PROFILING AUSTRALIA'S VULNERABILITY
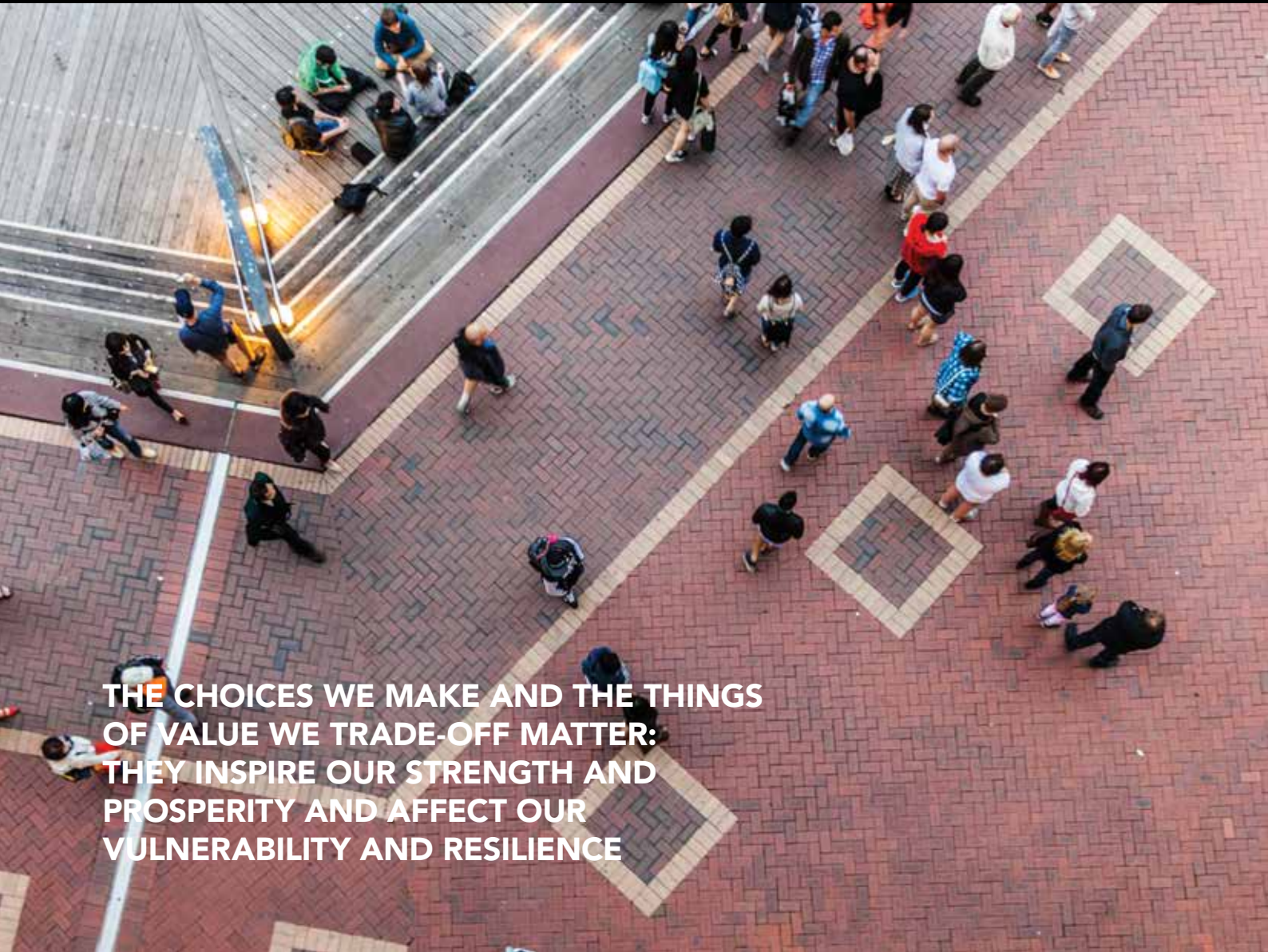
The interconnected causes and cascading effects of systemic disaster risk

THE CHOICES WE MAKE AND THE THINGS OF VALUE WE TRADE-OFF MATTER: THEY INSPIRE OUR STRENGTH AND PROSPERITY AND AFFECT OUR VULNERABILITY AND RESILIENCE

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This report is intended as a resource when considering disaster risk and does not represent official government policy.

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FOREWORD

This publication, *'Profiling Australia's Vulnerability: The interconnected causes and cascading effects of systemic disaster risk'* is the result of a year-long initial study of the causes and effects of disasters in Australia. It was initiated to help understand where to prioritise our collective efforts to reduce loss and harm across society.

In the face of intensifying natural hazards, extreme weather events and a variable and changing climate, it is more urgent than ever to tackle the root causes of disaster and to do this, new knowledge and methods are needed. Globally and across the nation, strong calls have been and continue to be made for practical guidance, tools and methods to complement our hazard management abilities with those required to reduce disaster risk.

Profiling Australia's vulnerability has led to the realisation that what effects the nation's resilience to disaster is the array of choices and decisions that have been made over generations and the decisions being made now that affect future generations. Fundamentally, the values and trade-offs inherent within these decisions have consequences, and getting the balance right is a complex challenge.

This work describes a new way of looking at *disaster risk* - based on the premise that hazards only lead to disaster if they intersect with an exposed and vulnerable society and when the consequences exceed people's capacity to cope.

Decision-makers at all levels need access to sound, trusted and authoritative disaster risk information and to expertise to help them navigate through increasingly uncertain, ambiguous and dynamic environments. Oftentimes it is not clear, even to those with authority and agency to do so, where and how to address these root causes and identify points of leverage to increase resilience. We know that responsibility for addressing the causes of disaster is not equally shared – there are different capacities and structures across our society that limits the actions people can take.

This paper intentionally focuses on systemic vulnerability – the element of risk that is not as well understood as hazard and exposure, and contributes to a developing knowledge base to inform complex and high-stakes decisions.

Consistent with the *Sendai Framework for Disaster Risk Reduction 2015-2030*, profiling Australia's vulnerability contributes to an understanding of disaster risk in all its dimensions – vulnerability, capacity, exposure of persons and assets, hazard characteristics and the environment.

The *Sendai Framework* is based on an all-encompassing approach to ensure disaster risk reduction is integrated into all areas of policy, investment and sustainable development. At its core is the central aim to prevent one sector from increasing risk in others, as well as making sure that all members of society, including the most vulnerable, are involved in crafting and implementing measures. Similarly, the central aim of the *United Nations Sustainable Development Goals 2015-2030* is to maintain the balance between economic development, social inclusion and environmental sustainability to maximise wellbeing for all.

This work provides a frame to equip leaders at all levels to have a different conversation about disaster risk, so that together the actions and decisions we make can uphold public trust and confidence, reduce suffering and sustain a safe and prosperous nation.

Mark Crosweller AFSM
Head of Taskforce
National Resilience Taskforce

CONTENTS

EXECUTIVE SUMMARY

Natural hazards and emergency events are inevitable in our modern world. The disasters that may result, and their causes and effects, are both complex and interconnected throughout society. For example, our growing and ageing population, and our increasing exposure and vulnerability to intensifying natural hazards, is in part leading to a higher likelihood and potential for loss and harm. The resulting cost to our society and economy from disasters is growing and becoming unsustainable.

The systemic nature of disaster risk

For the most part, our existing lifestyles and daily activities are heavily dependent on interconnected systems for the delivery of essential services when we need them (e.g. energy, water, food, health and education services, transport, and communications). These systems reflect a chain of accumulated decisions and choices made over generations, in different circumstances and with different priorities. These decisions have led to the safe and prosperous nation that we love and enjoy today.

It is important to note that natural hazards only lead to 'disaster' if they intersect with an exposed and vulnerable society (interrupting these systems) and when the consequences exceed people's capacity to cope. Such vulnerability is, in part, the result of the conscious and unconscious decisions that have been made and continue to be made about where and how we live our lives, where and how we build our homes and communities, and the placement and effectiveness of the critical infrastructure that supports them.

Australia has a long history of being exposed to many natural hazard events and to date has been able to cope. In the face of some natural hazards and extreme weather events intensifying, a more mature understanding of the root causes and effects of disaster risk and systemic vulnerability is needed, so that our efforts to mitigate the risk and build resilience can meet the challenges of the future.

What we value

Understanding the things we value, and the tensions and trade-offs between them, can provide insights about prioritising disaster risk reduction efforts and can assist us to better prepare. People hold different values and can, and often do, prioritise them differently. This can create tensions across society about how we think, decide and act. Usually we assign value unconsciously and we may only realise what we value when that is in jeopardy. We all value the services and processes in society that keep us safe and prospering, even if we take them for granted during times of stability. Insights like these, provided by this work will help us to understand the values that are in tension when choices have to be made about where to allocate finite time, effort and money in disaster risk reduction efforts.

Our purpose and challenge

Reducing vulnerability across our systems is possible. Policies and behaviours to reduce the likelihood or consequence of disasters need to focus on the root causes and effects of vulnerability. Collaboration and coordination is needed between multiple and diverse stakeholders across jurisdictions and socio-economic sectors to be able to develop our understanding of these systemic causes and effects, and what can or should be done to mitigate them. This will often require rethinking existing objectives and addressing gaps or misalignments in existing mandates, roles and responsibilities.

The purpose of this work is to advance our understanding of and approach to assessing disaster risk. Rethinking disaster risk and vulnerability in this context begins to address the least understood dimensions of disaster risk – vulnerability and capacity to cope.

This report, *Profiling Australia's Vulnerability: The interconnected causes and cascading effects of systemic disaster risk*, along with the Commonwealth Scientific and Industrial Research Organisation (CSIRO) technical reports that document the evidence base, provides a different, emergent logic to underpin novel, reframed approaches and narratives.

Over time the insights gained will be complemented with other mechanisms, tools and resources to help people practically use this work to diagnose causes and effects of vulnerability and to develop effective mitigation strategies. These resources can then guide people safely through uncertainty to arrive at options to effectively address disaster risk and to support the nation to be better prepared and more resilient.

ONE
WE NEED TO TALK ABOUT DISASTER RISK

1.1 MORE THAN CHANGE AT THE MARGINS

There is national and international recognition that the dynamics, frequency and extremes of many natural hazards, and the resulting emergency events, are intensifying. Globally we are experiencing the confluence of trends and extremes not previously recorded, leading to events that are triggering disastrous consequences for individuals, communities, regions and nation states.

As the global climate system has warmed, changes have occurred to both the frequency and severity of extreme weather (CSIRO & Bureau of Meteorology, 2016).

The changing nature of many hazards, coupled with growing and ageing populations and infrastructure in exposed areas, is leading to increased vulnerability, likelihood and potential magnitude of harm. The cost of disasters to society and the economy are growing and it is becoming increasingly apparent we need to urgently do more than change at the margins – reducing disaster risk is critical to improving resilience.

Inherent throughout this report is the premise that hazards only lead to disaster if they intersect with an exposed and vulnerable society and when the consequences exceed its capacity to cope.

Exploring what it is that people value, and highlighting the trade-offs and choices contributing to vulnerability or resilience, provides insights into the points of limitation and causes of disaster risk. In this report we expose the complex causes and effects of disaster that are embedded within the interrelated and highly dependent social, economic and environmental systems that underpin society. These causes span local, regional, national and global scales. They also reflect a chain of accumulated decisions, priorities and choices made by people across many generations and under diverse circumstances.

HAZARDS ONLY LEAD TO DISASTER IF THEY INTERSECT WITH AN EXPOSED AND VULNERABLE SOCIETY AND WHEN THE CONSEQUENCES EXCEED ITS CAPACITY TO COPE

In 2016 a magnitude 6.1 earthquake caused a ~20km long rupture of the earth's surface in the Petermann Ranges (near Uluru), demonstrating that hazard events of this magnitude have and do occur in Australia. However, because there was no impact on people in this place, there was no disaster. If this event occurred in a developed location, the impact on people would be catastrophic.

This report is for policy-makers, practitioners, and business and community leaders who are grappling with how to make effective high-stakes decisions, and to take informed and responsible action, in times of uncertainty and increasing complexity. While not exhaustive, it provides a solid basis upon which to establish a shared approach and a degree of confidence to navigate the necessary yet difficult conversations about the actions needed to minimise harm and reduce loss and suffering.

