bnhcrc.com.au

bushfire&natural HAZARDSCRC

UNDERSTANDING VALUES AT RISK AND RISK OWNERSHIP WORKSHOP SYNTHESIS REPORT

Celeste Young, Roger Jones and John Symons

Victoria Institute of Strategic Economic Studies (VISES), Victoria University

VICTORIA UNIVERSITY
MELBOURNE AUSTRALIA

Version	Release history	Date
1.0	Draft for end user review	30/03/2016
1.1	Draft for participant review	12/04/2016
1.2	Edited for review	22/05/2016
1.3	Final edit	03/06/2016
1.4	Final	30/06/2016

Australian Government
Department of Industry, Innovation and Science

Business Cooperative Research Centres Programme

Disclaimer:
The Victoria Institute of Strategic Economic Studies (VISES), Victoria University and the Bushfire and Natural Hazards CRC advise that the information contained in this publication comprises general statements based on scientific research. The reader is advised and needs to be aware that such information may be incomplete or unable to be used in any specific situation. No reliance or actions must therefore be made on that information without seeking prior expert professional, scientific and technical advice. To the extent permitted by law, the Victoria Institute of Strategic Economic Studies (VISES), Victoria University and the Bushfire and Natural Hazards CRC (including its employees and consultants) exclude all liability to any person for any consequences, including but not limited to all losses, damages, costs, expenses and any other compensation, arising directly or indirectly from using this publication (in part or in whole) and any information or material contained in it.

Publisher:
Victoria Institute of Strategic Economic Studies, Victoria University and Bushfire and Natural Hazards CRC

ISBN: 978-1-86272-713-7

June 2016

Citation: Young, C.K., Jones, R.N. and Symons, J. (2016) Understanding Values at Risk and Risk Ownership Workshop Synthesis Report, Victoria Institute of Strategic Economic Studies, Victoria University and Bushfire and Natural Hazards Cooperative Research Centre, Melbourne.

VISES Climate Change Working Paper No. 29

Cover: Big Stock Photos

Acknowledgements: We would like to thank Greg Christopher, Chris Irvine, Ed Pikusa, Collin Muller, Patrick Schell, Christine White, Liam Fogarty, Michael Rumsewicz, Vaia Smirneos, Darren Coughlan, Andrew McLeod, Helen Thompson, Margarita Kumnick and Cathy Tambakis for their support in organizing and running these workshops. All the participants who attended and contributed their time and knowledge to these workshops. Liam Fogarty and Ed Pikusa for their thoughtful contributions during the writing of this report. Margarita Kumnick for proofing and review.

TABLE OF CONTENTS

REPORT SUMMARY

'No matter how you define success, you will need to be resilient, empowered, authentic, and limber to get there.'

Joanie Connell, Flying Without a Helicopter: How to Prepare Young People for Work and Life (2014)

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. Most climate-related natural hazards, and the number of people living in hazard-prone areas, are increasing – raising the potential of future, unmanaged risks. Deficits in important social and environmental values could arise if they are not 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 a risk is **unowned**, these values may be more likely to be damaged and degraded, or lost.

Values underpin the foundations of decision-making and shape 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 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, are placing many of these values at greater risk. This is driving the need to ensure effective management by better understanding which values are most vulnerable, their worth and the risks that threaten them, and identifying who has ownership of these values at an institutional level.

This report provides an analysis of four workshops and supporting research for the project *Mapping and understanding bushfire and natural hazard vulnerability and risks at the institutional scale*, undertaken for the Bushfire and Natural Hazards Cooperative Research Centre (BNHCRC). These workshops were designed to provide a basis for testing work to date and for identifying key components needed for the development of the final outputs for this project.

The workshops were undertaken in Victoria, Tasmania, South Australia and New South Wales and developed in collaboration with our end users. They were designed to explore preferences in decision-making that relate to values at risk and current understandings of risk ownership. We also wanted to test the Draft Values at Risk Map developed by the project as a research tool, to determine the best future use for this output.

Key questions for these workshops were:

- How are the values at risk represented in the draft maps currently understood? What other values should be represented in the economic geography and how?
- What types of decision-making structures apply when incorporating values at risk into the 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?

Key decision-making areas that related to the identification of values and risk ownership were selected for the workshop exercises. These areas were assessed using five institutional categories – **local**, **state** and **federal** government, **business and industry**, and **community** – and four value categories – **built infrastructure**, **social**, **environmental**, and **economic**. Three risk scenarios covering **fire**, **flood** and **heatwave** were investigated.

