu-Whanganui fared fairly well during the Global Financial Crisis, but, compared with other New Zealand regions, have experienced muted emplyment growth over the last 20 years or so.

The retention of skilled workers following major shocks is generally considered a feature of resilient regions. At a national level, worker reallocation across locations and industries following a shock or in response to the decline of a traditional industry may be a positive outcome from a resilience perspective, as it helps the economy to adapt as discussed earlier. But at a local level, if skilled people are quick to move out of an area following a shock, a region may struggle to reinvent itself. Cities with attractive natural amenities, or with attractive cultural environments, tend to be better able to retain skilled workers and therefore tend to be more resilient (Coleman, Maré and Zheng 2019).

Some studies shed insights into some of these workforce dynamics and their implications for policies about the resilience of regions. For example, Coleman, Maré and Zheng (2019) analysed the changing nature of jobs in regional New Zealand between 1976 and 2013. They found three key developments:

- The decline of manufacturing and the increasing importance of several new service industries has tended to favour large cities, especially Auckland. Global trends like agglomeration are unlikely to

be overcome by regional interventions aimed at encouraging the development of industries in locations where agglomeration benefits do not exist.

- The speed at which urban areas recover from negative employment shocks to their specialist industries depends on the type of industry receiving the shock. For instance, it seems to be much more difficult to recover from adverse shocks that hit rural processing industries than shocks that hit other types of manufacturing industries. If the government wishes to help regional economies recovering from employment downturns, it should recognise that the transition path out of some industries is harder than others.
- All towns produce similar non-tradeable goods (local retail and hospitality, construction etc), whereas they produce different tradable specialities. For this reason, government programmes aimed at enhancing the performance of non-tradeable businesses are likely to produce the widest regional benefits, as they have the potential to improve performance in many sectors everywhere – a principle widely recognised in regional development strategies around the world.

Overall, the findings above imply that some regions face real challenges regarding their long-term resilience and growth prospects. These include regions that are remote, have limited natural amenities, and have an industry structure vulnerable to structural decline. Building the resilience of such regions might involve the region understanding the impact of inevitable trends like climate change and agglomeration, developing a collective and forward-looking position on how to survive disruptions and respond to inevitable trends, and making the best use of the region's resources and strengths.

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