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MAPPING AND UNDERSTANDING OUR VALUES AT RISK AND RISK OWNERSHIP

Context Paper

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INTRODUCTION

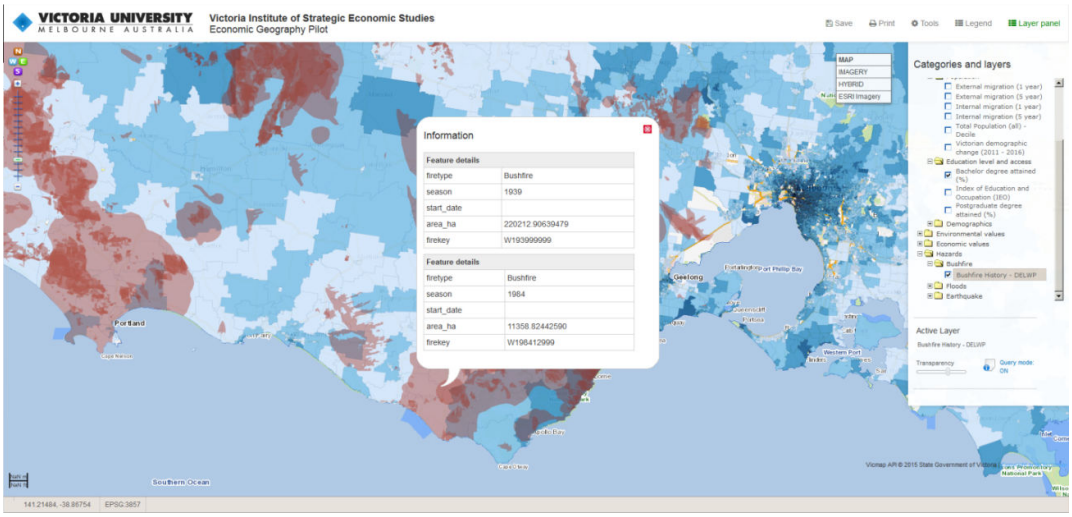
Currently, government spending on natural disaster response is more than 20 times spending on mitigation. When natural disasters are large and combine in unpredictable ways, they also cross domains, moving from the private to the public realm, and shifting from a local, to a state or national concern. Many climate-related natural hazards are increasing and the number of people living in hazard-prone areas is also increasing. This raises the potential of future, unmanaged risks.

Although the spending mismatch between response and mitigation is well understood, we face potential deficits in important social and environmental values. This is because they may not be adequately accounted or compensated for in decision-making processes. Communities and the environment are vital components of liveability and sustainability, but their underlying values are not well understood. If a risk is owned (in that who is responsible for managing the values under threat can be clearly identified), then we can assess this imbalance. If the risk is un-owned, these values may be more likely to be damaged and degraded, or lost.

Values underpin the foundations of decision making, shaping the choices we make. Yet often they only become visible when they are lost. Values can be social, environmental or economic and can be measured as tangible (monetary) or intangible (non-monetary). To date there has been little clarity as to the worth of different types of values and the role that they play in decision making within and across institutions. Preventing future loss of values and the associated costs from uncertain but potentially severe natural hazard events can be difficult, but is necessary in order to make the case for investment. It is also important for understanding more fully the implications of the trade-offs associated with different mitigation options to improve strategic decision making.

The increasing intensity of some natural hazards, changing demographics and environmental conditions is placing many of these values at greater risk. This is driving the need to better understand which values are most vulnerable and their worth, and also to identify who has ownership of these values at an institutional level and the risks that threaten them to ensure effective management.

THE WORKSHOPS



Mapping and understanding bushfire and natural hazard vulnerability and risks at the institutional scale is a research project that aims to address the issues outlined above by investigating vulnerability and risks to natural hazards on a range of scales. It will look at institutions involved in natural disasters, such as local government, state government, federal government and the community and private sector; and assess how their specific values and rules interact with the broader values affected by natural disasters. It will also explore the issue of risk ownership across institutions and examine the role it plays in the management of these risks.

The aim of the project is to develop:

- An economic geography of values at risk.
- A framework to assist the development of governance around risk ownership of values at risk.

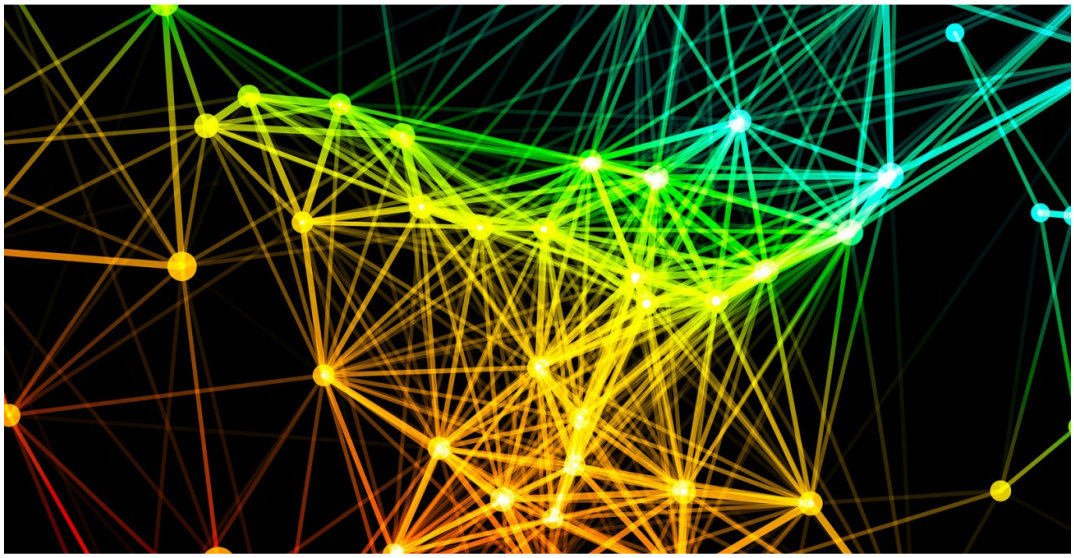
These series of workshops are a key part of our research. Their purpose is to explore how values and risk ownership currently inform decision making through a series of structured exercises. We will also be testing aspects of the newly developed draft values-at-risk map to ascertain gaps in the values currently represented, and explore how the draft values-at-risk map can inform risk ownership at an institutional level.

Key questions for these workshops are:

- How are the values at risk represented in the draft maps currently understood? What other values should be represented in the geography and how?
- What types of decision-making structures apply values at risk in strategic planning of natural hazard risk management?
- How might the values at risk map aid in the strategic planning of natural hazard risk management? What are the current strengths and gaps in risk ownership at an institutional level?

This project aims to benefit decision makers in institutions such as local, state and federal government, the community and various private sectors by helping them to better identify a more comprehensive way of costing these events and where their institutions may be at risk as a result of this. It also aims to help clarify how governance can support the long-term management of natural hazard risk and assist in building greater resilience.

THINKING IN SYSTEMS



Natural hazards, the risks they trigger and the values they affect are a systemic issue, impacting on environmental, social and economic systems simultaneously over multiple time frames. These systems are complex, interconnected and interdependent.