Importantly, the concepts explained herein will continue to trigger conversations about disaster risk and create an environment for talking about how we, as a nation, are vulnerable regardless of the particular hazard or the source of disruption. It is informed by the thoughts and experiences of a number of Australians about the ways our systems inadvertently make us vulnerable to disasters.

The purpose of this report is to:

- Provide new knowledge about the complex and interconnected systems that support our society and influence our resilience or vulnerability to disaster.

- Highlight what people value, and focus on how the tensions and trade-offs between different values influence priorities and choices now and in the future.

- Promote discussion about the interconnected and cascading effects of the systemic causes of vulnerability and the implications of decisions on future preparedness and resilience.

- Enable good intentions to be turned into focussed and sustained action at various levels in our society, in ways that reduce vulnerability and build resilience.

Consistent with the *Sendai Framework for Disaster Risk Reduction 2015-2030*, this report contributes to a shared understanding of disaster risk in all its dimensions – vulnerability, capacity, exposure of people and assets, hazard characteristics and the environment. It encourages enquiry from different perspectives, including from human geography, psychology, ecology, economics, societal change and philosophy.

This report is a significant and innovative contribution to transforming how we plan and prepare as a nation for emergency events, as well as informing new approaches to reducing disaster risk and building resilience. It raises important questions about the cascading effects of vulnerabilities and the limits of resilience at every level.

1.2 COMPLEXITY, UNCERTAINTY AND AMBIGUITY

In Australia, the legislation, regulations and administrative rules governing decision-making and action have evolved over time and during periods of relative stability and prosperity. Many of us now live within a highly dynamic network of social, economic and environmental systems, and we make assumptions that these systems will work together to create and maintain a safe and prosperous nation. While public trust and confidence in government, business and even society more broadly is under stress, we tend to expect that our lives will be able to continue in safety and security into the future.

The systems that sustain how we live in the modern world include those that provide food, water, energy, health, education and widely available methods of communications. We value and rely on these systems and processes in our everyday lives, often unconsciously. We often have high expectations about the delivery of a reliable and consistent supply of services from these systems with little tolerance for loss or disruption to them. Yet there are variable levels of redundancy built into these systems to reduce the potential for disruption.

Resilience in the face of natural hazards (e.g. flood, fire or tropical cyclone) is often held as a defining Australian characteristic, developed since human habitation of the continent by both Indigenous and non-Indigenous Australians. However, decisions and choices made throughout history about where communities and infrastructure are placed, and our increasing reliance on systems, have inadvertently contributed to an erosion of resilience.

Resilience is not a given, especially in a rapidly-changing natural environment. Resilience can be eroded by a focus on cost reduction, short-term (often financial) outcomes, and increased population mobility and spread which places people in unfamiliar environments, situations and communities. Depending on our choices today and in the future, we have the potential to further increase vulnerability or to build resilience. Against this backdrop, catastrophic consequences from natural hazards intersecting with societies are not only possible but are highly plausible, and their effects will likely exceed the capacity of the nation. The consequential damage, loss and suffering would be immense and enduring.

The task of preventing natural hazards developing into disasters is becoming more complex and challenging because of the uncertainties about the causes and consequences of disaster risk and how best to respond. The destructive and disruptive effects of intensifying natural hazards requires us to question why our exposure and vulnerability is increasing and what can be done differently – before disaster strikes.

The stress and hardship associated with damage and disruption can create new, and compound existing, social and financial problems across society. Escalating recovery costs indicate that a large proportion of loss is associated with recurring events that repeatedly damage critical public infrastructure, housing and economic productivity – key pillars of growth and development. This situation is expected to get worse.

RESILIENCE IS NOT A GIVEN, ESPECIALLY IN A RAPIDLY CHANGING NATURAL ENVIRONMENT.

1.3 DECONSTRUCTING DISASTER RISK

Natural hazards are part of Australia's landscape and are influenced by immense energies released from the earth's natural and environmental systems, over which we have no control. We have highly effective natural hazard forecasting capabilities and these provide a level of confidence in anticipating where, when and how some events may happen over the short to medium term. As with all things, however, there are limits to this capability, especially for coincident events over the longer term (more than 10 years) and given the varied and changing climate. Our challenge is to develop a new way to understand hazards and risk in this uncertain future.

Recognising the complexity of the challenge, and the limited resources and capacity to consider the systemic and dynamic dimensions of vulnerability and how these contribute to disaster risk, a bespoke approach and method has been co-created by Emergency Management Australia, the National Resilience Taskforce and the CSIRO to inform this work.

Collaborating with a broader team including the Department of Defence, Bureau of Meteorology (BOM), Geoscience Australia, Department of Environment and Energy, and the governments of South Australia, Queensland, Western Australia and the Northern Territory, this work seeks to answer the fundamental question of:

'What makes Australia vulnerable to disaster when severe to catastrophic events impact what people and society value?'

OUR CHALLENGE IS TO DEVELOP A NEW WAY TO UNDERSTAND HAZARDS AND RISK IN THIS UNCERTAIN FUTURE.

TWO

RECOGNISING VULNERABILITY TO STRENGTHEN RESILIENCE

Vulnerability arises from the relationships that we have with the things we value (people, places, objects, critical services, emergency services, etc.) and how these things may be disrupted as a result of an emergency or crisis. Vulnerability also arises from the tensions and trade-offs we have to make about where to allocate limited time, effort and money in disaster preparation, response or risk reduction to protect those things of value.

2.1 WHAT SHAPES VULNERABILITY?

Many things shape vulnerability – individually and collectively.

Firstly, natural resources and hazardous places are not distributed evenly across the planet.

Some places are more hazardous than others and some places contain more (rich or beautiful) natural resources. Similarly some people can be more or less exposed to hazards and have different levels of access to different forms of protection. This variability is present both globally and within nation states.

Secondly, the way we live in society reflects a chain of decisions and choices across many generations, responding to different circumstances, different priorities and different pressures. These past experiences and ideologies continue to be influenced, amplified or attenuated by a range of dynamic pressures and drivers of change including: rapid population growth and change; rapid urbanisation; decline of biodiversity; decline of soil productivity; and fluctuations in the global economic market.

CHOICES CAN RESULT IN EITHER AN INBUILT STRENGTH OR AN INBUILT VULNERABILITY.

RECOGNISING AND UNDERSTANDING OUR INDIVIDUAL AND SHARED VULNERABILITY IS AN ESSENTIAL ASPECT OF STRENGTHENING OUR RESILIENCE.

Thirdly, we all depend on highly interconnected socio-economic, environmental and technological systems that provide the critical services for us to meet our needs and support our livelihoods and lifestyles. Every aspect of how we live is affected, even determined, by these systems: what we understand about the risks where we live; where and how well we build our homes; how we design and where we locate our infrastructure; how we access and use power, water and food; how we communicate with one another; the transport options we have; our levels of health and wellbeing and the health and care system we access; how much we engage socially and participate politically; and whether we learn from our experience.

These economic, political and social systems can lead to thriving socially- and environmentally-sustainable societies, or vulnerable societies where people are living and working in less safe and secure locations. How well these systems work either enhances our (individual and shared) prosperity or exacerbates our vulnerability. When hazards intersect with vulnerable societies, disaster will expose (and even amplify) the vulnerabilities inherent within that society. Unresolved and persistent vulnerability within societies can undermine their capacity for resilience, creating feedback loops that become particularly apparent in times of disaster.

Recognising and understanding our individual and shared vulnerability is an essential aspect of strengthening our resilience. It is important therefore that we understand how these conditions have been reached and what they are likely to be in the future without intervention. For many individuals and communities in diverse locations, vulnerabilities continue to deepen, highlighting the dynamic and reinforcing nature of the processes creating vulnerability.

Therefore, the fundamental task of securing ongoing resilience and prosperity is to better understand these causes and effects of vulnerability in order to inform how to overcome them.

2.2 DISASTERS EXPOSE OR EXACERBATE VULNERABILITY

The growing connectivity and interdependency of the systems on which we depend presents a corresponding and growing networked vulnerability at the local, regional, national and global level.

The components of these systems have been conceptualised, planned and developed independently and are created to function when there is a relatively stable society and abundance of supply.

Yet the growing interconnectedness and dependencies between systems means that when one system or component 'breaks', there is a high likelihood of cascading effects across other connected or interrelated parts. This includes both the core systems underpinning our daily socio-economic activities and emergency management systems that operate during crisis.

During a (catastrophic) disaster, as the limits of these systems are exceeded or as the pillars that support their functioning are damaged or removed, chain reactions will ripple through all sectors of society. This has the potential to result in widespread system failures, which will expose everyday vulnerabilities, create new ones and deeply change peoples' lives.

The consequences of this will vary depending on the extent, intensity and duration of the disruptions. Experience tells us that many people may die and many more may be injured, displaced and isolated. All survivors will experience some physical, emotional or psychological hardship and suffering from the loss of loved ones, livelihoods, their homes, pets and personal possessions. Local disaster and emergency response capacities may also be overwhelmed and the coping and recovery efforts hampered as food, water, energy and communications supply chains are disrupted and rendered unserviceable for extended periods. Formal and informal support systems and services will be compromised, at least initially, and crisis leadership at local, state and national levels will be significantly tested well beyond 'normal' emergencies.

WHEN NEW AND INTENSE EVENTS STRIKE, BUILT-IN VULNERABILITIES ARE EXPOSED AND NEW ONES EMERGE.

2.3 EVERYONE IS BOTH VULNERABLE AND RESILIENT

Everyone has a unique combination of capabilities and capacity to prepare, cope and recover from disaster, which means they are vulnerable and resilient in different ways.

There is variability in relation to things like: our abilities to access and pay for goods and services; how well we process and manage our emotions; the nature and strength of our relationships with people, culture, nature, technology and infrastructure; our ability to understand the causes and effects of our vulnerabilities; and our compassion for others and how willing we are to participate in and be inclusive of community. All of these capacities are important for fostering resilience or, if weak or absent, creating vulnerability (Figure 1).

While the better educated, wealthier and more powerful or influential can be vulnerable when they are unaware and ill-prepared for the hazards that surround them, they often have greater means for coping and recovering in the event of a crisis. The poor, on the other hand, bear disproportionally higher economic and social costs if disaster occurs, irrespective of their levels of preparedness, because they tend to be in more exposed areas and have fewer options to respond, cope and recover. Individuals with low capacity and high vulnerability experience disproportionately higher social and economic costs from disasters.

INDIVIDUALS WITH HIGH VULNERABILITY EXPERIENCE DISPROPORTIONATELY HIGHER SOCIAL AND ECONOMIC COSTS FROM DISASTERS.
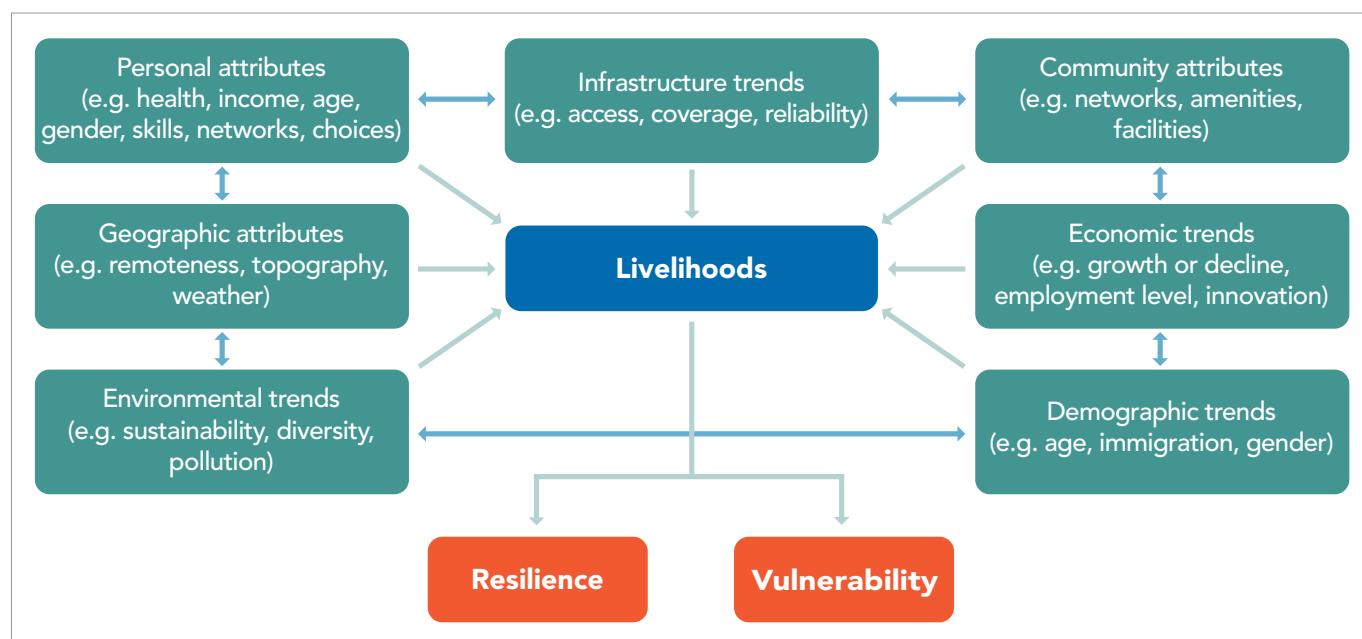
Figure 1: There is a range of direct and indirect external factors outside the control of people that leads to them being more or less vulnerable or resilient – depending upon whether they have the necessary means of access and choice (adapted from Buckle et al, 2001).