Scenario-based planning exercises across **short (2–12 months)**, **medium (1–2 years)** and **long-term (2+ years)** timeframes were also applied to assess strategic decision-making and to identify potential gaps.

Because of the focus on decision-making preferences, the outcomes contained within this report are qualitative and reflect the understandings of the workshop participants. They do not represent a quantitative risk analysis based upon calculated risk measures.

Key findings with respect to identification of values and allocation of institutional ownership were:

- The highest total allocations across all hazards were to the social (43%) and economic (23%) value categories. Built infrastructure and environmental value categories had equal allocations of 17% (see Figure 1).
- Community was allocated the highest ownership of values in the social category and business and industry were allocated the highest ownership of values in the economic category.
- The social value category had the highest level of unowned values.
- The private sector was perceived to own 46% of values at risk identified, the public sector 53% and 1% of values were considered unowned (see FIGURE 1)

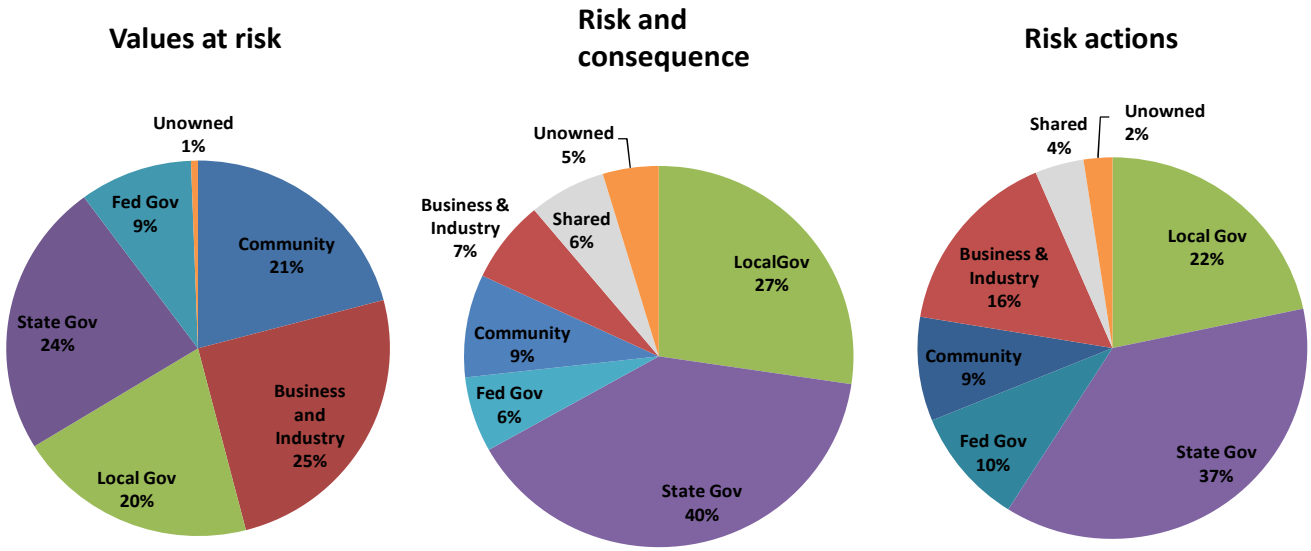


Figure 1: Allocation of institutional ownership across decision making areas.

The key findings relating to the identification of risk and consequences, and allocation of risk ownership were:

- The social values category had the highest level of allocated risks and consequences (41%), economic (25%), environmental (21%), and built infrastructure (13%).
- Public sector institutions were allocated 73% ownership of risk and consequences, and 69% ownership of risk actions relating to the values selected (see Figure 1).
- Knowledge gaps across long-term strategic horizons (2+ years) were found in relation to mapping and identifying risks and consequences, and allocation of risk ownership – particularly for the flood and heatwave hazards.
- The social values category had the highest allocation of unowned risks and values.
- The risk and consequence area had a higher allocation of unowned risks, compared to values at risk and the ownership of actions.
- Specific allocation of accountability, responsibility and payment was found to be particularly difficult and, at times, contentious.

State government and local government had the highest allocations of ownership for both risk and consequences and actions in all workshops. The lack of formal governance and resource limitations in local government identified in previous research (Young et al. 2015b) makes this an area of concern.