Each of these systems is supported by a number of smaller subsystems that in turn interact with each other so that impacts in one part of the system can affect another. For example, in natural systems such as rivers and coastlines that cross jurisdictional boundaries, stakeholders from one area may take action that may have repercussions downstream or further along the coastline, transferring the responsibility for managing any subsequent risks to other jurisdictions.

Secondary impacts of events, such as loss of social cohesion, increased health issues and financial stress are often overlooked, but can increase vulnerability and reduce resilience to future events. At an economic level, these impacts can be devastating, particularly in regional areas where businesses may not have the resilience or strategies to deal with such events. For example, after the fires in Marysville in 2009, 80% of local businesses are reported to have closed within 12 months (Young and Jones, 2013b) (for further details see Attachment A).

Many natural hazards are not predictable, in that we are often able to tell when and where they are most likely to occur, but not how or what the outcome may be. Also, changes in demographics, the environment, the climate and available resources which are also dynamic stressors, can affect the nature of the event and its impacts. Responding to these complex situations requires different kinds of decision making that address immediate, medium and long-term needs.

VALUES

"Value is not a logical process because value is not just about what something costs, it is about what we as individuals and communities hold as precious to us."
Participant, Beyond the Mean Workshop (Young and Jones, 2013a p11)

Values are things considered important because they are useful or appreciated for their existence. Values can be tangible: goods and services with a direct monetary value; or intangible: values that do not have an explicit monetary value but are still considered important. Intangible values include environmental and social values such as community connectivity, beauty of a landscape and environmental services such as clear air and water. These values also help to support the economy and enhance resilience.

There are two types of values that are part of decision making: the values that are internal to an individual, group or institution and external values. Internal values make up the psychological landscape of the people involved in making decisions. These are social and cultural values that provide the context for what is valued and why. External values are linked to the physical environment that surrounds the individual, group or institution. These include social, environmental and economic values and are the focus for our research. (For details of values currently under consideration, see Attachment B.)

Internal and external values interact, so that changes or loss of a value in one area will often have repercussions in the other. Perceptions of worth of the many different values spanning the monetary economy, human society and the natural environment, vary widely and can change over time. This can make it difficult for decision makers to fully assess trade-offs when using conventional economic tools. This is particularly the case for intangible benefits over long-term time frames.

Values affected by natural hazards exist within a system that links people with their environment. Values can also be interdependent within a system so that damage to one value can impact on others. For example, extensive wildfire damage to a forest in a tourist area is likely to directly affect the local community and economy. The increasing intensity of some natural hazards and changing demographics is placing many of these values at greater risk. This is driving the need to better understand which values are most vulnerable and how they are vulnerable; and also to understand the interactions and where key dependencies lie between different value groups and the institutions that are responsible for them.

> *Values are affected by disasters in two ways: one is through the damage experienced as a result of the shock and the other is as ongoing losses/gains during recovery (Cavallo and Noy, 2010). Losses in some areas of value may never be recovered, while other values may actually be stimulated by the shock or by other measures taken to aid recovery. For example, rebuilding often stimulates the construction and materials sectors as occurred following the 2011 Queensland floods (Hartley et al., 2011).* (Jones et al., forthcoming, 2015 p8)

Greater understanding of these positive and negative effects will also improve strategic planning in a way that will support the building of resilience.

THE ROLE OF INSTITUTIONS

Institutions are rules and norms held in common by social actors that guide, constrain, and shape human interaction (North, 1990). Such rules can be formal, such as laws and policies, or informal, such as norms and conventions. Organizations such as parliaments, regulatory agencies, firms and community bodies act in response to institutional frameworks and the incentives they frame (Young et al., 2008).

Institutions involved in natural hazard planning and management include different levels of government, the legal system, the community, business and industry, and the emergency management sector. Individually and collectively they can be said to 'own' and 'share' risks. Institutional rules can be separated into stated and realised rules or norms, with stated rules being the official rules and realised rules being the way people within an institution behave (Ostrom et al., 1994).

In many cases, institutional values and agendas may not be well aligned with those required for effective management of these risks. For example, if housing is allowed in poorly-sited developments both the developer profits and local government increases its rate base. Future risk is transferred to individual property owners, but can also refer back to local government who take on the legacies of increased risk to its community, and pressure to mitigate future risks.

In particular, strategic planning can be compromised by short-term institutional outlooks and planning horizons. As resilience and areas of recovery require ongoing investment and planning for the longer term, it is important to understand what barriers and opportunities there are within and across different institutions in relation to this.

VULNERABILITY

Although a basic and simple definition of vulnerability is the propensity to be harmed (Carter and Mäkinen, 2011), there are multiple definitions used when assessing vulnerability. This is because what is vulnerable and how it is vulnerable depends on the type of value being assessed, the context it is being assessed in and the purpose for which it is being assessed.

To give some examples, in a business context, vulnerability may be defined as:

> *Degree to which people, property, resources, systems, and cultural, economic, environmental, and social activity is susceptible to harm, degradation, or destruction on being exposed to a hostile agent or factor*. (Businessdictionary.com, 2015).

In a social context, vulnerability may be defined as:

> *... a term that may be applied to those people who have the potential to be adversely affected by a disaster or emergency to an extent that their safety and recovery requires significant and coordinated intervention, response and support from service agencies and the community*. (State Recovery Office, 2013 p6)

To further complicate this, individual values may also be assessed as vulnerable or there can be a chain of values that are interdependent within a system or across systems that together, when stressed or impacted, can cause a reaction which makes an entire system vulnerable. Within the NERAG, vulnerability is not clearly defined except to refer to it as vulnerability to hazard (National Emergency Management Committee, 2010) p. 11., leaving it up to users to define their specific usage. Based on an informal survey of the guidance material and published literature, the two main uses of vulnerability for natural hazard management in Australia are:

1. Socio-economic vulnerability as a precursor to risk.
2. Impact-related vulnerability as an outcome (e.g., vulnerability to a hazard).

Some authors divide hazard-related vulnerability and general socio-economic vulnerability according to susceptibility to primary and secondary hazard impacts

(Birkmann, 2006). However, other input measures such as exposure, also contribute to total risk, so can contribute to some framings of vulnerability. The complex nature of vulnerability requires us to be clear about the context in which it is being applied (Cardona et al., 2012).

Key components commonly used when assessing vulnerability are exposure, sensitivity and hazard. These are often placed within a framework which is specific to a certain context as illustrated below. This conceptual diagram was designed to understand socio-spatial vulnerability and climate disadvantage, but can be applied to natural hazards. The inclusion of factors that ascertain capacity is particularly important, as the capacity of a system or part of a system to cope or adapt to an event can be a useful way of indicating where thresholds may be reached and what sort of action is required to mitigate this risk.