2.4 THE SIGNIFICANCE OF INTERCONNECTED SYSTEMS

Vulnerability is nested within and dependent on systems which themselves are vulnerable due to their limited redundancy and high interconnectivity. Ultimately this makes everyone vulnerable to some degree.

Individuals, communities and organisations have become increasingly reliant on a number of highly interconnected systems to provide them with critical services. Yet if we stop to consider the consequences for society if we were to lose access to any one or more of these critical services (like the ability to use electricity, buy food or fuel, flush the toilet or communicate with family members), we immediately become aware of our vulnerability in dealing with and recovering from disruptions.

REDUCING SYSTEMIC VULNERABILITY BUILDS RESILIENCE.

However, most people have little understanding of, or influence over, the factors that create vulnerability or resilience, such as how resources are allocated and used within society. This is particularly relevant to societal choices about:

i how risks are created and transferred from those with power and authority to those without; and

ii the trade-offs between redundancy, diversity, supply, availability, reliability, accessibility, dependency, affordability, efficiency or equity in the provisioning of critical services.

The socially, economically or geographically marginalised have fewer options and choices, and have limited agency to change this. Many of these groups often struggle with low incomes, increasing living costs, high levels of debt, homelessness, poor nutrition, and poor physical and mental health, and have less available personal energy or household resources to develop and strengthen personal and community resilience.

Meeting the demands and expectations of daily life displaces any motivation or ability to reduce vulnerability to disaster through better choices and investment in preparedness.

It becomes clear, then, that individuals, communities, institutions and governments each have different capacities to prevent, prepare, resist, cope and recover – and that these are not equally shared. It is also clear that each level of society has aspects of resilience or vulnerability nested within it (Figure 2). Consequently, there are limited mechanisms available to individuals to reduce their vulnerabilities.

It is often not clear, even to those with the authority and agency to do so, how complex systems can be changed. Critical to making progress on this is building understanding of these complex systems so that we are able to identify points of leverage that can be targeted to increase resilience. Section 3 contributes to this improved understanding.

Figure 2: Nested across all sectors and all levels of society are features that effect the level of vulnerability and resilience.

THREE
PATTERNS OF SYSTEMS VULNERABILITY

There is little knowledge or understanding amongst decision-makers and the general public of how complex and highly dynamic systems interact across our society. Extreme events create systemic shocks that disrupt these systems and quickly cascade to overwhelm the capacity of social, economic and natural systems to cope.

To understand these complex systems requires us to distil complexity into something which people are able to engage with. Mapping the elements of a system (i.e. the people and organisations and how they are connected), and the flow between these elements, provides a way to critically diagnose the causes and effects of vulnerability and identify key points of intervention.

Engagement with a diverse group of individuals from across jurisdictions, levels of decision-making, roles, experience and cultures has helped us understand the typical patterns that emerge when disruption cascades throughout these systems. These patterns are summarised in the following section, and understanding them provides an opportunity to tackle the root causes in order to build resilience and minimise loss and suffering. The patterns described are not comprehensive or complete and will improve with time as our knowledge and engagement methods mature.

3.1 PLACEMENT OF COMMUNITIES, INFRASTRUCTURE AND ASSETS

People, housing, infrastructure and assets are most susceptible to impact when they have been physically placed in hazardous areas, and when the standard to which they have been built does not meet contemporary or anticipated (disaster resilient) building standards and codes.

It follows that a combination of decisions (both inherited and contemporary) to place people and assets in harm's way is at the core of what makes the nation vulnerable. Some places previously not exposed have progressively become more exposed.

The incentive to knowingly or unknowingly build in hazardous locations is influenced by values, such as: affordability; being amongst people with similar culture; being safe and secure; or wanting to live close to the bush or along rivers and coasts. In making these trade-offs between values, people sometimes occupy areas in close proximity to areas prone to bushfire, flood or coastal inundation. People may or may not understand the risks before making these choices, or may not be sufficiently prepared for such natural hazards because of limited awareness, means or even willingness to address the risks.

Collective planning decisions to place housing, infrastructure and assets in particular locations include considering different factors of benefit to different groups, such as: ensuring equitable access to affordable housing; providing high quality and safe housing and infrastructure; providing enjoyable life experiences (i.e. for a growing population); or providing an economic return (i.e. to the building industry or to real estate developers). These factors cannot always be reconciled with one another, and trade-offs need to be made to prioritise some factors over others. Many of these trade-offs are embedded in processes that incentivise certain decisions about the zoning of areas, in the scoping and planning stages of land-use developments, or during the design, construction, sale and management of infrastructure assets.

Many of our coastal airports have been sited on flat land near the coast. This allows a safe landing or take-off path over water or comparatively low-lying land. The consequence is that these airports, now the most important hubs for movement of people and goods, are especially vulnerable to sea level rise and storm surges. The state capital cities were all located on the coast because they were established at a time when people and goods were moved by ship. Those decisions were rational at the time but they now increase the risk of damage from sea level rise and extreme weather events. Canberra's inland location was partly driven by a concern at the time to ensure the national capital could not be attacked by warships. However, it was also placed at the foothills of the Brindabella Ranges which has seen fire burn from its peaks to the coast of New South Wales over millennia.

When new developments or pieces of infrastructure are built, there are many different owners (or others involved) who each bear some risk of loss and damage in different ways and at different times. Governments and businesses are often involved in the early stages, bearing risks during the development process. Ownership is usually transferred to individuals or smaller businesses following completion. Initial decisions about undertaking a new development will sensibly consider risks during the building process itself, and deliberately balance the benefits to the developing entities themselves (their own well-being) and to the broader society in the short term. In the phase following completion, the risk is substantially transferred to owners and residents. From this point onward, people are exposed for a much longer period of time. Often entire life savings are invested into these assets, and capacities to access additional sources of discretionary funding to recover following disaster is limited.

WHAT MAKES US VULNERABLE?

> People and assets in hazardous areas.
> Standards for building assets and infrastructure no longer adequate for location and likely hazard.
> Regulatory authority and controls that are no longer adequate.
> Risks created and transferred to others.
> Economic benefits prioritised higher than safety.
> Limited capacity to understand and communicate what is at risk.

Additional vulnerability can be added during each stage of the process. During the construction phase the quality of the 'build' is dependent on whether appropriate standards are set, interpreted, complied with and regulated. Often these standards are weighted toward past experience rather than anticipating future exposure. When combined with methods that prioritise a 'prosperous now' over an 'unknown future', the desire for higher building standards may be lowered and a 'minimum compliance' approach adopted. Information that people need may not be available in a form in which it can be used, reinforcing layers of systemic vulnerability.

These layers of vulnerability build on one another over time. Each generation inherits legacy decisions, and vulnerability may increase as it becomes more and more difficult to change course. Sunk costs make it extremely difficult to change course and avoid transferring the risk.

What happens after disaster occurs can add further layers of vulnerability. A well-trodden path following disaster is to seek to apportion blame for loss and suffering, and find comfort in that process. To focus on blame denies the opportunity to investigate, discover, learn and recognise systemic causes of vulnerability and their contribution to the crisis experience. It is difficult to make societies safer when these opportunities to learn are missed.

PEOPLE, INFRASTRUCTURE AND ASSETS CAN BE LOCKED IN OR INCREASINGLY SUSCEPTIBLE TO DISASTER RISK.

The consequences of disaster are rarely attributed to the legacy of systemic decisions that generated the risks. They are much more likely to be attributed to human error, an uncontrollable natural event, or a combination of both. This lack of attribution and accountability to the root causes of disaster creates perverse incentives for continued risk-generating behaviour.

Some of the costs of disaster are shared through arrangements with the insurance sector. Some costs are transferred to government and tax-payers in the form of recovery payments or the increased demand for the provision of other government services and support.

Avoiding conversations about systemic vulnerability perpetuates a cycle in which people fail to prepare or mitigate effectively. Where and how we build then becomes a self-reinforcing loop of risk transference.

"When I went to live in Brisbane in 1977, I found that every estate agent had a flood map, showing the depth of water in the devastating 1974 flood. Nobody bought or rented property without studying the map to evaluate the risk of flooding. Then the Wivenhoe Dam was built, and optimists claimed that Brisbane would never again be flooded. I pointed out at the time that the reservoir would only act as a buffer until it filled, after which water would need to be released to protect the structure. Flood maps gradually disappeared. By the early years of the twenty-first century, people were both buying properties and building new dwellings in places where there had been several metres of water in the 1974 flood. In early 2011, a period of heavy rainfall meant the operators of Wivenhoe Dam were forced to release water and Brisbane was again flooded, to similar levels as in the 1974 flood." *Prof Ian Lowe*

3.2 ACCESS AND SUPPLY OF ESSENTIAL INFORMATION, GOODS AND SERVICES

Expectations and preferences of society for affordable, safe, high-quality and reliable essential services such as information, food, water, electricity, fuel and healthcare are driving the decisions about where and how these are provided.

For services to be affordable, providers pursue lowest cost (just-in-time) and most efficient (low redundancy) means of production and provision. Yet the lack of redundancy means these systems are easily disrupted. Disruption to one part of a system can trigger cascading effects across society, testing the limits of highly integrated supply chains and exposing vulnerabilities and inequities throughout society – particularly if disrupted for extended periods.

In these cases, vulnerability exists because the creation, manufacture or generation of essential goods and services, and their access and distribution, lack redundancies and are highly reliant on other systems such as critical infrastructure, transport and effective supply chains. The speed, severity and reach of any single system failure will influence the ability to restore access to these goods and services.

This vulnerability applies globally as the ability of any nation to sustain the supply of essential goods and services (like food and fuel) to its population is dependent on having access to global production and distribution.

The opportunity that globalisation provides to enhance our prosperity also makes us increasingly vulnerable to essential service disruption, which is outside the control of governments and business. The systems that support the provision of essential goods and services balance differing needs for:

- equitable access to affordable goods and services;
- high quality and safe good and services;
- enjoyable life experiences for a growing population; and
- providing an economic return to relevant industry or businesses.

These needs cannot always be reconciled with one another, and trade-offs are made to prioritise some over others. For example, a range of pressures can result in a higher value being placed on affordable goods and services, such as the provision of electricity. Subsequently, values of efficiency (i.e. just-in-time supply) can be prioritised over equity or robustness. Centralised provision of critical services can be highly valued for being more efficient and less expensive compared with distributed approaches to service delivery, especially in locations prone to natural hazard events. Providing services for generic needs or current conditions is less expensive than providing optimised or tailored services for specific needs or unknown future conditions.

WHAT MAKES US VULNERABLE?

> High levels of dependency and growing system interconnectedness.

> Just-in-time supply, low levels of storage, hub and spoke distributions.

> Single sources or lines of supply and few alternative sources.

> Dependence on imports to meet demand (e.g. food, fuel).

> High expectations of continuous ongoing supply.

> Low tolerance for loss and disruption.