When allocating risk ownership, the following were found to be important:

- The need to understand not only *who* is allocated ownership, but *what* it is allocated for, *how* it is allocated, and *if* the allocated responsibilities can be fulfilled.
- The targeted allocation of risk ownership needs to be supported by clear process structures, skilled facilitation and be given sufficient time for effective outcomes to be achieved.
- Ascertaining community values requires stakeholders with diverse expertise and experiences to fully represent the different values and agendas that make up the community.

Data availability and quality was also a major theme during the workshops and was highlighted as a key area where support and capacity building is needed. Particular needs related to:

- selection of data
- lack of specific data
- how to maintain and ensure quality of data, and
- integration of data and data use.

Social data, particularly mental health data and data relating to vulnerable communities, was identified as a key need by workshop participants.

Discussions with end users during and following the workshops have identified interest in a process where they can explore sense making of data in a research setting. The conclusion reached was that the Values at Risk Map could add value as a testing tool to see how different data layers could be represented and integrated. The purpose of this would be to apply successful outcomes to tools that are already in use or in development, in the Emergency Management Sector (EMS).

The findings from these workshops indicate potential imbalances with current public and private sector arrangements between ownership of values and ownership of risk. Further research is needed to clarify if the workshop findings reflect the real levels of private/public ownership. It is also important to ascertain what a more sustainable balance of public/private ownership might be in relation to future resilience. The workshops have also highlighted the importance of including intangible values in strategic decision-making contributing to natural hazard risk management and the need to develop tools, methods and processes to enable this.

For the purpose of these workshops, boundary organisations, such as not-for-profit (NFPs) and non-government organisations (NGOs) and peak bodies, were allocated to the community category. It is suggested that in future, due to their unique function, boundary organisations should be allocated a separate institutional category when assessing risk ownership.

'You have talked about all sorts of risk, intangible risk, systemic risk, linear risk, so when you talk about bushfire risk, how do we know what you mean?'

Community member question to DELWP Panel, Montrose Bushfire Symposium 2015.

To build resilience at the institutional scale, consistency in understanding longer-term strategic thinking and risk ownership is needed to enable and support the transformation of current systems and processes. This requires a common understanding of what natural hazard risk is and how it works. Natural hazard risk is not a single risk, and requires a more systemic understanding; in particular, how different areas of risk interact across values and different timeframes. This makes risk ownership a dynamic space where drivers, contexts and ownership can change abruptly. Risk contagion across different hazard and geographical areas and the breaching of capacity thresholds are two of the key ways that this can occur.

Effective long-term planning, preparedness and recovery require:

- Robust risk cultures across communities and public and private organisations.
- Organisational flexibility and responsiveness and the frameworks to support this.
- A willingness to work with what is unknown and to accept that there is no one perfect solution or answer. To ask 'what if' rather than state 'what is'.
- An understanding of current perceptions of how success, failure and risk appetites can impede progress.
- The development of values-based decision making and governance.
- Skills development, communication and education.

Further work is needed to build more connected and robust institutional and organisational arrangements. It is also important to develop new skills and knowledge in both public and private sectors, to enable more effective management of natural hazards.

These workshops explored preferences concerning values and risk ownership in strategic decision making. They have identified cultural, political and organisational barriers facing those in different public and private organisations in relation to these areas. More importantly, they have highlighted the opportunity for transformation. This will require targeted resources, community engagement and long-term policy and investment to support the changes needed across society to manage these risks more effectively.

Risk ownership of natural hazards has traditionally been focused in the area of effective response, administered primarily through command and control mechanisms. However, the changing nature of natural hazards and the socio-economic context in which they occur is leading to the emergence of new and different types of risks. The need for community, businesses and government to build greater resilience to these risks requires a different focus; one that goes beyond the event and builds greater capacity in all areas of our society. Strategic decision-making provides a bridge between the present and the future; one that can help us act decisively and collaboratively in the present, whilst thinking and planning ahead. It is a crucial factor for our governments, businesses and communities, if we are to prepare and effectively respond to natural hazards in the future.

1 BACKGROUND

1.1 THE PROJECT

This research project aims to address the issues outlined above by investigating vulnerability and risks to natural hazards on a range of scales. It is looking at institutions involved in natural disasters, and assessing how their specific values and rules interact with the broader values affected by natural disasters. It is also exploring the issue of risk ownership across institutions and examine the role it plays in the management of these risks.

The aims of the project are to develop:

- An economic geography of values at risk to assist decision makers to better identify areas of vulnerability, and
- A processed-based framework to assist the development of governance around risk ownership of values at risk.