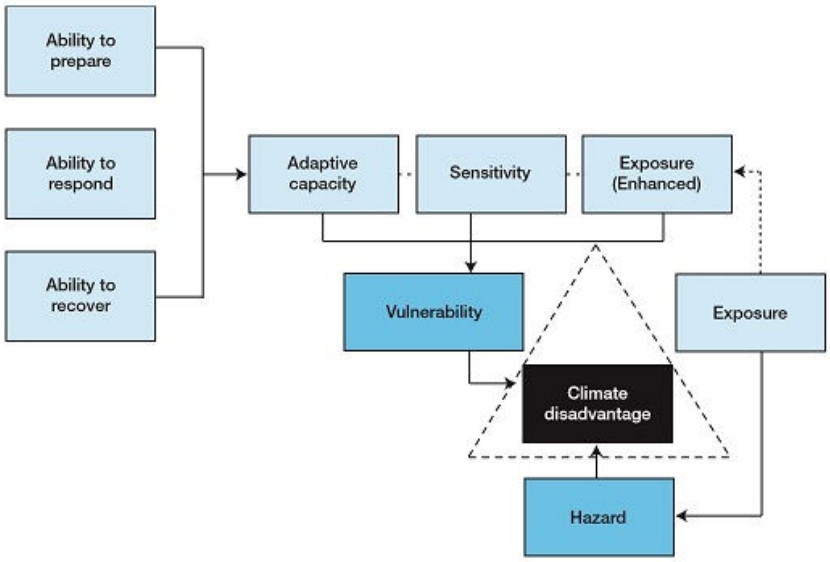


FIGURE 1: CONCEPTUAL FRAMEWORK FOR ASSESSING SOCIO-SPATIAL VULNERABILITY AND CLIMATE DISADVANTAGE (UKCIP, 2014).

THRESHOLDS

Understanding thresholds is key to being able to maintain agency when planning for the management of natural hazards. There are two areas where the thresholds are applicable:

- The management of the event itself and ability to effectively respond to the event across short, medium and long-term time frames. For example, the Black Saturday Bushfires required all levels of government and private and public participation.
- In relation to systems or assets that are the responsibility of institutions and the point at which they cease to fulfil their function as a result of a shock.

In both of these areas, exceeding a threshold can lead to the loss of an activity, or reorganisation or transformation, which may be temporary or permanent. Thresholds are hard to pinpoint, so it is important to identify the early signals that precede these being reached, because often, if a threshold is clearly visible, it is too late to successfully avoid it. However, to date, thresholds in the natural hazard area have been poorly understood and, as a result, it has been difficult to effectively include these in current risk management processes.

RISK PROPAGATION ACROSS DOMAINS

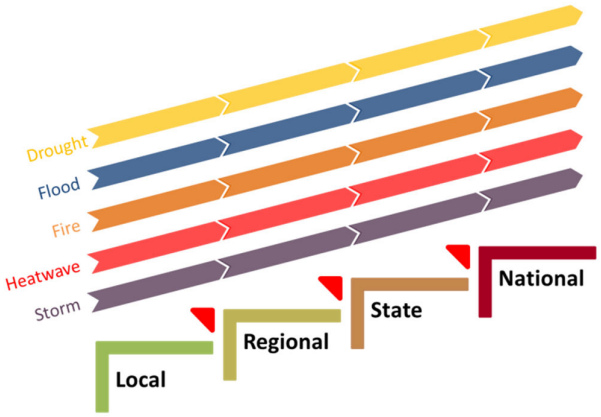


FIGURE 2: DOMAIN CROSSING OVER SPATIAL SCALES OF FIVE SELECTED NATURAL HAZARDS (Jones et al., forthcoming, 2015 p11)

To manage the risk of rapidly changing impacts, coordination is needed across government, industry and civil society, as these risks can affect many sectors and jurisdictions, crossing both temporal and spatial scales (domains). Clear ownership of these risks is particularly important and needs to be considered holistically so as not to avoid perverse outcomes.

Domains, can be geographic, sectoral or institutional, denote an area of institutional responsibility. Responsibility can be defined by aspects of governance such as rules, control, knowledge and agency. Government institutions at all levels form an important link between geographic and institutional domains.

The propagation of risks across domains can accelerate when a number of linked and/or successive climate-related events such as drought, heatwave and fire combine, resulting in a number of domains being crossed (see Figure 2 above). In such situations, the ownership of risks can change and spread to new institutions, such as when state or territory and federal governments are required to supply disaster relief and act as the insurer of last resort.

RISK OWNERSHIP

A risk owner is defined in the ISO 31000 risk standard as being:

> *…a person or entity that has been given authority to manage a particular risk and is accountable for doing so" (ISO, 2009). The Productivity Commission align risk ownership with assets stating "asset owners are generally best placed to manage risks to their property*. (PC, 2014 p314).

Accountability and responsibility as forms of risk ownership are related but separate. Accountability is an aspect of governance where an organisation or individual is ultimately answerable for actions undertaken ('where the buck stops'), whereas responsibility is seen as being allocated responsibility for carrying out specific actions. For example, a government agency may be accountable for managing public land, but subcontracts its management to other bodies or private contractors, who are responsible for carrying it out.

Risk ownership is primarily allocated in two ways, either through funding or finance or through the process of managing the risk itself (see Figure 3 below).

However specific ownership can be allocated in other ways such as:

- In relation to a hazard, for example, specific authorities and agencies are charged with managing bushfire risk, others manage flood.
- In relation to an activity or task required during a given phase of the risk management process (e.g., roles related to preparation, plan, response and recovery).
- Through policy, regulations or legal requirements.

There are two areas of activity that need to be considered by institutions in relation to risk ownership:

- Risks that are external to the institution, which they have little or no agency over.
- Risks that are internal to the institution, which has greater agency to address. (These risks are generally task related and often determine the ability of institutions to manage external risks.)

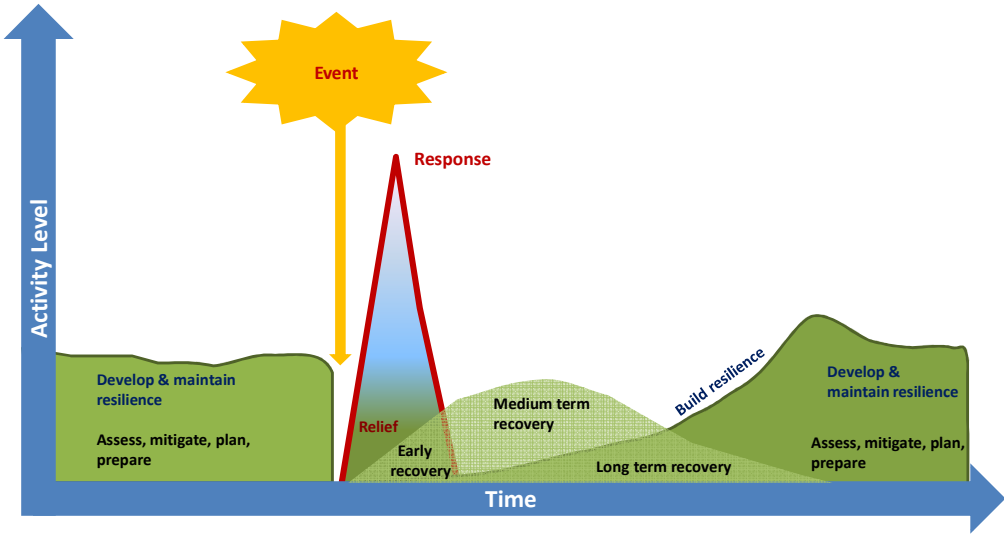


FIGURE 3: PROJECTED RESOURCE REQUIREMENTS FOR EFFECTIVE INTEGRATED NATURAL HAZARD RISK MANAGEMENT TASKS ACROSS TIME SCALES. (Young et al., 2015 p3 adapted from, AEMI, 2011 p29)

Tools for allocating risk ownership

The main instruments used to allocate risk ownership are shown in FIGURE 4 overleaf. Policy and strategy relate to over-arching principles and plans that guide and direct the economic, social and environmental terms for influencing the management and mitigation of natural hazard risks. Plans and assessments address the development of specific actions and their implementation – contracts and agreements are part of this process. Legislation provides the framework for the legal aspect of policy making, and regulations and standards support the enforcement of these by providing regulatory processes and rules.