The choices and trade-offs between different needs can be complex and subtle. During times of prosperity and stability, short-term economic goals may take precedence over a focus on reducing vulnerability to future disruptions. Disasters expose these vulnerabilities and trade-offs. For example, when the provision of goods and services breaks down, the trade-off between just-in-time supply and robust supply is highlighted. There is a trend towards privatisation of the supply of essential services and a concentration of suppliers to achieve efficiency. As a result, these essential services industries are now responsible for maintaining economic and social stability of regions and even nations, with many associated risks.

> (There was a) general lack of community preparedness and resilience e.g. emergency kits with battery powered radios, torches, etc. While the loss of power was a problem for many people, the subsequent loss of telecommunications including internet in some locations was very difficult. Australians have become very reliant on technology for information, communication, work and entertainment.
> *Port Pirie Council*
> *(Burns et al, 2016)*

Choices have been made over time about the ways we want and expect our social and economic systems to operate. The cumulative effect of these choices is to have constructed a society with high expectations and dependencies on ongoing supply and access to essential goods and services. Yet underpinning these choices to increase efficiencies and to optimise existing ways of doing business are assumptions that our past experiences will be a reasonable guide to the future, and therefore we can expect uninterrupted access to reliable supplies of critical services.

Energy supply

The South Australian event of 28 September 2016 demonstrates what can occur after significant energy infrastructure failure where the supply of electricity across an entire State can be disrupted for extended periods of time at substantial economic cost. However, public awareness of these risks remains relatively low; and even significant energy infrastructure failures such as this quickly fade from people's memory.

Australia's liquid fuel supply demonstrates a similar vulnerability to disruption. This is largely due to complex interests of many diverse organisations which depend on affordable and reliable supplies of fuel. Historically we have not adequately understood or considered our interdependencies and vulnerability to radically changing dynamics of natural hazards under a changing climate. Consequently, the many systems that depend on liquid fuels are highly vulnerable to an unexpected disruption that would impact and cascade to individuals, communities, businesses and many economic activities.

Health and capacity to care

Australia has one of the best health systems in the world though increasing stress on the health care system is apparent.

In times of stability, access to health and care services is relatively robust and equitable. The health system meets much of the demand most of the time, and the incidence of injury and mortality is relatively low. The functioning of the formal health and care systems is dependent on things like the levels and flow of funding, the effectiveness of decision-making (authorising) processes, legislative frameworks, and access to essential goods and services (like food, water, waste management, energy) and digital information and communications.

Emergency health implications are becoming increasingly likely in the event of more frequent and intense heatwaves, storms or floods, and increasing numbers of exposed and vulnerable people. This is expected to result in increased strain on hospital and health systems, increased presentation at emergency departments, increased hospitalisations, increased mental stress on healthcare workers and emergency services personnel, declines in productivity, increased disruptions to businesses, lost incomes and increased loss of life.

The strengths of a system in times of stability can become vulnerabilities when critical services become disabled or disrupted. This occurs particularly when people are entirely dependent upon these services. For example, the gap between demand and supply of accessible and affordable healthcare services widens as system dependencies increase. When disruptions occur, many parts of the system change their state dramatically. These parts include level of demand, physical distance and transport of patients, types of treatments required, the digital operation of health services and supply of pharmaceuticals.

THE CHOICES AND TRADE-OFFS BETWEEN DIFFERENT NEEDS CAN BE COMPLEX AND SUBTLE.

On 28 September 2016, South Australia experienced an extreme weather event which brought thunderstorms, destructive winds, large hailstones and heavy rain. Between 3.00pm and 4.00pm tornados moved across the State, primarily in the Mid-North, which damaged 23 transmission towers and at 3.48pm triggered a State-wide power outage – a black system event. The significance of wide-spread power loss over several hours and in some areas days, identified new challenges for State and local governments, businesses, and individuals. There were problems associated with loss of power, including access (lack of) to food, medications, fuel, credit card payments, cash, telecommunications, essential home appliances and water. Many business continuity plans across the business sector and within government departments including emergency services, proved to be inadequate – they lacked contingencies for back-up power or the planned contingencies failed. The egress of thousands of people from the Adelaide Central Business District (CBD) in a relatively short period of time was orderly despite the frustrations of access to public transport, inoperative traffic lights, traffic congestion, and poor weather and road conditions. However, it highlighted a need for an evacuation plan for the CBD and backup power for traffic lights to achieve a rapid exit from the CBD through identified traffic corridors.
(Burns et al, 2016)

Importantly, we do not just rely on the formal health and care system to support us. We also rely on informal care systems to support children, the elderly or individuals working through problems arising from drug and alcohol addiction, those with a disability, those with mental health concerns or those who suffer anxiety, depression, bullying and feelings of isolation, loneliness and marginalisation.

We know that after disasters, these issues can become more prevalent and both the formal and informal care systems respond. Carers are doubly vulnerable as the demand for their services increases during a crisis, while often being affected themselves. For informal carers, their extremely low wages often mean they will have access to fewer options for disaster response and recovery. Furthermore, the tasks of informally caring for others, especially unpaid work, is not evenly spread across communities and falls disproportionately to women, setting up gender-specific vulnerabilities.

Information

Generating and sharing knowledge that people can understand and make sense of can enable people to become more aware, prepared and safe, and to make decisions they have the confidence to act upon.

People have growing expectations of reliable access to timely, authoritative, credible and important information. Access to content-rich, diverse and rapid digital communication is now the norm. Yet this is also increasing the dependence of people on this information. In many instances this increased dependency can have the unintended outcome of reducing peoples' ability to make sense of situations and take appropriate action in the absence of information.

Disasters are intense periods and accelerate the demand for services and information. They put extraordinary strain on information and communication systems and related infrastructure. When the flow of information is disrupted people can experience confusion, distress, feel unable to cope and may well be unable to think or act in their best interests. To mitigate these challenges and minimise negative consequences requires: a greater interoperability of systems and platforms; a clear and coordinated flow of information and resources from providers; and the building of people's capacities to make proactive decisions in the inevitable absence of information.

DISASTERS ARE INTENSE PERIODS AND ACCELERATE THE DEMAND FOR SERVICES AND INFORMATION.

HAZELWOOD MINE FIRE

Bushfires around Victoria's Morwell region spread and broke out in the Hazelwood open cut mine in February 2014. The coalmine fire burned for 45 days, blanketing Morwell with acid smoke and ash, and creating a severe health risk for local residents. Located 700 metres from the Hazelwood mine is a 51-bed aged care facility run by a community sector organisation. Residents there were highly vulnerable; physically frail, with limited mobility and significant care needs, with many experiencing dementia. The organisation had emergency management plans in place in the event of a fire in the facility. However these did not specify what to do in the event of a bushfire or mine fire. Initially throughout the smoke event, residents remained in the facility for their safety. Windows were closed, wet towels were used to block gaps under doors, and the air conditioning and ventilation were run only occasionally to prevent smoke infiltration. After three weeks, the Chief Health Officer of Victoria made the decision to evacuate vulnerable people from Morwell. The aged care residents were relocated to three separate facilities in neighbouring towns. These relocations were coordinated in partnership with organisations including the Royal Flying Doctor Service, Department of Social Services, Department of Health, Environmental Protection Agency and Ambulance Victoria. The facility's staff attended residents in their temporary accommodation. In total, the facility's operations were severely affected for nine weeks. It took three weeks before government agencies declared it was safe to return to the town, and then a further three weeks for the facility to clean and restore the facility to its usual high standards. Incalculable costs were incurred in terms of stress and anxiety for staff, residents and their family members.
Source: Facing disaster: Hazelwood Mine Fire

New challenges arise as people become increasingly mobile, less connected to place-based communities and more connected to the digital world. Data is being generated at an exponential rate. The diversity of information needed is growing, the variety of modes and devices is growing, as is the range of locations information needs to reach and the forms it needs to take. Reducing disaster risk necessitates keeping pace with the rapid evolution of communication technologies and leveraging the opportunities this enables, while at the same time learning how to protect the things we value most when the provision of information and communications is disrupted.

Local individuals and communities also need to share information with governments, agencies and outside entities. New mechanisms are needed to listen and engage in two-way (or multiple) conversations about vulnerability, risk and risk mitigation. The general public and government officials often do not know how to find or effectively engage with each other and opportunities to learn from one another are therefore missed.

Near misses should not be viewed as failures in prediction/warning services but rather opportunities to practise. In 2017, Victorians were warned by the Bureau of Meteorology (BOM) and the State Emergency Service of weather that would see widespread flooding with severe damage to homes and property across the state, including in Melbourne. The severe storms which were forecasted to have a high impact on Melbourne instead had high impact on North East Victoria, particularly in Euroa. The impact in Melbourne saw BOM and the emergency services criticised for over-dramatising the risks, which only resulted in minor flooding. However, elsewhere in the state, particularly in Euroa, the event caused significant damage and major flooding. The response to the warnings in these regions were quite different to those in the state's capital, with residents recognising the importance of heeding the warnings, noting that lives were saved by doing so. *"We weren't going to close the park, we weren't going to cancel bookings… Because of what they said, we did cancel the bookings and we're very grateful we did because otherwise we would've had 30 caravans and tent sites here and the way that water rose I think there would've been a fatality."* (Source: www.abc.net.au). Though there was criticism of the agencies involved in issuing the warnings, there was an opportunity for Victorians to practice their preparedness and for agencies involved to communicate effective messages to their communities about preparedness. The narrative both before and after the event exacerbated these issues. The danger in labelling 'near misses' as 'failures' is that the community is encouraged to treat these predictions less seriously in the future.

WHAT MAKES US VULNERABLE?

> Inability to depend on everyday forms of communication.

> Not knowing what to do before disaster happens.

> Conflicting messages from different sources.

> Barriers to knowledge across people and sectors.

> Ability of communications infrastructure to withstand disruption or increased loads.

> Ability for people to talk with each other in high-pressure situations in ways which are compassionate, honest, empathetic and that build trust.

Finally, the changing profile of Australians also affects how well information is communicated. Around 25 per cent of Australians speak a language other than English at home. Increased skill, capability and effort are needed to effectively engage with diverse communities (culturally, linguistically, geographically and socio-economically) to exchange experiences and wisdom. The challenge is to generate a sophisticated conversation including different perspectives from a range of leaders and constituencies.

3.3 RISK ASSESSMENT, OWNERSHIP AND TRANSFER

The institutional processes for decision-making are often made in a cycle of risk creation (new developments or pieces of infrastructure) and risk transfer (when they are sold). Different people or organisations bear the risk of loss and damage in different ways, at different times.

"There is already a great deal of excellent work underway including increasing guidance being developed for understanding risk ownership and systemic assessment and management of strategic risk such as Young et al. (2017)"

In disaster, the capacity to cope is in part dependent on the level of anticipation and proactive decisions taken by those bearing the risk. Effective processes to assess and transfer risk are therefore critical.

Assessing risk across multiple hazards and timescales, under rapidly variable and uncertain conditions, is difficult and complex. Traditional approaches are coming under increasing pressure to change.

Existing probability-based (i.e. likelihood x consequence) risk assessment approaches when used out of context can inadvertently contribute to growing exposure and vulnerability.

Many of these approaches are heavily dependent on recent historical data and being able to confidently assume the future will be much like the past and present. As such, these approaches have limitations being applied to complex, intractable situations where:

1. the likelihood of outcomes are not known or cannot be predicted (situations described as being uncertain);

2. the characterisation of outcomes is problematic (i.e. situations described as ambiguous) because of disagreements over the selection, partitioning, measurement, prioritisation or interpretation of outcomes as part of framing or defining the problem, objectives or policy options; and

3. neither the likelihood nor the consequences are known or knowable (i.e. ignorance) and where "we don't know what we don't know" and so face the ever-present prospect of "surprise".

DIFFERENT PEOPLE OR ORGANISATIONS BEAR THE RISK OF LOSS AND DAMAGE IN DIFFERENT WAYS, AT DIFFERENT TIMES.

WHAT MAKES US VULNERABLE?

> Approaches to assessing risk have focussed on understanding hazard probabilities.

> Risk assessments do not include ways to consider value trade-offs.

> Managing risk and managing vulnerability will have different outcomes for different people.

> Knowledge about value trade-offs for high-stakes decisions is limited.