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

The focus is on long-term strategic decision making prior to, and following, natural hazard events, and the implications for mitigation, resilience and long-term recovery. The findings in this report are being analysed using social science, quality assurance and risk-based methods. They are also being considered in context of the latest *National Emergency Risk Assessment Guidelines* (NERAG) (Australian Emergency Management Institute 2014), the key national guidance document for decision making in relation to risk assessment in the EMS. It provides a framework that aims to develop a common understanding of risk assessment and management of natural hazards across Australia in the EMS, and a foundation on which it can build.

The final goal of this project is to provide supporting material to the NERAG in the areas of risk ownership, understanding of strategic risk, protection of intangible values and vulnerability assessment.

1.2 RISK OWNERSHIP

As the nature of our society and the risks it faces is changing, so is our understanding of how these risks are being owned, and perhaps should be owned.

Risk ownership is not a new concept, but understanding and application in this area has been changing over the last decade, particularly in business and financial areas. This has been influenced by events such as the global financial crisis and a series of natural hazard events, such as the 2011 floods in Thailand and Cyclone Katrina. Locally, the Black Saturday bushfires and 2011 floods highlighted how externally-driven disasters can have a knock-on effect into more conventional areas of the economic system. Hindsight has also shown that the social and environmental costs from these types of risk are often not fully understood or able to be accounted for.

We define risk ownership as coming from two perspectives: asset ownership and risk management (Jones et al. 2015; Young et al. 2015b). This is illustrated by the following two definitions:

1. '… a person or entity that has been given authority to manage a particular risk and is accountable for doing so' (ISO 2009).
2. '… the alignment of risk ownership with assets: asset owners are generally best placed to manage risks to their property'(Productivity Commission 2014).

The most common ways of allocating these types of ownership is through the ownership of the asset, funding or finance, or the process of managing the risk itself (Young et al. 2015b).

Specific ways of allocating ownership include:

- In relation to a hazard, specific authorities and agencies are charged with managing bushfire risk, while 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.

How risk ownership is allocated to event response is relatively clear, but the allocation of risk ownership to strategic areas of planning and to activities that precede and follow hazard events, is unclear. A further complication is that mitigation and resilience activities often require high levels of collaboration, and the responsibility for these activities can be owned by multiple parties in different ways. For activities to be successfully sustained, adequate distribution of resources across multiple timeframes is needed (see FIGURE 2). We have found many areas of ownership relating to the strategic management of natural hazard risks are currently ill-defined, especially those concerning resilience and long-term recovery (Young et al. 2015b).

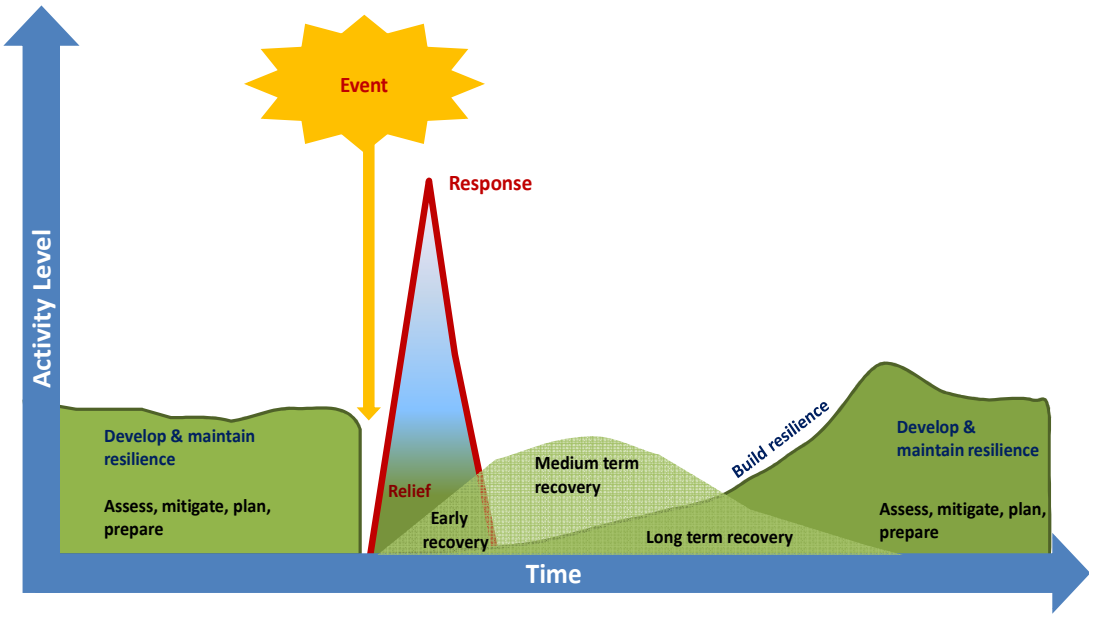


Figure 2: Projected resource requirements for effective integrated natural hazard risk management tasks across time scales (Young et al. (2015b) adapted from AEMI (2011)).