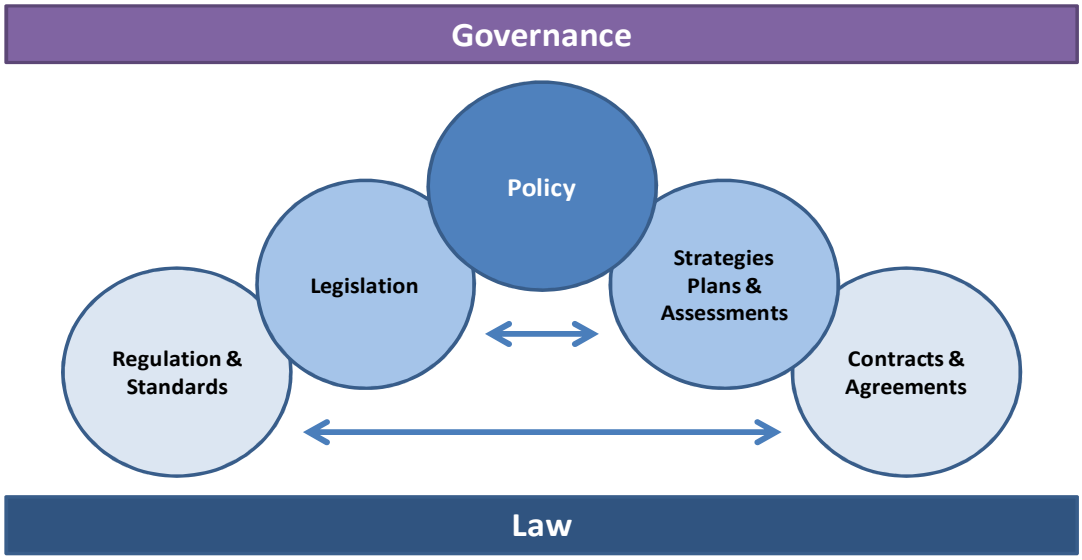


FIGURE 4: INSTRUMENTS FOR ALLOCATING RISK OWNERSHIP (Young et al., 2015 p14).

Governance and law are components associated with all these instruments. Governance provides the frameworks for establishing accountability. The law provides legal frameworks through which aspects of risk can be allocated, tested and enforced. This is done through different areas of law, such as common and commercial law, which outline specific areas of responsibility and accountability. These are often linked to enforcement actions if they are not adhered to (MacIntosh et al., 2013). These instruments are applied across institutions in different ways as part of an interconnected and iterative process of development, implementation and review (see Table 1 below).

Instruments	Application in ascertaining risk ownership
Policy	All levels of government, industry and business and aspects of civil society. Includes overarching policy and principles at federal, state and local government levels and organisational policies in the private sector and community agencies.
Legislation	All institutions but less so for civil society. Includes international, federal and state legislation.
Regulations and standards	All levels of government and industry and business, but less so for civil society. Includes building and planning, consumer protection, official standards and professional codes of practice.
Strategies, plans and assessments	Applicable to all institutions in the form of risk assessments and response plans at federal, state, regional, municipal, sectoral, community and organisational level. Civil society has little accountability in this area, but can be allocated roles via specific policies and strategies associated with international treaties Australia is a signatory to.
Contracts and agreements	All institutions covering government, industry and business, and civil society. Contracts are a key driver for industry and business. These include vendor agreements, contractual arrangements, commercial law, common law and community arrangements. Includes all international legally binding treaties and agreements.

TABLE 1: APPLICATION OF INSTRUMENTS TO INSTITUTIONS (Young et al., 2015 p14)

Establishing the ownership of natural hazard risk is complex due to a number of factors, which include the following:

- The dynamic nature of natural hazards, which can result in changes in risk ownership throughout the management cycle or as a result of a specific event.
- Multiple owners and areas where ownership is not clearly delegated or shared.
- Incomplete knowledge about natural hazard risks and limited access to information may limit the ability to allocate ownership appropriately.
- Differing expectations from within, and external to, institutions that compete for limited resources and/or that promote competing agendas.
- Different approaches by state level agencies, e.g., comprehensive, all hazards, all agency, multi-hazard, single hazard.
- Uneven transition of public institutions to being more flexible and collaborative.
- Systemic interdependencies where ownership actions in one area create impacts in another area.
- Related policies and plans that contribute to a specific region, activity or set of outcomes that are being addressed separately, e.g., adaptation to climate change, regional economic development.

WHAT WE HAVE FOUND SO FAR

Risk ownership was examined within a matrix of broad institutions (federal, state/territory and local government, business and industry, and civil society) and values (built, social and environment assets, and infrastructure). Risk ownership across this matrix was found to be allocated according to individual hazards, ownership of assets, tasks associated with the risk management process and policy/legislative instruments.

Risk ownership is highly dynamic and is changing as new operational structures and processes are emerging, and growing within and across institutions. Variable interpretation of risk, risk ownership and lack of clarity of appropriate governance, particularly across areas of multiple ownership was also found.

Review of pre- and post-event policies and strategies revealed ownership strengths in the following areas:

- Built infrastructure and assets have the most complete coverage of risk ownership, which is supported by a wide range of policies and regulation.
- Well-developed early- and medium-term response plans for impacts on built assets and infrastructure and to a lesser extent on social assets and infrastructure. The majority of recovery funds are currently spent on roads and other transport infrastructure due to high levels of damage and lack of insurance in this area in most states.

- Growing allocation of ownership in risk planning and preparation at the state and local level, for civil society, and business and industry in designated high-risk areas for specific hazards such as flood and fire.
- Broad ownership by civil society of overall hazard risk in terms of insurance coverage, although growing exposure increases the risk of under-insurance.

Ownership gaps were observed in the following areas:

- Mitigation of risk to environmental assets and infrastructure has limited ownership, and there are important gaps in coverage for both built and social assets and infrastructure.
- Despite a degree of existing resilience, resilience is relevant to all areas of the risk management process, but its application is not well defined. Accountabilities also extend beyond emergency management into broader social, economic and environmental areas, such as climate change adaptation and business development.
- Lack of clarity between investment in and relative effectiveness of active (e.g., emergency management plans, targeted mitigation) and passive resilience measures (e.g., building to regulation).
- Recovery plans for social and environmental assets and infrastructure. There was no defined funding mechanism for environmental recovery or for social recovery over the long term.

(For further details see Attachment C.)