> Risk is routinely transferred to other people and future generations.

> Limited understanding of whose risk is being managed by whom.

Probability-based approaches cannot effectively deal with situations where the consequence of an event is catastrophic and the likelihood is rare (e.g. extreme events such as the Black Saturday bushfires), as the rarity of the event tends to discount the consequence in prioritisation processes. This can lead to such events not being adequately considered in decision-making. Decision-makers therefore need to increasingly recognise the benefits that come from more broad-based approaches to disaster risk assessment that encompass diverse and rigorous ways to:

• consider the changing nature of many natural hazards including accounting for extreme, catastrophic events to reduce the element of 'surprise';

• recognise different ways complex problems can be framed; and

• be inclusive of different perspectives.

The cycle of risk transfer created by institutional processes, and the levels of loss, disruption or inequity of support that follow disaster, can fuel anger and blame. In part, this is dependent upon roles, responsibilities and accountability – i.e. who ultimately pays the cost of disaster, and the role of insurance, industry, community and government in supporting people to recover.

Knowing that responsibility for preparedness and resilience is not equally shared, and understanding the cycle of risk transference and points where our individual and collective capacity to cope reach its limits, can provide insights into where priority efforts can be applied to minimise suffering and mitigate or avoid creating future risk across the whole system and over multiple timescales.

3.4 GOVERNANCE AND ORGANISED DECISION-MAKING

People are the first responders after a disaster, and those affected bear the brunt of recovery over the long-term. Sharing responsibility and being better prepared is not just about an immediate response – when disasters occur the amount of harm felt is determined in part by society's preparedness well before the event. It is important to understand the different levels of agency people have to make or influence decisions.

In times of stability, governance and decision-making can be highly formal and structured, with static rules that stay in place and can be difficult to change. In times of disaster, however, a different set of powers, authorities and processes can be set in motion. Society expects governments and institutions to overcome barriers that inhibit problem-solving and preparedness, trusting them to lead, create knowledge and establish environments in which decisions and actions can be taken that minimise harm and reduce loss.

While stability is often sought in political, economic and social structures, the imperative for change is challenging us to redraw and redefine the rules – before disaster strikes. To do so requires an openness to transform systems of decision-making, to adjust management approaches and to be agile enough to effectively deal with highly charged and dynamic circumstances.

Leaders play a pivotal role, both in shaping national culture and carrying responsibility for guiding people through crises and times of complexity and uncertainty. This includes those in formal leadership positions as well as emergent leaders. Current and future leaders – across all sectors – need to be prepared to lead using next-generation and fit-for-purpose instruments of governance in public and private settings, enhancing accountability and transparency.

FOUR
VALUES INFLUENCE DECISIONS

4.1 VALUES SHIFT WITH CHANGING CIRCUMSTANCES

People as individuals or collectively as families, households, communities or businesses can and often do hold different values and prioritise those values differently.

People change their values with age, education, wisdom, experience, circumstances or influences such as economic markets, regulation or peers.

There are many examples of cultural change motivated by the objective of achieving positive health and wellbeing outcomes for society. Each of them challenged the prevailing social norm at the time they were introduced. As with any new or different idea that challenges the status quo, patterns emerge in the shift to new societal norms. This includes initial protest or even violent opposition, adoption by segments of society, and eventually broad acceptance as being self-evident and desirable.

During times of relative stability, societal and market influences play a significant role in determining the things society prioritises and values. Typically we seek to improve on the success of previous generations and 'more' of something is sought: improved standards of living, more money, another car, or a bigger house. There are many reasons why people are initially reluctant to adopt new ways of thinking or changing behaviours. Some of these are based on a perception that such changes will jeopardise current lifestyles, while others are more fundamental and involve individual perceptions that their identity is being threatened.

The relative importance or priority of values can change radically at times of hardship or disruption. Natural hazard events have a way of temporarily sharpening our focus on the things we value most but which we often don't recognise because we assume they will always be there. A stark example is the value of social cohesion where people reach out to help one another during times of hardship and can often look back with nostalgia at the feeling of belonging.

DURING TIMES OF RELATIVE STABILITY, SOCIETAL AND MARKET INFLUENCES PLAY A SIGNIFICANT ROLE IN DETERMINING THE THINGS SOCIETY PRIORITISES AND VALUES.

ATTITUDES TO SMOKING

Perhaps the most dramatic example of a recent change in our culture is the shift of attitudes to smoking tobacco over the last 40 years, especially in shared spaces. It had been presumed that smokers had the right to light up anywhere on aircraft, buses and trams; the same tolerance applied to restaurants, meeting rooms, public buildings and, in some states, even in cinemas. Now, most smokers have conceded that their right to smoke is overruled by the rights of others not to breathe exhaled tobacco smoke. As more people have become aware of the health risks of smoking, the percentage of people who smoke has fallen.

RANDOM BREATH TESTING AND SEAT BELTS

There are other, equally striking, examples of radical changes in attitudes in Australia. Random breath tests were widely considered an infringement to personal freedom when first suggested in the 1960s. We are now accustomed to a regime in which drivers can be stopped "anywhere, any time" and invited to provide a sample of their breath. There is a close parallel with seat belts in cars and helmets for motorbike riders. In each case, the compulsion was seen by some as an unacceptable intrusion, despite the overwhelming statistical evidence that the measures saved lives. Australia introduced compulsory seat belts before most other nations.

BANNING PLASTIC BAGS

As increasing numbers of people are concerned about the environmental impact of single-use plastic bags, and some states are either restricting the practice or requiring retailers to charge for bags, we are seeing a return to the practice of shoppers bringing their permanent shopping bags.

4.2 WHAT WE VALUE

Across society we value physical things, living things, services, processes and rules. We value houses, roads, infrastructure and economic productivity because of the services they provide, such as food, water, health, emergency services, energy, employment and education. We value things with sentimental meaning like photos and mementos, and intangible things like the place we live, family, friends, pets, community members, leaders and nature. Many also value a sense of place and a sense of connection to the environment.

The relative importance and priority of these values generally changes between stable times and in the face of disaster. While many things are important at both times, some things are taken for granted most of the time, and their value is only revealed or surfaces during or after a disaster – for example a sense of security, safety, normalcy and self-efficacy, or a lack of trauma.

THE EXPERIENCE OF A DISASTER CHANGES THE PRIORITY OF WHAT PEOPLE VALUE.

Things that can be taken for granted include protecting those who are important to us, knowing others and being known through relationships and connections, and preserving valued things such as: our homes; having food, water, power and communications; the animals and environment around us; and other things that give us a sense of identity, place and belonging.

> ## A MONETARY VALUE CANNOT BE PLACED ON MANY THINGS WE DEEPLY VALUE.

Other things we might not immediately think of are also valued, like minimising the experience of mental or physical harm; preserving, protecting and maintaining a safe and secure society where hope, freedom and individual liberties are respected and protected; learning and growing through increased knowledge, skills and experience; and having an opportunity to change perspectives. A dollar amount cannot be assigned to many of the things people deeply value, as the suffering and loss experienced when these things of value are impacted can never be fully or meaningfully compensated in monetary terms.

4.3 VALUES AND TRADE-OFFS

When values between people and groups align they are reinforced and strengthened, creating societal rules or norms. These can in turn influence other trends and patterns, and feedback loops are created. These can be positive or negative and are generally reinforced and strengthened over time. As a result of different values and priorities, people will also have different perspectives of some situations and will see different choices and decisions as possible. Where these perspectives clash, tensions can arise because the differing values held by people cannot be reconciled. In such situations choices and trade-offs are necessary and unavoidable.

Clashes or tensions in values arise between different sectors of society and between different roles. For example, they occur between individuals, groups, households, communities, businesses, institutions or even governments. They also occur between citizens, industry groups and businesses, political groups, and rural, remote and urban domains. There are also tensions between values within groups and within each of us. The values we hold as parents, employees, individuals, community members, or members of a political party can conflict.

These tensions and trade-offs are most commonly unconscious. The choices we make between incompatible or conflicting values are often outside our awareness and are shaped by history, business and governments. They are strongly determined by the distribution of power and wealth, access to information and resources, and the dominant narratives across society.

Figure 3 illustrates the concept of values that are in tension, conflict or contestation with each other and in most instances cannot be simultaneously held or reconciled without a compromise. The more strongly certain values are held over others, or the longer certain values are prioritised over others (e.g. prioritising a 'prosperous now' over a 'prosperous future'), the more likely it is that outcomes will occur that are counter-productive for the long-term resilience or prosperity of society more broadly. Additionally, decisions that are weighted too far and for too long towards either end, limit or compromise our capacity to cope and recover at times of disaster.
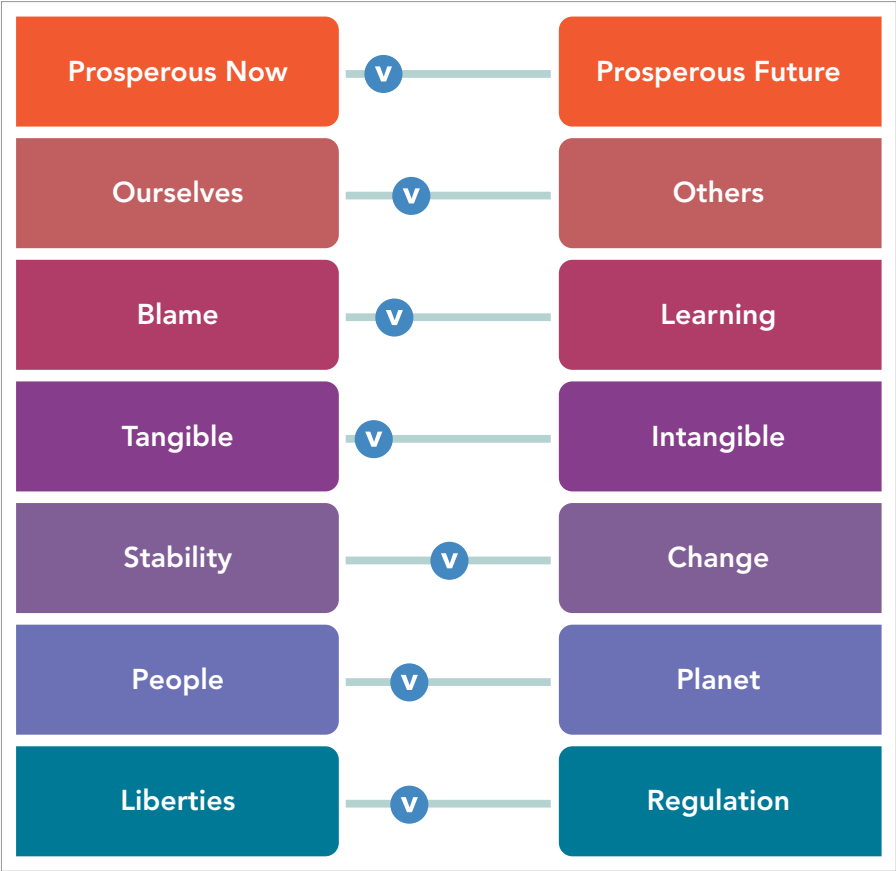
Figure 3: Values that are in tension and cannot be reconciled at the same time - choices and trade-offs are necessary.

4.3.1 Prosperous Now versus Prosperous Future

It can be a challenge to balance an immediate gain or benefit, against a long-term gain or potential benefit. We all must decide whether we spend or save, and whether we invest for the future. These choices require deliberate effort because of an increasingly persuasive societal emphasis on immediate or short-term gratification or consumption that promotes the agenda of economic growth.

Anticipating an uncertain future is difficult. The last 200 years have seen remarkable change, and only in recent decades have we experienced the emergence of the internet, the mobile phone, and more recently the rise of social media. There are an overwhelming number of possibilities that may become reality in the future. The future is therefore quite uncertain. Uncertainty makes many people uncomfortable, resulting in a quest for more information, and for delayed action until more is known.

Uncertainties, combined with limited capability to comprehend and make decisions in the face of uncertainty, also (partially) explain the lack of disaster preparedness of the wider community. Exploring how the future might unfold using scenarios can help reveal which values are at risk and what we can feasibly do to reduce and manage the risks.

This situation is worsened when decisions are made to prioritise numerous values that are positively reinforcing of each other. For example, decisions that prioritise a prosperous now over the future tend to promote individual (private values) over community (public values), people over planet, and tangible values over intangible values.