The basis of determining risk ownership is established through understanding what forms of governance and approaches are most suited to the nature of the particular risk and the context in which that risk exists. All risks exist in a system where they are interrelated – an impact on one area

of risk can impact on other areas (see FIGURE 3). It is important to understand how the different risk types associated within this system and their interactions can effect an institution, organisation or community.

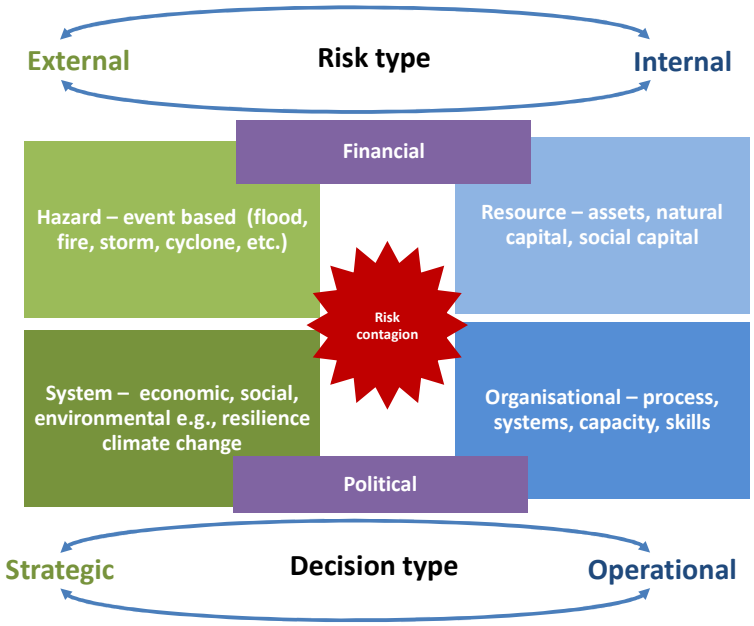


Figure 3: Risk system with internal and external components (adapted from PWC (2013) and Kambil et al. (2005)).

Ascertaining whether the risk is external or internal to the organisation can also assist risk owners to better understand where they have the most agency to act. It can also help to determine *how* a risk can be managed and *if* it can be managed. It is particularly important to ascertain if the owner or entity is capable of fulfilling the ownership role allocated, and the following areas need to be considered:

- the capacity and skills of allocated owner/s
- resources available to address the risk
- key connections the primary owner depends on to deliver outcomes
- identified interdependencies between the different values and areas of risk and the possibility of contagion from one risk area to another, and
- the nature of the systems (social, environmental and economic) that surround the risk.

Internally-based risks are more likely to have limited impacts within a defined system, and are more amenable to controls by risk owners. The effectiveness of these controls often determines the ability of institutions, organisations and communities to manage impacts of externally-based risks. Effective management of these internally-based risks is a key part of building organisational resilience and the ability to proactively respond, rather than react, to an event in 'damage control'.

Externally-based risks are often beyond the control of any single institution. They are often systemic, highly dynamic and can have multiple owners. The boundaries of these risks are often unclear, spanning multiple areas and timeframes. They can be prepared for, but not predicted, and because of the high level of uncertainty regarding the future, often have unanticipated outcomes.

Natural hazard risks also need to account for internal and/or external political and financial risk. The internal aspects of these risks will influence perceptions and decision-making at individual and institutional scales. External risks arise from external policy and financial markets that can influence the level of risk different parties are exposed to.

1.2.1 The dynamic nature of risk ownership

As different types of risk and geographical contexts are often interrelated and exist in a dynamic system, risk ownership can change abruptly. Two of the key ways this can happen are as a result of:

- risk contagion, and
- the exceedance of capacity thresholds.

'Risk contagion' is a term most commonly used in relation to financial risk and describes how financial shocks travel through an economic system and can 'infect' other areas of the economy. Impacts are seen to spread across geographical and institutional borders 'like a contagious disease' (Bordo and Murshid 2001), creating a cumulative effect far larger than the initial event. This type of systemic understanding of risk is well understood in the natural hazard literature through catastrophe risk (Hewitt and Burton 1971; Burton et al. 1993) in areas of social and environmental systems. However, the idea of risk contagion has recently started to emerge in business models as a way of understanding how different areas of risk can be affected by strategic risks. This is particularly relevant to the natural hazard area where risk ownership can be allocated through the risk type.