THE POLICY LANDSCAPE

At the Federal level, a number of key policies provide high-level guidance and frameworks that pertain directly to risk management and resilience building for natural hazard and disasters. The policies define general areas associated with the pre- and post-event areas include: National Disaster Resilience Framework (2009), Critical Infrastructure Resilience Strategy (2010), National Strategy for Disaster Resilience (2011), and National Emergency Risk Assessment Guidelines (2010) (NERAG).

All State Government and Territory bodies have direct responsibilities for natural hazards that are legislated (see Attachment D for details), and some of these responsibilities are shared with Local Government. There is still a lack of clarity as to how long-term actions that relate to resilience and recovery can be managed through policy; particularly in the face of short-term political cycles that can disrupt the ongoing continuity needed to ensure effective outcomes.

There is large cross-over with other areas of policy at all levels of government that support building and maintaining resilience, such as climate change adaptation, and social and economic development. A greater understanding of the synergies between different policy areas and how these agendas can work together would assist in maximising resource use and building capacity.

TOWARDS A BETTER UNDERSTANDING FOR THE FUTURE

'If these disasters are going to happen in a way so I can't base judgment of what to do on historical evidence, how am I supposed to prepare let alone deal with these things?'
— *Ex Country Fire Authority (CFA) Volunteer* (Young, 2012 p 8)

Socially and environmentally, the world is changing, which is affecting how natural hazards impact our communities, environment and economies. These changes are driving the need to find new ways of seeing and understanding, what is valuable to us and how it is at risk. It also raises the question as to what type of investment and resources are needed and where they can be most effectively used. The systemic nature of this requires us to act in a more adaptive fashion where continuous review, learning and flexibility to adjust become part of current practice. It also requires strategic planning and multi-tiered actions across multiple time frames if we are to become resilient to future events.

Already, the model for managing and understanding natural hazard disaster risks is adopting more integrated and flexible structures in response to these changes. As these processes and institutional arrangements mature, understanding of risk ownership and values will continue to evolve. This provides challenges, not only for the Emergency Service Sector, but also for our communities, government bodies and private sector as it requires large-scale social change. It is also offers an opportunity to understand our relationship with these events, the responsibilities we each have as a result and how we can best address these issues through innovative solutions.

GLOSSARY

Adapted from (Emergency Management Australia, 1998).

Built assets and infrastructure. 'Hard' assets such as housing, business establishments, roads, communications, energy and water infrastructure.

Disaster. A serious disruption to community life which threatens or causes death or injury in that community and/or damage to property which is beyond the day-to-day capacity of the prescribed statutory authorities, and which requires special mobilisation and organisation of resources other than those normally available to those authorities.

Domains. Geographical areas of jurisdiction such as local, state or national government areas, or institutional areas, such as the public and private economy.

Emergency management. A range of measures to manage risks to communities and the environment; the organisation and management of resources for dealing with all aspects of emergencies. Emergency management involves the plans, structures and arrangements required to integrate the normal endeavours of government, and voluntary and private agencies in a comprehensive and coordinated way to deal with the whole spectrum of emergency needs, including prevention, response and recovery.

Emergency service. An agency responsible for the protection and preservation of life and property from harm resulting from incidents and emergencies. Synonymous with 'emergency services authority' and 'emergency service organisation'.

Hazard. A source of potential harm or a situation with a potential to cause loss; a potential or existing condition that may cause harm to people or damage to property or the environment.

Institution. Institutions are rules and norms held in common by social actors (individuals, groups and organisations) that guide, constrain and shape human interaction. Institutions can be formal, such as laws and policies, or informal, such as norms and conventions. Institutions can influence human interaction through direct control, incentives and processes of socialization.

Mitigation. Measures taken in advance of a disaster aimed at decreasing or eliminating its impact on society and environment.

Natural assets and infrastructure. The natural environment, sometimes modified by people, consisting of ecosystems, biodiversity and the biophysical environment of land, soil and water.

Preparedness. Measures to ensure that, should an emergency occur, communities, resources and services are capable of coping with the effects; the state of being prepared.

Prevention. Measures to eliminate or reduce the incidence or severity of emergencies.

Recovery. The coordinated process of supporting emergency-affected communities in reconstruction of the physical infrastructure and restoration of emotional, social, economic and physical wellbeing.

Response. Actions taken in anticipation of, during, and immediately after an emergency to ensure that its effects are minimised, and that people affected are given immediate relief and support.

Risk. The likelihood of harmful consequences arising from the interaction of hazards, communities and the environment; the chance of something happening that will have an impact upon objectives. It is measured in terms of consequences and likelihood; a measure of harm, taking into account the consequences of an event and its likelihood.

Risk owner. Asset owner who faces a potential loss. A person or entity that has been given authority to manage a particular risk and is accountable for doing so (ISO, 2009).

Social assets and infrastructure. The soft assets of society and communities that bind them together such as health, education, social connectedness, knowledge, clubs and religious groups**.**

Values. Things considered important because they are useful or appreciated for their existence. Values can be tangible: good and services with a direct monetary value; or intangible: values that do not have an explicit monetary value but are still considered important. Intangible values include environmental and social values such as community connectivity, beauty of a landscape and environmental services such as clear air and water. These values also help to support the economy and enhance resilience.

ATTACHMENT A: NATURAL HAZARDS IMPACTS

(Adapted from Young and Jones, 2012 p9)

Natural hazard impact	Primary impact	Secondary impacts
Individual storm event	Damage to and loss of infrastructure Disruption to services and production, supply chains Possible endangerment of life Potential disruption to energy supply Potential communication disruption Loss of business services or productivity Stress experienced by support services responding to the event	Decreased income Increase cost to business through insurance premiums, cost of infrastructure replacement Possible increased cost to consumer Decrease in some primary resources leading to market shortages
Collective storm events (e.g., some areas in regional Victoria have recently been flooded three times in 12 months)	Cumulative damage and loss of infrastructure Cumulative disruption to services, supply chains and production Possible endangerment of life or wellbeing of employees Loss of business and reduction in profit Disruption to energy supply Limited capacity of support services to deal with ongoing events Disruption of data and communication	Increased cost to business through insurance premiums and need to replace infrastructure Potential reduction of insurance payouts leading to increased expenditure Warranty life of products shortened Potential refinancing difficulties for vulnerable industries Decrease in business Increased cost to consumer leading to less disposable income in some areas Associated health and wellbeing issues with employees Migration of existing community members to other locations
Bushfire	Damage to and loss of infrastructure Disruption to services, supply chains and production Endangerment of life, serious injury Loss of business and reduction of profit Damage to or destruction of community Disruption of data and communication	Lack of financial capacity, particularly SMEs Increase in insurance premiums for property and liability Lack of infrastructure and financial support impacts Associated health issues Change in market structures Migration of existing community members to safer locations

Natural hazard impacts	Primary impact	Secondary impacts
Flood (overland)	Damage to and loss of infrastructure Disruption to services, supply chains and production Possible disruption to energy supplies Possible endangerment of life Loss of business and reduction of profit Destruction of community Disruption of data and communication	Lack of financial capacity particularly SMEs Increase in insurance premiums for property and liability Lack of infrastructure and financial support impacts Associated health issues Migration of existing community members to other locations
Heat wave	Damaged to infrastructure, e.g., train tracks Disruption to production due to OH&S requirements Disruption to power supplies and supply chains Increased energy costs due air-conditioning and cooling costs Possible endangerment of health of employees Damage of products, e.g., food, pharmaceutical products	Potential increase in work cover cases Associated health issues Increase of prices with some resources Loss of business and reduction of profit