These can generate reinforcing feedback loops which can create and further entrench systemic vulnerabilities to disaster and make it even more difficult to build resilience.

The challenge facing us is to have the necessary foresight and commitment to find a balance, and monitor and adapt as the context changes, in order to be resilient and prosper in good times and bad.

ANTICIPATING AN UNCERTAIN FUTURE IS DIFFICULT.

Communities can be positively transformed after disasters. As disruptive as disasters are, the disruption that comes with a disaster is one of the few opportunities individuals, families and communities have to consider their future direction. A bushfire which nearly destroyed the township of Dunalley, Tasmania, has demonstrated how through hardship, communities can flourish, galvanise and develop a new spirit of rejuvenation and resilience. In 2013 the residents of Dunalley lost 80 properties and many residents did not have anywhere to go. The Dunalley neighbourhood house became a focal point of community healing and support, offering the township a place where they could come together to work on projects that benefited their town. Despite the devastation, residents were inspired to create new businesses or reinvigorate existing ones with the support of the community. Similarly, an individual who lost his home in the fires decided to build a gym on the land – now seen as a space where young people are nurtured and empowered.

4.3.2 Ourselves versus Others

We frequently make choices about how we balance what we value for ourselves, and what we value for others. We decide how much we give to charity, how much we help family and friends in need, and how much we participate in our communities. If we are not sufficiently aware or deliberate about these choices, the path of most comfort is to favour looking after ourselves.

Over time society has established formal institutions and rules to constrain or enable our choices to ensure they minimise harm to others and promote benefits to society more broadly. This is why we have environmental protection policies, a Medicare levy and incentives for (and regulation of) businesses and industries. We know that the trade-offs between values create losses. Decisions must be made about which losses matter more than others, whose losses are acceptable or unacceptable, and whose losses will be taken into consideration in decision making. This reveals the complex and contested nature of the trade-offs between people with different value priorities and the important influence of power and authority on which values ultimately get prioritised over others. As a result of this, the importance of governance arrangements that are based on principles of openness, fairness, tolerance and deliberation cannot be overstated.

THE CLOSER WE ARE TO AN ADVERSE EXPERIENCE, THE MORE OUR VALUES ALIGN WITH UNIVERSAL VALUES, AND THE MORE LIKELY WE ARE TO MAKE CHOICES ALIGNED WITH THOSE VALUES.

Potential vulnerability emerges because we live in an increasingly individualistic and empowered modern society. Most people value freedom and independence, and yet there is comfort in having support provided to us and knowing individuals cannot pursue their own interests unconstrained, especially during a crisis when favourable outcomes for most/all are likely to depend on community cohesiveness and mutual trust. Governments are expected to balance both – to equip and empower individuals, but also to provide support when needed and to promote a shared culture of tolerance and respect that underpins a sense of community.

People's prior experience of a disaster is a factor in their ability to independently prepare and proactively respond. People are busy and have to prioritise many other aspects of daily life.

In places where a major emergency has not occurred within living memory, people may find it difficult to prepare to experience extreme adversity and their reliance on others increases. Current expectations may well be that government will provide support when needed.

The nature of 'community' is changing, from the original foundations of the 'village' to something else, although we are not sure exactly how to describe it. For many, there is a loss of a place-based community, particularly within cities. Working away from home, spending long hours at work and interacting more with interest-based communities has meant less time and motivation to get to know the neighbours.

THE NATURE OF 'COMMUNITY' IS CHANGING, FROM THE ORIGINAL FOUNDATIONS OF THE 'VILLAGE' TO SOMETHING ELSE, ALTHOUGH WE ARE NOT SURE EXACTLY HOW TO DESCRIBE IT.

In a globalised world, economic success as individuals, businesses and a nation is increasingly tied to people and entities elsewhere (often in other countries), rather than people and businesses in local communities. However, when disasters arise, place-based communities become of paramount importance, and many realise just how much a local community – the people who can band together to help each other – matters.

Divisions and differences exist within any community (place-based or not) based on individual values, roles, interests, location, socio-economic status, culture or history. Some people make decisions beneficial to themselves irrespective of the consequences for others in the community. Some community leaders who hold decision-making power or control can perpetuate a vulnerability imbalance. Further, people are increasingly busy managing competing demands in their own lives, making it difficult to engage everyone in a process of preparedness.

4.3.3 Blame versus Learning

Disasters and disruptions provide an opportunity to learn. Distilling the causes and sharing experiences of what contributed to each disaster, providing evidence or unpicking what happened, all provide important opportunities to learn so that measures can be taken to reduce the chance of the same thing happening again. Legacy decisions and existing behaviours, capacities, regulations and standards that contributed to unwanted outcomes can be recognised, diagnosed and alternatives identified to improve future decisions and actions. Learning can be used to better characterise the contributing factors, improve understanding of the effectiveness of possible interventions, and to more equitably share the responsibilities, costs and benefits associated with them.

Many of us admire people who learn and transform as a result of adversity. Unwanted outcomes are situations of genuine hardship and harm to people. We expect our leaders to navigate decisions to minimise these no matter how challenging that might be. Our formal and informal leaders are incentivised through accountability measures to learn from and improve their understanding of the consequences of decisions/actions in order to promote better decisions next time.

However, often after a disaster there is a tendency to blame someone for the loss of life or property, and the economic and environmental damage which has occurred. People try to find reasons for their loss in order to make sense of it, and may blame others. Unfortunately this tendency to allocate blame reinforces our vulnerability. It can impede our ability to collectively learn about what unfolded, or to appreciate the interdependencies and cascading effects of the complex systems involved.

IT IS THE STORIES WE DO NOT TELL THAT REINFORCE CYCLES AND ACCUMULATE DISASTER RISK.

Learning is at its most valuable when it is open and honest, which is less likely if blame is the intent. We can break the cycle by having deliberate conversations about our level of tolerance for loss and the values that we are willing to trade-off now and in the future. During preparedness planning, we can have conversations about the root causes of disaster and talk about systemic issues.

Disaster preparedness planning is most commonly perceived to be a formal government responsibility and officials take their accountability for consequences seriously. Yet when emergencies occur there can be an impression that response and (early) recovery did not happen as well as they should have. Any lack of inclusiveness for people to contribute to plans and discuss value trade-offs makes it easier to allocate blame afterwards. This makes it more difficult for everyone to talk about inherent vulnerabilities in the system. The media also play a role in frequently sensationalising disaster or reinforcing the cycle of conflict and blame, rather than focussing on accountability, learning and increasing the depth of our understanding.

The uncertainty relating to a varied and changing climate means that we need to understand how we are vulnerable, acknowledge that risk exists, and that these need to be effectively managed. We need to help people navigate and prepare for irreversible loss. Equipping people with information they understand, including drawing upon traditional and non-traditional forms of learning and knowledge, can help navigate ambiguity and future uncertain outcomes. We can learn from the experience of Indigenous peoples about their relationship with nature, their local knowledge, cultural practices, skills and materials to better understand the reasons for their success in surviving or coping with disasters over centuries. We can also learn from other communities and societies who have faced similar situations.

4.3.4 Stability versus Change

Stability is often associated with a sense of safety, security, predictability and comfort, along with the belief that when disruption occurs there will be solutions to alleviate its effects. Conversely, change brings with it uncertainty that can be experienced with either fear or excitement depending on our perspective. There are well-understood benefits from agility and innovation, and the ability to adapt and change.

An exclusive focus on maintaining stability or tradition may provide a sense of safety but in a changing world it also exacerbates vulnerability. On the other hand, focussing entirely on being changeable and adaptable may lead to taking too many risks resulting in unstable environments (e.g. depleting investment confidence). In normal times control and stability are often favoured. However, sometimes stability can be counterproductive to response and recovery. In events where the traditional command and control structures of emergency services are overwhelmed, traditional methods focussed on restoring stability may not be enough. A new approach from an unexpected source may be more successful (e.g. from a community member or group, or from the private sector).

LEARNING IS AT ITS MOST VALUABLE WHEN IT IS OPEN AND HONEST, WHICH IS LESS LIKELY IF BLAME IS THE INTENT.

Recognising that people have capacities suggests they are also able to participate in positive ways to reduce disaster risk and unfolding emergencies. Emergency management and allied institutions can collaborate in new ways to empower others. This is not simply a means to improve response capability when services are overstretched. Individual resilience is to be encouraged as a safety net for the moments when the limits of good public policy and emergency management practices are reached. However, we also need new efforts to reduce vulnerability through enhancing the resilience and preventing the degradation of (political, economic, social and cultural) systems in the long term.

A continued challenge is that 'change' is accelerating rapidly and in every domain. Natural hazard events are occurring at intensities not previously experienced, with consequences previously unimagined. There are some things we cannot control – like bringing glaciers back, or engineering the oceanic currents to flow, or preventing earthquakes, cyclones or floods. The increasingly complex nature of unfolding events means that we cannot fully predict, understand or manage them and events will exceed the capabilities and capacities we have.

Some nation states have been preparing for the impact and consequences of climate change. Kiribati and Tuvalu are two of the most vulnerable nation states susceptible to sea level rise and a changing climate. Both states are implementing various measures to ensure their people's survival, however not in similar fashion. In Tuvalu, seawalls are being erected to safeguard homes, fresh water and crops. In other nations, a discussion about the repatriation of the population is underway. Simultaneously, changes in the economy are being made to raise funds to implement alternative measures for protection and continued development. Across Kiribati, the Marshall Islands and Tuvalu, there is a sense that with climate change comes a threat to that state's identity, culture and sovereignty. The people of these nations do not want to be refugees, and resettlement remains an unpopular solution.

Australian flood-prone towns have in the past been relocated to higher ground in an effort to mitigate and avert future disasters. After the 2011 floods in the Lockyer Valley region, which claimed the lives of 14 individuals, destroyed 29 houses and severely damaged 130 in the town of Grantham, The Lockyer Valley Regional Council initiated a land relocation option to allow flood-impacted residents to move to a new land parcel outside the flood zone. It is anticipated that up to 80% of all Grantham residents will relocate.

This is not the first time that an Australian town has moved to higher ground due to severe flooding. In 1810, Governor Macquarie sought to move settlers from the Hawkesbury and Nepean rivers to higher ground after repeated floods, with not much success. Other towns that have been successfully been relocated after catastrophic flooding include Bega, Gundagai and Clermont. Moving towns is never easy and the threat of future floods may not be incentive enough for some to be convinced to move, as was discovered by Governor Macquarie.

4.3.5 People versus Planet

People hold different values about the relationship between people and the planet. The planet can be seen as a resource for the purposes of human use. It can be viewed as a form of capital, which can be traded or substituted for other forms of capital. Conversely, people can be seen as custodians of the planet, with a primary role to nurture and care for nature, and where the goal is to leave the smallest possible 'footprint'. Between these two viewpoints, there is an option where it is acknowledged and respected that there are limits to substitution between nature and other forms of capital, requiring some areas or aspects of the natural environment and the planet to be protected and others to be available for sustainable and equitable use.

Everyone is dependent on the planet for clean air, water, food and other essential goods, as well as the natural processes that regulate the climate and maintain the productivity of land and water resources. We are dependent on the planet to sustain our lives and we therefore have a responsibility to protect or safeguard it for future generations.

Society has been modifying the landscape to build homes and cities, and to underpin resource-based economic activities, and increasingly this transforms and exposes future generations to hazards. With increasing populations and the desire for continued growth, demands on the planet as a resource are also increasing. Our survival becomes increasingly fragile the more the planetary system experiences stress and change. We need to recognise the fragile nature of our place in the environment and draw on broad forms of knowledge (including both old and emerging) to better inform our choices about how we live our lives and the consequences for nature.

Balancing the tension in values between people and planet across local, regional, national and global scales is important for our current and future livelihoods, and to build resilience in times of disaster or adversity.