Risk contagion can also be a useful way to understand how risk ownership can change as natural hazards can spread through and across systems. One example is the 2011 Thailand floods that, due to the disruption of key supply chains, became a risk for many companies globally, resulting in profound financial impacts in some industry sectors (Haraguchi and Lall 2015). This type of contagion can resonate over long-term timeframes if the damage incurred is not addressed. If identified and treated in advance, the knock-on effect for long-term secondary and tertiary impacts can be reduced.

Another aspect associated with changing risk ownership is the breaching of capacity thresholds (environmental, social or economic) (Jones et al. 2013) where the original risk owner will transfer the responsibility of the risk to another owner (either by a prior arrangement or by default), because they lack the capacity to address or manage the risk. An example of this is the 2009 heatwave in Victoria that exceeded the coping capacity of the health services resulting in an estimated 374 excess deaths. Many agencies that were outside of the normal health sector networks became involved with the event due to health agencies being unable to meet the demands created by this event.

In terms of risk ownership, identifying whether the nature of the risk is changing through contagion or capacity exceedance is important, as this determines how the ownership may be transferred or where risks may become unowned. It can also help identify potential areas of vulnerability.

1.2.2 Complexities associated with risk ownership

The workshops reinforced areas previously identified by Young et al. (2015b), about the complexity of risk ownership. Key observations in this area were:

- **Lack of clarity in relation to how shared ownership should be defined, and the governance structures most appropriate for these sorts of collaborative arrangements**. This was a consistent theme across all workshops, in particular how you establish accountability in these circumstances. A key focus of our research is to clarify this area.
- **The role of boundary organisations and what this means in relation to institutional ownership**. Boundary organisations have an increasingly crucial role to play in the disaster management process, particularly in relation to recovery, areas of resilience and capacity building in communities. For future analysis, it would help the allocation of risk ownership to create an extra category for this group to not only make their role more visible, but also to understand how their role is evolving over time in relation to the management of natural hazards.

- **Local level identification of what values are at risk and identification of risk and how this can be used effectively in higher levels of decision making.** There was a general theme in many of the groups as to how you can develop and include 'neighbourhood-level knowledge and ownership' into state-level decision making in a way that is sustainable.
- **Lack of understanding and different understandings of natural hazard risk across different agencies and communities.** Different understandings as to the nature and level of risk faced and the need to develop common understandings across multiple sectors was raised in all groups.
- **Allocation of risk ownership did not necessarily lead to active uptake of risk ownership.** A number of challenges were identified in this area, in particular, the need for better techniques to improve engagement and understanding across agencies and communities. Better understanding of available resources in some areas was also mentioned. Participants also articulated that the expectation in the community of where the responsibility lies with others was a major challenge; it was felt that this was often supported by current formal and informal arrangements.
- **The contentious nature of allocating risk ownership accountability (e.g., who is responsible, who is accountable, and who pays?)** Allocation of risk ownership was particularly contentious and needed clear structures, appropriate time and negotiation to achieve outcomes.

1.3 UNDERSTANDING VALUES AND THEIR RELATIONSHIP TO DECISION MAKING AND RISK OWNERSHIP

'If we do not recognise the fundamental difference that exists between price and value, then we are doomed.'

Sylvain Raynes, Financial Analyst

Values are 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.

Values can be determined by different levels of society and shape how these different areas of society prioritise what is important to them. These different levels can include the following groups (adapted from Jones et al. (2014)):

- individual
- group – communities, organisations, and
- institutional.

Two main areas of values that influence decision-making are values internal to an individual, group, organisation or institution, and the external values that surround them. Internal values make up the psychological and behavioural landscape of those involved in making decisions. These are social and cultural norms that provide the lens through which people and organisations interpret and prioritise what is important to them and how they perceive risk. The interaction between the different components of internal and external values and the natural hazard risks are the key components that shape what decision is made and why (see FIGURE 4).