ATTACHMENT B: DRAFT MAP VALUES

Area	Core value	Example of metric
Social/human values		
	Mobility	Access to transport Journey to work: ▪ Accessibility of roads and main transport routes ▪ Commuter traffic and trip time
	Cultural	▪ CALD communities ▪ Indigenous communities ▪ Cultural areas of significance, e.g., Sydney Opera House, Kakadu
	Health	▪ Health service providers ▪ Age demographics ▪ Wellbeing ▪ General health and morbidity ▪ Mental health
	Community	Community organisations, volunteerism Vulnerable communities, CALD, single parent families, elderly ▪ Rental properties ▪ Access to open space ▪ Connectedness – internet, remoteness ▪ Libraries ▪ Sporting bodies
	Equity	▪ Demographics ▪ Income, wealth gaps ▪ Education level and access
	Households	▪ Number of residents ▪ Ownership ▪ Income ▪ Access to food and clean water (after emergencies but some Aboriginal communities only have it sporadically) ▪ Access to emergency accommodation
	Children	Access to: ▪ Schools ▪ Kindergartens ▪ Child care ▪ Play areas ▪ Family or foster family ▪ Positive experiences
	Population growth	▪ Refugees ▪ Sustainability of resources/environment, etc. ▪ Demographic change (see also Health)
Environmental		
	Parks	▪ Park status – regional to World Heritage
	Ecosystem health	▪ Health status
	Biodiversity	▪ Richness and quality ▪ Endangered species and ecosystems (ranking of significance, endangerment)
	Amenity	▪ Amenity and liveability ▪ Ecosystem goods and services

Area	Core value	Example of metric
	Agricultural land	▪ Key food production areas ▪ Productivity
	Geographical areas vulnerable to BNH	▪ Coastal, bushfire areas, inland flooding
	Environmental stress factors	▪ Invasive species ▪ Land degradation ▪ Disturbance regimes ▪ Sensitivity to climate change ▪ Fragmentation ▪ Recovery status follow drought, fire etc
	Environmental contamination	▪ Old waste sites, mine dumps, industry sites
Infrastructure (N.B. Possibly sensitive to public display and release.)		
	Hard infrastructure	▪ Site based: government buildings and facilities Networked: roads, rail, etc.
	Essential services	▪ Water, electricity, gas, telecommunications, etc.
	Location of state assets (exposure)	▪ Physical infrastructure, buildings etc.
	Location of private assets	▪ Physical infrastructure, housing, ports, etc.
	Housing	▪ Assets at risk
	Industry and business	▪ Assets at risk

ATTACHMENT C: KEY ACTIONS, INSTITUTIONAL OWNERS AND INSTRUMENTS

(Young et al., 2015 p34 adapted from, PC, 2014)

Key actions	Institutional owner and key agencies	Key primary instruments	Related instruments
1. National coordination and strategy development			
▪ Provide strategic direction through the development of key policies and documents ▪ Provide oversight and direction from a national perspective of coordination ▪ Lead national policy coordination	▪ Federal government leads, but shared ownership with all other levels of government. Key agencies include: o Attorney General's Department o COAG, Ministerial councils, ANZEMC o The Ministerial Council for Police and Emergency Management – Emergency Management (MCPEM-EM) o Emergency Management Australia (EMA) o Infrastructure Australia o Regional Development Australia	▪ National Disaster Resilience Framework (2009) ▪ Critical Infrastructure Resilience Strategy (2010) ▪ National Strategy for Disaster Resilience (2011) ▪ NATCATDISPLAN (2010) ▪ Trusted information sharing network	▪ National Consumer Law (2011) ▪ Building Code of Australia ▪ Climate Adaptation Outlook: A Proposed National Adaptation Assessment Framework (2013) ▪ National Climate Change Adaptation Action Plan (2007) ▪ Australian building codes and standards ▪ National Sustainability Framework for Financial Reporting and Asset Management Approach to Asset Planning and Management (2007) ▪ *Environment Protection and Biodiversity Conservation Act (1999)* ▪ *Australian Heritage Commission Act (1975)* ▪ Cooperative Approach to Integrated Coastal Zone Planning Framework and implementation plan (2006) ▪ Industry Innovation and Competiveness Agenda (2014) ▪ *Public Governance, Performance and Accountability Act 2013* ▪ *Work, Health and Safety Act 2011* ▪ *Natural Resources Management (Financial Assistance) Act 1992*

Key actions	Institutional owner and key agencies	Key primary instruments	Related instruments
2. Natural hazard information and research			
▪ Undertake research and analysis	Federal Government is accountable and research delivers through the following agencies: ABS, BOM, CSIRO, Geoscience Australia and BNHCRC, research agencies, universities, private industry	▪ National Disaster Resilience Framework (2009) ▪ National Strategy for Disaster Resilience (2011) ▪ *Australia Research Council Act 2001* ▪ AS 5037—2005 Knowledge Management standard	▪ National Adaptation Framework ▪ National Climate Change Adaptation Action Plan (2007) ▪ Industry Innovation and Competiveness Agenda (2014)
▪ Provide jurisdiction specific information for preparation, response and recovery efforts ▪ Information delivery through municipal and regional bodies ▪ Facilitation of knowledge sharing across community, private business and industry ▪ Research development and collation in jurisdictional area	State government in collaboration with: ▪ Local government ▪ Regional bodies ▪ Peak industry bodies ▪ Community organisations ▪ NGOs/NFPs ▪ EMA, AEMI	▪ Risk assessments and strategies (all states and territories) ▪ Fire Management and Natural Hazard Response Plans (all states and territories) ▪ Trusted Information Sharing Network ▪ AS 5037—2005 Knowledge Management standard	▪ Regional, state and municipal adaptation plans (all states and territories) ▪ Regional development plans ▪ Municipal development plans
▪ Provide local community with specific information for preparation, response and recovery efforts ▪ Enabling knowledge sharing across local private and community areas ▪ Provision of information to State Government of context specific information	Local government in collaboration with: ▪ State Government and associated agencies ▪ Regional bodies ▪ Community ▪ NGO/NFP ▪ Private industry and business ▪ EMA, AEMI	▪ Municipal and State Emergency Management and Response plans ▪ Fire management and Natural Hazard Response Plans (all states and territories) ▪ AS 5037—2005 Knowledge Management standard	▪ *Local Government Act* (all states) ▪ Regional and municipal adaptation plans ▪ National Sustainability Framework for Financial Reporting and Asset Management Approach to Asset Planning and Management (2007) ▪ Community Business Partnership ▪ Regional Development Plans (all states and territories)