4.3.6 Tangible versus Intangible

In Australia, many are accustomed to having functioning infrastructure and a reliable supply of essential information, products and services. On the whole, we live more comfortably than previous generations and many populations in other countries. In general we are healthier, wealthier, live longer, and have the opportunity for richer life experiences than ever before. In times of stability as a society we are familiar and at ease talking about monetary values in decision-making. For the most part, we tend to prioritise things that are tangible and to which commensurable values can be assigned. That is, we may prioritise things that we can touch, feel, own, exchange and accumulate. Most people may value having an income and having a successful economy, and link 'success' to economic or financial success. We often use numbers, facts and figures to guide much of our decision-making about how systems work. However, we tend not to factor intangible values and things that are difficult to measure into our decision making.

EVERYONE IS DEPENDENT ON NATURE.

Because tangible things are easier to count or measure we have used them to establish and reinforce many societal norms that influence behaviour. Such an approach can seem more defensible, evidence-based and fair. It can also provide goals that create feelings of achievement, purpose and fulfilment. This way of valuing has formed the foundation of most formal processes for decision-making. The consequence of this is that we prioritise things that can be quantified and monetised at the expense of those that cannot.

Yet at times of disaster or disruption the relative priorities of what we may value heavily shifts to those less tangible things that are more difficult to measure. We value our families, our relationships, and our connections. People may value a sense of belonging, of having friends, social harmony, community identity, spirit and cohesion, traditions and heritage, and the feeling attached to particular places. We may value feelings of prosperity, safety or resilience. A number or dollar value cannot be placed upon these things. A tendency to value the tangible over the intangible can crowd out a more holistic perspective to making decisions. A wiser option may be to find new ways of valuing what is tangible and intangible.

4.3.7 Liberties versus Regulation

At one end of this spectrum is heavy regulation, standardisation, constraints and accountability in the way we decide how we want to live our lives. At the other end is minimal state intervention (libertarianism) involving removing red tape and having little to no regulation or constraints on decisions or behaviour.

Heavy regulation and a reliance on rules reflects a preference for control over openness, a focus on the future rather than the present, the importance of public interests over private ones, and an emphasis on collective benefits above individual benefits. This approach values affordability, accessibility and equality for all segments of society, even if this is less efficient in the short term. Heavy regulation can suppress innovation. Appropriate regulation can incentivise innovation and creativity.

On the other hand, a 'free' market-driven society prioritises individual liberties, private interests and benefits, adaptability, and a focus on the shorter term. This approach values flexibility over stability, and individual benefits over broader concerns. These drivers often manifest in the efficient, just-in-time supply of services, encourage individuals to comply with market dynamics, and people pay for services as consumers because this is the most efficient thing to do.

A heavy dependence on just-in-time supply creates vulnerability at times of disaster, which can conflict with our value on maintaining access to services during disaster.

A level playing field is difficult to achieve. The role of governments in democracies is generally to try to promote fair and balanced outcomes through the use of regulations, taxes, subsidies and other legislative measures. We rely on governments to be agile and effective in finding the right balance between allowing or incentivising people to fulfil their individual liberties as they choose, while respecting the equal rights of others and promoting the welfare of those in society who are disadvantaged or vulnerable.

THE ROLE OF GOVERNMENTS IN DEMOCRACIES IS GENERALLY TO TRY TO PROMOTE FAIR AND BALANCED OUTCOMES THROUGH THE USE OF REGULATIONS, TAXES, SUBSIDIES AND OTHER LEGISLATIVE MEASURES.

FIVE

A CHANGING NARRATIVE

We are accustomed to talking about the risk or resilience of infrastructure and critical systems. We talk about attributes that relate to ageing infrastructure, single points of system failure, dependencies within and between key systems, constraints to supply, the effect of lead times, and stress failures.

We talk about the influence of trends, opportunities and advances in business, science and technology. We do not, however, have a good baseline understanding of the root causes of disaster and processes influencing how places and people are vulnerable and how this leads to disaster.

The critical systems on which society depends have evolved to become highly efficient at delivering to specific objectives. However, the functioning of one system is highly interconnected with the functioning of others. While we recognise and understand the vulnerabilities within each system quite well (i.e. when we think in silos), we are only beginning to fully recognise and think about the cascading impacts on society more broadly that result from disruption due to the highly interconnected nature of social, economic, infrastructural and technological systems.

We acknowledge vulnerable people and can identify the attributes that apply to them. We are aware of inequality, poverty, disadvantage, marginalisation, chronic illness, alcohol and drug use, and family violence. However, we are less rehearsed in talking about how prevailing institutional arrangements and decision-making processes lead to that poverty, inequality, disadvantage, marginalisation, chronic illness, alcohol and drug use, and family violence in the first place. We are not as good at having the difficult conversations about how people are impacted when services are not available or are disrupted, or in talking about what we can do to deal with degrading systems.

We are accustomed to talking about ecological vulnerability through attributes like deforestation, erosion, loss of soil fertility, contamination, pollution, and unsustainable farming. We are beginning to discuss the fragile nature of our dependence on a healthy planet, the amount of waste we generate, the amount of plastic in the oceans, pollution in the atmosphere, and the impact of food and lifestyle choices on ourselves and the planet. We avoid having conversations about power and ethics in decision-making, and the cycles of risk creation and transfer that are the causes of unsustainable and inequitable resource use.

MORE FOCUS IS NEEDED ON THE INTERSECTIONS AND INTERDEPENDENCIES IN THE SYSTEMS THAT SUPPORT US, FROM LOCAL TO GLOBAL LEVELS.

Efforts to reduce disaster risk have been made in earnest since the International Decade of Disaster Risk Reduction (the 1990s), and yet the projections for the cost of disaster continue to increase as populations grow and exposures and vulnerabilities increase. Governments and taxpayers, as the insurers of last resort, will continue to provide (escalating) post-disaster assistance to vulnerable people and places.

More focus is needed on the intersections and interdependencies in the systems that support us, from local to global levels. We must appreciate and address the profound consequences of our past and present decisions (including the public as decision-makers), including those decisions and actions that have the perverse consequence of building in *more* vulnerability.

Figures 4 and 5 are indicative of the factors that lead either to increased vulnerability or to increased resilience and safety. Figure 4 illustrates the progression to vulnerability and Figure 5 illustrates the pathway to resilience and safety –bringing the concepts outlined in this paper together.

More action is needed to support our desired progression towards a resilient and safe society for all. We must all engage in this work if we are to create and then maintain the momentum required.

Important aspects of society and wellbeing are entrusted to business (economic), government (national security and public policy), media (information and knowledge) and non-government organisations (social causes and issues). Governments set the 'playing field' through regimes of taxes, subsidies, legislation, regulations and other policy measures.

Governments establish various forms of control to balance opportunities and risks through a system of incentives and rules that also balance private interests with the public good. This is especially important where markets fail: e.g. where the costs and benefits cannot be priced, where information on causes and effects is not available, and when impacts are delayed.

The public expects government to lead, create knowledge and establish environments in which decisions and actions can be taken that minimise harm and reduce loss. We expect governments and organisations to create, maintain, share and use information needed to solve problems and look to people in positions of leadership and power to make decisions that are in our collective best interests.

Vulnerability is primarily a concern about the impacts of society on society. People and leaders face ambiguous and challenging situations and must make decisions that affect them and many people around them. Decisions are sometimes skewed to the advantage of those who already have money, power, authority and influence because they have greater access to networks determining how systems work. Often there is no way of knowing the effects of these decisions or choices on those around us. Sometimes there are ways of knowing that we ignore. Each choice we make, knowingly or unknowingly, is a choice about which values we are trading off and whose values are being traded. Societal level trade-offs can intentionally or unintentionally constrain a prosperous future for all.

EACH CHOICE WE MAKE, KNOWINGLY OR UNKNOWINGLY, IS A CHOICE ABOUT WHICH VALUES WE ARE TRADING OFF AND WHOSE VALUES ARE BEING TRADED.

SIX
INFORMED AND INSPIRED ACTION

"We need to remember that the future is not pre-determined in any important sense. It is not an unknown land into which we totter unsteadily one day at a time, but an extension of the present that we shape by our decisions and our actions. The future is not somewhere we are going but something we are creating. We all have a role in shaping Australia's future." Professor Ian Lowe

Australia has made commitments to three international agreements[1] and to other global initiatives of significant relevance to reducing disaster risks. The success of one agreement is dependent on the success of the others. This context is driving efforts across the globe to systematically analyse and reduce drivers of disaster risk. This includes reducing exposure to hazards, lessening and addressing vulnerability of people and property, sustainably managing land and environment, and improving preparedness and early warning for natural hazard events. This intent is also captured in the *Global Assessment Report on Disaster Risk Reduction 2015*. Australians see the growing potential for natural hazards to trigger devastating disasters with escalating impacts, and rightfully expect all sectors to work together to limit the impacts, loss and harm.

As natural hazards are becoming more intense, variable and frequent, the cost of disasters will continue to grow. As our population grows, so does the exposure and vulnerability of people and assets, and our dependence on essential services that are also increasingly interconnected and interdependent.

All Australian governments and sectors of society have recognised there is a need for change; as a result there is a great deal of innovation, investment and effort already underway across the country. Building on this momentum, there is tremendous opportunity for greater cooperation and to broker knowledge across domains, unify efforts, and do more than change at the margins.

To support our endeavours, this paper, *Profiling Australia's Vulnerability: The interconnected causes and cascading effects of systemic disaster risk*, along with the CSIRO technical reports, provides a different, emergent logic to underpin reframed approaches and narratives about disaster, systemic vulnerability and resilience.

The learning derived from this work provides a solid base upon which many new tools, methods and guidance will be created. These resources will provide practical support for a wide range of policy makers and practitioners to encourage and continue this new conversation, to engage with all sectors of society, and to make the changes that are needed. This includes government at all levels, non-government organisations, community groups and organisations, and businesses in the private sector.

We need to engage with one another early and often. This work provides a frame which equips leaders at all levels to have a different conversation about disaster risk, so that together we can uphold public trust and confidence, and sustain a safe and prosperous nation.

"The best public policy solutions will come when we allow and encourage debate, discussion and an open exchange of ideas between those people on all sides of a debate who share only one thing in common – finding answers." Prof Tom Kompas

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1 United Nations 2030 Agenda for Sustainable Development (including the Sustainable Development Goals), United Nations Sendai Framework for Disaster Risk Reduction 2015-2030, The Paris Agreement on Climate Change.

Increasing vulnerability

Root causes	Dynamic pressures	Fragile livelihoods and unsafe locations	Disaster Risk	Hazards

Societal deficiencies in:
- Clarity in roles, responsibilities and accountabilities
- Risk creation and transfer practices
- Clarity of risk ownership
- Planning and development practices
- Regulations and related incentives or disincentives
- Dependence and reliance on technologies, resources and services
- Learning and education practices
- Communicating and translating information
- Experience and connection
- Agency, choice and self-sufficiency
- Ethical standards

Macro-forces related to:
- Population change
- Rapid urbanisation
- Displaced populations
- Changes in world economic market
- Government debt (recovery costs)
- Poor governance
- Unsustainable land use or resource use
- Decline in soil productivity and biodiversity
- Collapsing planetary systems
- Conflict

Changing lifestyle patterns including increasing affluence and consumption

Unequal balance between economic, social, environmental priorities

Inequitable access to resources, wealth, power and decisions about structures and services

Priorities are skewed toward an end-state
- Now – future
- Ourselves – others
- Blame – learning
- Tangible – intangible
- Stability – change
- People – planet
- Liberties – regulation

- Assets anchored in unsafe places
- New developments in hazardous locations
- Unprotected buildings and infrastructure
- Disproportionate levels of social protection (such as insurance)
- Fragile health, wellbeing and livelihoods
- Marginalised people (geographic, social, economic etc.)
- Declining social cohesion and networks
- Disproportionate access to information and communications or inability to understand it
- Limited opportunity to participate in disaster risk reduction
- Disproportionate access to affordable and reliable essential services
- Degrading ecosystems
- Low tolerance for loss

Disaster Risk = Hazards + Vulnerability

Weather and climate related
- Severe storm
- Tropical cyclone
- Storm surge
- Flood
- Bushfires
- Drought
- Heatwave

Geomorphological and geological
- Earthquake
- Tsunami
- Landslide
- Soil erosion
- Soil contamination

Astronomical
- Solar flare
- Geomagnetic storm
- Space junk re-entry

Biological and ecological
- Human epidemic
- Plant disease, pests and invasive species
- Biodiversity loss
- Livestock disease