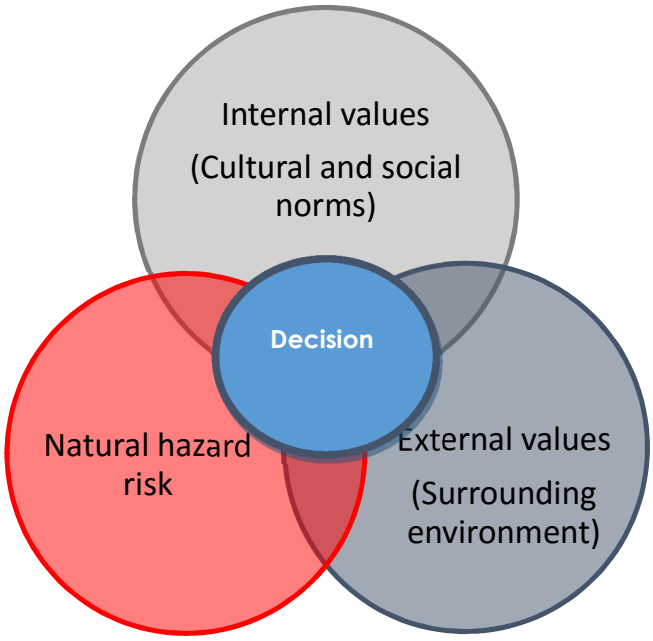


Figure 4: Different value and risk components in relation to decision making.

1.3.1 Complexities associated with values

Participants identified a number of complex areas associated with identification and use of values in decision-making. Key observations were:

- **Values are subjective in nature and defined by who is doing the valuing.** This was particularly apparent across different scales of decision-making. For example, a community level appraisal of what is valuable can be different to a higher level government appraisal.
- **Representation of values that are intangible in the decision making process is difficult.** Decision makers do not currently have sufficient tools or methods to be able to effectively quantify intangible values, particularly in the social and environmental areas. This can often cause barriers to building business cases to support the longer-term investment or the protection needed in these areas. It also makes it difficult to ascertain what the actual cost of trade-offs between different values is.
- **Values exist within a system but are often assessed as individual components.** A primary value is often identified as important and protected without the values that it depends upon being identified. As a result, value can inadvertently be placed at risk if one of the supporting values is damaged. It also means that areas of vulnerability are not always clearly identified before the vulnerability becomes apparent.
- **What is of value can change.** Because all values exist within social, environmental and economic contexts, what is of value can change as these contexts change.
- **Shared ownership of complex values can be difficult to allocate, particularly if the value is intangible.** Complex values, such as resilience and wellbeing, require identifying specific components of the value and allocating ownership for each of these parts.

1.4 UNDERSTANDING STRATEGIC DECISION-MAKING

Strategic decision-making is a critical aspect of building resilience and supporting the effective management of future natural hazards. The inclusion of resilience in policy and practice areas, and the need to reduce future expenditure on response, has highlighted the need for a more active focus on strategic long-term decision making to achieve these goals.

Understanding what strategic decision-making is and how it can be applied has varied across the different groups who have participated in the research process to date. Currently, emergency services practitioners understand the term strategic decision making in two ways:

- **Short-term decisions using previously collected strategic information during the response to an event.** These decisions relate directly to the event and the immediate impacts that may happen during or following the event.
- **Long-term strategic decision making in planning for resilience and mitigation, and for medium- and long-term recovery.** The timeframes for this project fall following the event: short-term (post event – 12 months), medium-term (12 months – 2 years), and long-term (2+ years).

The difference between the two areas of decision-making is that the response-based 'strategic' decision is a form of complicated decision-making. The timeframe for these decisions is generally shorter term, and is primarily in relation to minimisation of damage and containment of the event-based risk. It is often undertaken in what is commonly referred to as a 'command and control' mode.

The longer term planning outside of the immediate response to events requires collating information and analysing how this might influence and impact current and future activities. Due to the often uncertain and changing nature of the outcomes, this requires ongoing, reflexive operational frameworks where new learnings and feedback are incorporated as they emerge into current and future activities. This area of decision making is the current focus of our research.

1.4.1 Key types of decisions

'Unfortunately, in many companies, the CFO is handling financial risk, the CEO is handling strategic risk, and the COO is handling operational risk, but no-one is looking at all those risks as one.'

Jim Loucks, Chief Commercial Officer, Aon Risk Solutions

Long-term strategic planning of natural hazards is an emerging area of decision making in the EMS, and the required skills, structures and processes are evolving. The aim of the work we are currently undertaking is to develop materials to support practitioners and policy makers in this area of practice.

To do this it is important to understand the different requirements of strategic decision making, as it helps to define the different areas of decision making that are currently used. We have defined key types of decisions by adapting a model developed for adaptation by Jones et al. (2014). Decisions are categorised as simple, complicated and complex (TABLE 2 overleaf). Categorising decisions in this manner can help delineate how and where these decisions are used in practice, and the type of approaches that are most appropriate.