Key actions	Institutional owner and key agencies	Key primary instruments	Related instruments
2. Natural hazard information and research			
▪ Provision of relevant and sector specific information in relation to risks ▪ R&D to develop new market opportunities as a result of change ▪ Undertaking sector specific research	Industry and business ▪ Peak bodies to develop and provide sector specific information and research ▪ Individual organisations information is updated – public liability, vendor agreements, standards, regulations ▪ Government (all levels) ▪ Australian Business Roundtable for Disaster Resilience and Safer Communities ▪ EMA	▪ ISO standards: 13000, 14001, 2600, 9000 ▪ AS NZS 31000: 2009, 5050 2010 ▪ Community Business Partnership ▪ AS 5037—2005 Knowledge Management standard	▪ Industry Innovation and Competiveness Agenda Federal (2014) ▪ Emergency Management Arrangements ▪ Community Engagement Action Plan (EMA)
▪ Information dissemination through community and social networks	Civil Society ▪ Private industry/business (media) ▪ State and local government NGOs and community organisations ▪ Regional bodies ▪ EMA, BoM	▪ Community Engagement Action Plan (EMA) ▪ State Government guidelines on warnings, signals ▪ BoM ▪ National Emergency Management Volunteer Action Plan (2012)	▪ State and Local Government Communication and Engagement plans ▪ AS 5037—2005 Knowledge Management standard
3. Planning and readiness			
▪ Risk assessments, business continuity ▪ Planning ▪ Budget provisioning ▪ Planning – asset management	Federal Government ▪ Related government departments, committees and agencies in particular the Attorney General's Department ▪ Treasury and Finance	▪ NERAG ▪ Critical Infrastructure Resilience Strategy 2011 ▪ National Strategy for Disaster Resilience 2011 ▪ *Public Governance, Performance and Accountability Act 2013*	▪ Building Code of Australia ▪ AS/NZS ISO 31000:2009 ▪ Cabinet Implementation Unit Toolkit, 4:Risk (2013) ▪ Climate Adaptation Outlook: A Proposed National Adaptation Assessment Framework (2013)

Key action	Institutional owner and key agencies	Key primary instruments	Related instruments
3 Planning and readiness			
		▪ Federal Risk Management Policy (2014) ▪ National Emergency Management Volunteer Action Plan (2012)	▪ National Climate Change Adaptation Action Plan (2007)
External ▪ Risk assessments ▪ Budget provisioning	Federal ▪ Attorney General's Department ▪ Treasury and Finance ▪ Related external agencies, committees and subcontractors	▪ NEMP ▪ NERAG ▪ Federal Risk Management Policy (2014)	▪ *Natural Resources Management (Financial Assistance) Act 1992* ▪ Building Code of Australia
Organisational ▪ Risk assessments, business continuity planning ▪ Budget provisioning ▪ Planning – asset management	State and territory governments ▪ Related government departments and agencies ▪ Attorney General's Department ▪ Treasury and Finance ▪ Agencies and stakeholders	▪ NERAG ▪ *State Work, Health and Safety Act 2011* ▪ State Government Risk Policies and Guidelines ▪ State Building Codes and standards ▪	▪ State, regional and municipal adaptation risk assessments and plans ▪ State Government
External ▪ Risk assessment ▪ Budget provisioning	State and Territory governments ▪ Related government departments and agencies ▪ Attorney General's Department ▪ Treasury and Finance ▪ External agencies and stakeholders	▪ *Disasters Act 1982 (NT)* ▪ *Disaster and Management Act 2003 (Qld)* ▪ *Emergencies Act 2004 (ACT)* ▪ *Emergency Management Act 2004 (SA)* ▪ *State Emergency and Rescue Management Act 1989 (NSW)* ▪ *Emergency Management Act 2013 (Vic)* ▪ *Emergency Management Act 2005 (WA)* ▪ NERAG	▪ State building codes and standards ▪ Regional development plans (all states and territories) ▪ State, regional and municipal adaptation risk assessments and plans

Key actions	Institutional owner and key agencies	Key primary instruments	Related instruments
3. Planning and readiness			
▪ Organisational ▪ Risk assessments, business continuity planning ▪ Planning – asset management	Local Government ▪ Associated agencies, committees and subcontractors	▪ *Local Government Act* (all states) ▪ Emergency Management Acts as detailed above (all states and territories ▪ Standards and guidelines for mitigation activities such as pile burning	▪ National Sustainability Framework for Financial Reporting and Asset Management Approach to Asset Planning and Management (2007)
▪ External ▪ Risk assessments ▪ Budget provisioning	Local Government ▪ State Government bodies, committees and associated agencies	▪ *Local Government Act* (all states) ▪ Emergency Management Acts as detailed above (all states and territories) ▪ Standards and guidelines for activities related prescribed burning	▪ State, regional and municipal Adaptation risk assessments and plans ▪ Heatwave plans (Local Government Vic) ▪ Regional Development Plans (all states and territories) ▪ National Sustainability Framework for Financial Reporting and Asset Management Approach to Asset Planning and Management (2007)
▪ Risk assessments, business continuity planning	Private industry ▪ Peak industry bodies ▪ Government (all levels) ▪ The Community Business Partnership	▪ NEMP ▪ ISO/AU:NZ Standards ▪ Standards and guidelines for activities related prescribed burning	▪ State and regional adaptation plans (all states and territories) ▪ Building Code of Australia ▪ Industry Innovation and Competiveness Agenda (2014) ▪ Vendor agreements ▪ Common law acts
▪ Preparation and management of private properties and assets in relation to possible natural hazard events ▪ Local volunteer organisations training and information provision ▪ Development of hazards management plans, e.g., evacuation plans for fire	Civil Society ▪ The Community Business Partnership ▪ Local Government ▪ State government volunteer based agencies such as CFA, SES	▪ National Disaster Resilience Framework 2009 ▪ Local and state fire management and response plans ▪ Trusted Information Sharing Network ▪ Standards and guidelines for activities related prescribed burning	▪ State and regional adaptation plans (all States and Territories) ▪ Building Code of Australia ▪ Vendor agreements ▪ AS 5037—2005 Knowledge Management standard

Key actions	Institutional owner and key agencies	Key primary instruments	Related instruments
4. Risk modification			
▪ Mitigation activities ▪ General infrastructure spending ▪ Transfer risk by purchasing insurance	Federal, state and local governments ▪ Insurance bodies (ICA, VMIA) ▪ Infrastructure Australia ▪ Regional Development Australia	▪ National Disaster Resilience Framework (2009) ▪ Critical Infrastructure Resilience Strategy (2010) ▪ National Strategy for Disaster Resilience (2011)	▪ Building Code of Australia ▪ Adaptation activities all states and municipalities (e.g., Victorian Adaptation Sustainability Partnership Fund) ▪ *Natural Resources Management (Financial Assistance) Act 1992*
▪ Risk transfer through buying insurance ▪ Mitigation activities ▪ Invest in management of mitigation activities related to resilience building	Private/Industry ▪ Federal, state and local government ▪ Peak bodies ▪ Australian Building Codes Board ▪ Australian Business Roundtable for Disaster Resilience and Safer Communities	▪ National Strategy for Disaster Resilience (2011) ▪ State building laws, standards, regulations, codes (all states) ▪ NEMP	▪ Building Code of Australia ▪ State and regional adaptation plans (all states and territories) ▪ Coastal Protection Plans (WA, Tas, Vic, NT, Qld, SA) ▪ Vendor agreements ▪ ISO/AS:NZ standards ▪ Warranties
▪ Risk transfer through buying insurance ▪ Mitigating activities	Civil Society ▪ Australian Business Roundtable for Disaster Resilience and Safer Communities ▪ EMA ▪ Insurance and finance companies	▪ National Strategy for Disaster Resilience (2011) ▪ Local and State Government planning requirements (all states and territories) ▪ NEMP	▪ Vendor agreements ▪ Adaptation activities (all states and municipalities)
▪ Land use planning ▪ Building regulations	Federal, State and local governments ▪ Local Government and Planning Ministers' Council ▪ Regional Development Australia ▪ COAG ▪ Relevant peak bodies from the construction and building industries	▪ All government planning policies, plans, strategies and regulations ▪ Building Code of Australia ▪ State building laws, standards, regulations, codes (all states) ▪ Regional Development Plans ▪ Critical Infrastructure Resilience Strategy 2010	▪ Precinct planning (all Local Governments) ▪ State, regional and municipal development plans