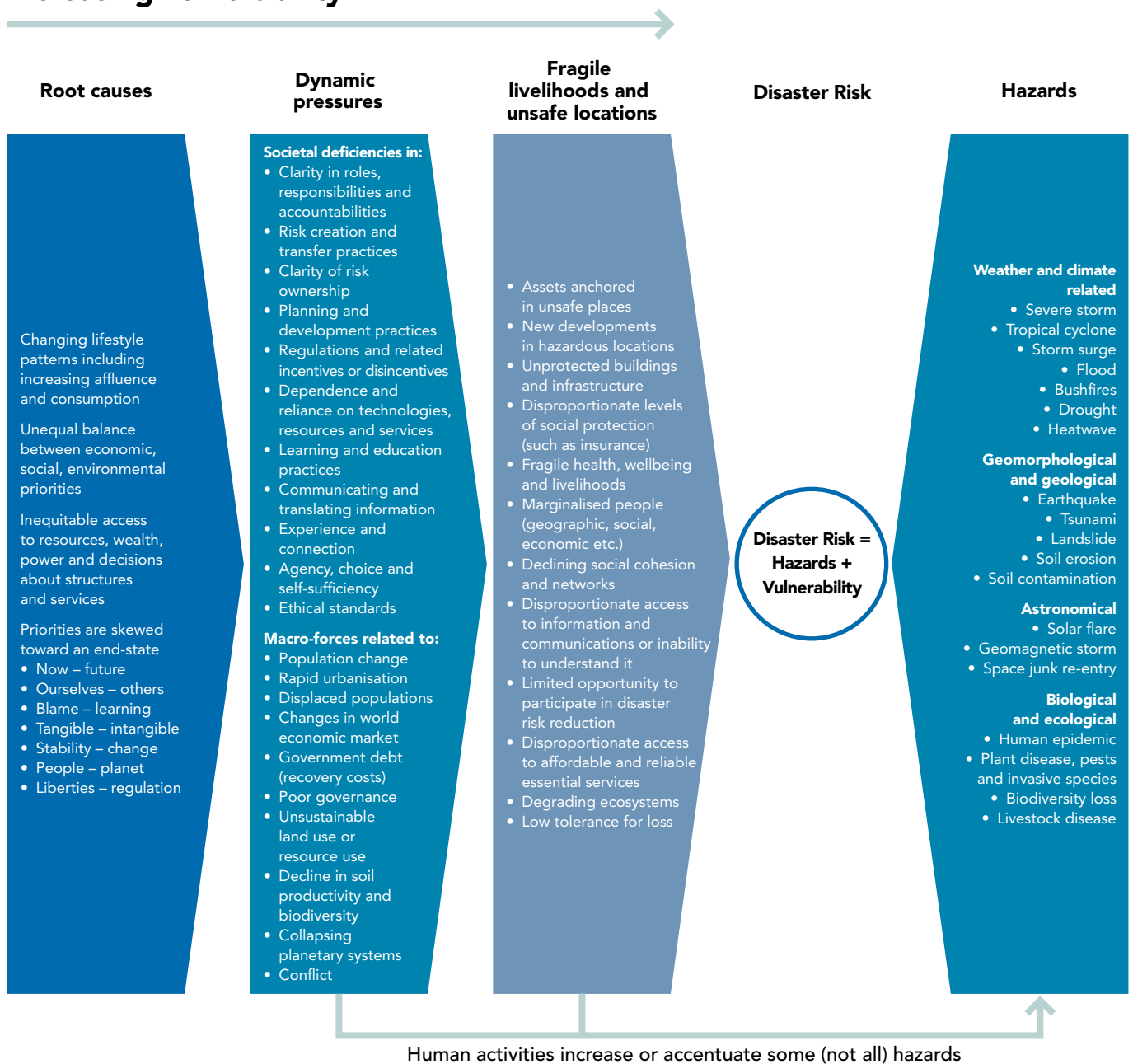Human activities increase or accentuate some (not all) hazards

Figure 4: The progression of vulnerability, highlighting the things to reduce or the things to avoid. Note this diagram is to serve as an illustration of the concepts of addressing systemic vulnerability and is not comprehensive (Source: adapted from Wisner et al, 2011)

Pathways to safety

| Address root causes | Reduce dynamic pressures | Achieve safe locations and sustainable livelihoods | Disaster Risk Reduction | Hazards prevention and mitigation |

Socially and environmentally sustainable development and lifestyle practices

Economic priorities balanced within social priorities and within environmental limits

Equitable access to resources, wealth, power and decisions about structures and services

Optimum balance navigated for prosperity and public good
• Prosperous now and Prosperous future
• Ourselves – others
• Blame – learning
• Tangible – intangible
• Stability – change
• People – planet
• Liberties – regulation

Tell stories, listen to stories that challenge ideas, values and perspectives

Buffers for external or system dependencies

Agile systems, technologies resources and services

Good governance structures and transparency in decision making

Clarity in roles, responsibilities and accountabilities

Limit creation of new risks and risk transfer practices

Planning and development practices

Social protection and environmental management

Diversity and options to alternate sources and supply

Access to brokered knowledge from trusted sources

Social participation in decision making

Ethical standards and leadership

People and assets in safe locations

Investments in buildings and infrastructure are resistant and built appropriate for locations

Access to basic needs

People have good health, good support services and overall wellbeing

Diversity of jobs, employment and skills for people

Sufficient and durable income levels

High level of education and educational programs

People feel seen, included and that they belong

People are connected to where they live

Enhance capacities and reduce vulnerabilities

Protect biodiversity

Strategic risk management

**No loss of life
No/few injuries
No/limited damage
Livelihood security
/prosperity**

Hard engineering-oriented measures
• Levees
• Sea walls
• Raised structures
• Wind breaks
• Slope protection
• Air conditioning systems

Soft society-oriented measures
• Monitoring systems
• Hazard mapping
• Early warning systems

Spongy ecosystem-oriented measures
• Afforestation
• Conservation of soils, ecosystems and biodiversity
• Pest and invasive species control
• Vaccination

Human activities reduce or attenuate some (not all) hazards

Figure 5: The pathway to safety, highlighting the things to enhance or the things to increase. Note this diagram is to serve as an illustration of the concepts of addressing systemic vulnerability and is not comprehensive (Source: adapted from Wisner et al, 2011).
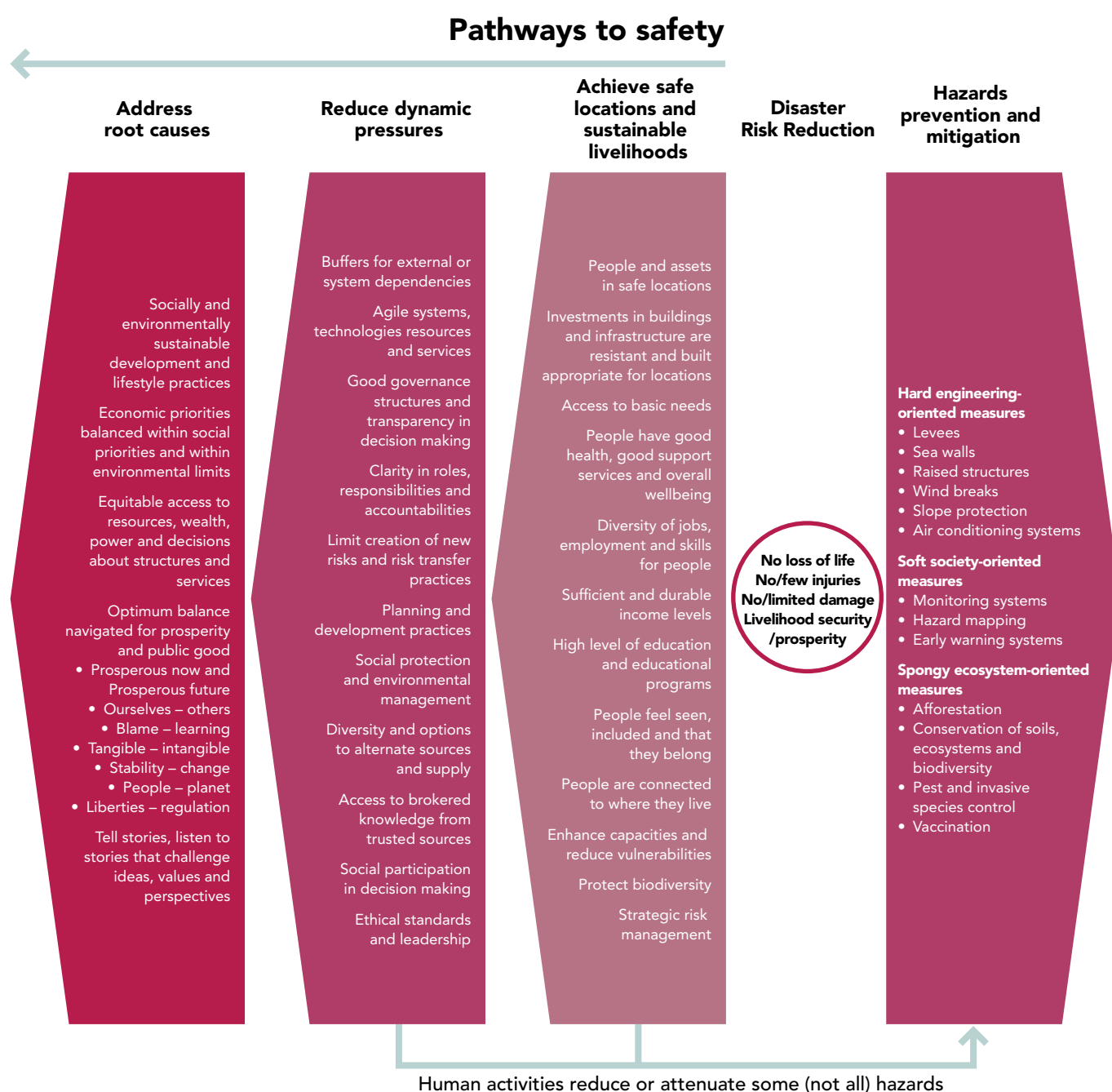
SEVEN

TERMS TO KNOW

People interpret particular terms in different ways and may use some terms interchangeably. The following terms were adopted throughout this document (informed by established glossaries, specialist practitioners and other national and global initiatives):

Agency	The ability of people to make choices and decisions that have an impact within systemic structures.	*National Resilience Taskforce*
Disaster	A serious disruption of the functioning of a community or a society at any scale due to hazardous events interacting with conditions of exposure, vulnerability and capacity, leading to one or more of the following: human, material, economic and environmental losses and impacts.	*UNISDR*
	Severe alterations in the normal functioning of a community or a society due to hazardous physical events interacting with vulnerable social conditions, leading to widespread adverse human, material, economic or environmental effects that require immediate emergency response to satisfy critical human needs and that may require external support for recovery.	*IPCC 2014*
Disaster risk	The potential loss of life, injury, or destroyed or damaged assets which could occur to a system, society or a community in a specific period of time, determined probabilistically as a function of hazard, exposure, vulnerability and capacity.	
	Annotation: The definition of disaster risk reflects the concept of hazardous events and disasters as the outcome of continuously present conditions of risk. Disaster risk comprises different types of potential losses which are often difficult to quantify. Nevertheless, with knowledge of the prevailing hazards and the patterns of population and socioeconomic development, disaster risks can be assessed and mapped, in broad terms at least.	
	It is important to consider the social and economic contexts in which disaster risks occur and that people do not necessarily share the same perceptions of risk and their underlying risk factors.	*UNISDR*
Natural hazard	A natural process or phenomenon that may cause loss of life, injury or other health impacts, property damage, social and economic disruption or environmental degradation.	*UNISDR*
Resilience	The ability of a system, community or society exposed to hazards to resist, absorb, accommodate, adapt to, transform and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and function through risk management.	*UNISDR*
System	A complex network, or networks, of interconnecting and related rules, structures and mechanisms that work towards a common goal(s).	*National Resilience Taskforce*
Vulnerability	The conditions determined by physical, social, economic and environmental factors or processes which increase the susceptibility of an individual, a community, assets or systems to the impacts of hazards.	*UNISDR*

EIGHT

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National Resilience Taskforce

PROFILING AUSTRALIA'S VULNERABILITY
The interconnected causes and cascading effects of systemic disaster risk