Key actions	Institutional owner and key agencies	Key primary instruments	Related instruments
5. Relief and recovery arrangements			
▪ Provision of funds ▪ Relief and recovery funding policies ▪ Monitor and review	Federal Government ▪ State and local government, private industry and business and civil society ▪ Research Bodies ▪ COAG Committees and councils	▪ Provide recovery funding through the NDRRA ▪ Provide relief funding through the AGDRP ▪ NPANDR & NEMP ▪ COMDISPLAN (2014) ▪ NATCATDISPLAN (2010)	▪ Cabinet Implementation Unit Toolkit, 5: Monitor Review and Evaluation 2013 ▪ *Work, Health and Safety Act 2011* ▪ *Public Governance, Performance and Accountability Act 2013* ▪ *Natural Resources Management (Financial Assistance) Act 1992*
▪ Funding and financing of recovery ▪ Development of EM recovery plans ▪ Utilise Australian Government recovery funding ▪ Monitor and review	State Government ▪ Department of Treasury and ▪ Finance, Department of Premier and Cabinet (all states) ▪ Associated agencies (NFP, NGO, CFA, SES)	▪ NDRRA ▪ NPANDR & NEMP ▪ State Emergency Management Recovery plans	▪ Guidelines and reporting requirements for expenditure (all states and territories) ▪ Work, Health and Safety ▪ Act 2011
▪ Funding and financing of recovery ▪ Development of EM recovery plans ▪ Utilise Australian Government recovery funding ▪ Monitor and review	Local government ▪ Financial and Insurance bodies ▪ Australian Business Roundtable for Disaster Resilience and Safer Communities ▪ Federal Government ▪ EMA ▪ CFA, SES	▪ NDRRA ▪ NPANDR & NEMP (applies to the resilience building). ▪ Local Emergency Management Recovery plans ▪ Community Business Partnerships	▪ Reporting requirements for expenditure and grant acquittals ▪ National Sustainability Framework for Financial Reporting and Asset Management Approach to Asset Planning and Management (2007) ▪ *Work, Health and Safety Act 2011*

ATTACHMENT D: SNAP-SHOT OF INSTITUTIONAL RISK OWNERSHIP OF VALUES AT RISK FROM NATURAL HAZARDS

(Young et al., 2015 p26)

Functional area	Current risk ownership status
Building and maintaining resilience	Resilience-building is in early development: ▪ Within government, general allocation of broad areas of accountability, but lack of clarity as to accountability and responsibility for implementation. ▪ Private and business and civil society ownership primarily through provision of services such as insurance and housing improvements, e.g., hail-resistant roofing. ▪ Complementary ownership in other areas such as the climate adaptation agenda. ▪ Key barriers to establishing ownership are multiple owners, lack of clarity about what resilience is and uncertain goals.
Mitigation	Mitigation supports resilience, but investment in mitigation is dwarfed nationally by recovery payments and insufficient to enable risk owners in some areas to fully achieve mitigation tasks: ▪ Well-allocated risk ownership for built assets and infrastructure particularly through: o Planning and building regulation initiatives. o Flood and bushfire mapping at local and state level. o Insurance. ▪ Lack of clarity in other public areas regarding ownership of risk mitigation (e.g., community and environment). ▪ Limited ownership at household and small business scale, but improving for fire, flood, heat and cyclone (e.g., build back to regulation established for damaged pre-regulation buildings). ▪ Ownership of mitigation in natural areas primarily at state and local government levels. Actions limited but include fuel reduction burning, levees and environmental flow management. ▪ Many gaps remain as to who should own various aspects of risk mitigation in order to obtain the greatest benefits possible. ▪ Limited dedicated finance for mitigation at local government and community scale.
Plan and prepare	Plan and prepare has established ownership at all levels of state and local government, but it is not always taken up in other institutions: ▪ Accountability in this area falls mostly to state, territory and local governments. ▪ Management is often through state government, statutory bodies and associated state agencies, local government and volunteer organisations. ▪ Risk assessments and planning being undertaken at all levels of state and local government, and natural resource agencies. ▪ Property-scale management plans (e.g., bushfire, cyclone, and flood) mandated by planning overlays in some areas, but many gaps remain exposing civil society, private industry and business. ▪ Disaster plans include environmental assets, but capacity to deal with severe events limited by resources.

Functional area	Current risk ownership status
Early recovery **1–2 months**	Allocation of risk ownership clear at most government levels, but less for civil society and private industry and business: ▪ Government payment and financing responsibilities clearly established, but currently under review. ▪ Unclear as to accountability and responsibility in industry and business, and civil society, except in areas of structured volunteer activities with organisations such as CFA, SES and community groups. ▪ Both public and private critical infrastructure providers have clearly defined responsibilities for business continuity to ensure service provision. Environmental assets are usually assessed in the context of safety rather than recovery, so recovery can remain unowned in areas.
Medium term recovery **2 months – 2 years**	Ownership of the medium-term recovery is variable, but generally reasonably defined for government: ▪ Government payment and financing responsibilities clearly established, but currently under review. ▪ Local government have the primary responsibility of management in the local context with state government having accountability, but less responsibility. ▪ Civil society and private industry and business have less well-defined accountabilities and their capacities are not well understood. It is unclear how consistent the ownership of volunteering is over time. ▪ Some areas of civil society lack resources, even if recovery is identified as a need, and may not always be able to fulfil the obligations of risk ownership. ▪ No clear ownership of funding for environmental recovery.
Long term recovery **2–7 years**	Risk ownership in all areas unclear: ▪ It is not clear who "inherits" cumulative long-term losses, but it is likely that areas of local government, industry and business and civil society may be the default owners in this area. ▪ Ownership of the management of long-term risk is unclear but it is likely that areas of local government, industry and business and civil society may ultimately be responsible. ▪ Social and environmental assets and infrastructure do not appear to have risk ownership allocated for long-term response as current risk profiles are often shorter term. ▪ Aspects of long-term recovery in areas of health and community well-being may have unacknowledged owners in all levels of government through flow-on impacts in areas such as unemployment and health. ▪ Lack of ownership of long-term response for environmental assets and infrastructure makes this area particularly vulnerable.

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