Type of decision	Simple	Complicated	Complex
Characteristics	Linear, actionable, can be solved with one solution. Often static risks with known treatments and outcomes.	Systemic, can be bounded but may require more than one solution to address. Will use a mixture of known and unknown treatments. Dynamic, but usually able to be stabilised over time.	Systemic, unbounded, multiple interrelated actions and solutions required to address the issue. The treatment will often evolve and change over time. Highly dynamic and unpredictable, high levels of uncertainty. Often high-impact low probability.
Example	A faulty piece of machinery.	Containment of a natural hazard event.	Climate change, resilience.
Actors	Individual to organisational – person(s) with allocated responsibility or the asset owner.	Collaborative – parties associated with, and effected by, the event. Shared ownership with delegated areas of responsibility.	Extensive collaboration – a 'whole of society approach'. Complex collaborative ownership that is shared across all areas of society.
Thinking frameworks	Logical, analytical, prescriptive and practical.	Short- to medium-term thinking, analytical, responsive. Predominantly prescriptive, but has intuitive elements that respond to changing circumstances.	Long-term, strategic, conceptual, lateral, analytical, creative, reflexive, continuous, flexible.
Leadership actions	Direct and review.	Consult, assess, respond and direct.	Consult, facilitate, empower and direct.

Table 1: Simple, complicated and complex decision making related to practical application (adapted from Jones et al. (2014)).

2 THE WORKSHOPS

This series of workshops were held during August 2015 in:

- Melbourne, Victoria, 7 August.
- Hobart, Tasmania, 13 August.
- Adelaide, South Australia, 21 August.
- Sydney, New South Wales, 28 August.

The workshops were developed by the team at VISES and supported by the BNHCRC and our stakeholders in each state. Their purpose was to explore, through a series of structured scenario exercises, how values and risk ownership are currently understood in relation to decision making. We also wanted to gain feedback of the newly developed draft Values at Risk Map to ascertain gaps in the values currently represented, and to define if there was a need to develop the map for use within the EMS.

Key questions were:

- 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?

2.1 THE STRUCTURE OF THE WORKSHOPS

A context paper (Young et al. 2015a) was developed prior to the workshops and circulated to the participants to ensure that there was a common understanding amongst participants attending the workshops of what was to be explored during the workshop and the key questions.

The activity process for the workshop is shown in FIGURE 5.

Figure 5: Key components of the workshop process.

The following workshop exercises were undertaken: (For the workshop agenda see Appendix 1 p. 59).

Exercise 1: Establishing understanding

Presentations were provided by the research team, local end users and key stakeholders to provide an overview of the research undertaken to date, and to frame it within the end user context. These presentations were then followed by a group discussion.

Groups of six to eight people were allocated a table host to guide them through the exercises. Each group was then provided with a scenario that described either a fire, flood or heatwave situation tailored to a familiar but fictitious setting (see page 66).

Exercise 2: Ascertaining values at risk

Participants were asked to map the social, environmental, built environment and economic values likely to be impacted by this scenario event. They were asked to think beyond the tangible values into intangible values such as connectivity and wellbeing. They were then asked to draw lines connecting where one value was dependent on another (supporting dependency). Two-way arrows denoted mutual dependency. They were then asked to list the institutional owners of the identified values. Finally, participants were asked to select what they would consider the most significant value(s) for the next exercise.

Exercise 3: Mapping risks to values and owners

Using the value(s) selected, participants were asked to consider the consequences across social, economic, environmental and hard infrastructure areas. They were asked to identify the risks and consequences that arose as a result of these across short-, medium- and long-term timeframes on the template provided. Finally, they were asked to allocate owners for the identified risks.

Exercise 4: Mapping owners of risk actions

Using a new template, participants were asked to reflect on the exercise they had previously undertaken and list activities that could be undertaken in the short- and long-term to mitigate the risks identified in the previous exercise.

In Victoria, participants were given a different template that focused on the recovery phase, and asked to allocate ownership in these areas according to the RAP criteria (who is Responsible, who is Accountable, and who Pays).

Exercise 5: Needs, barriers and opportunities

Each group was asked to identify needs, barriers and opportunities and consolidate key themes from the workshop.

To conclude the workshop, a brief summary discussion was facilitated by Prof Roger Jones.

Following the first workshop in Melbourne, some modifications were made to the process. Melbourne had the largest group of participants who found the complexity of the tasks tiring, which led to a reduced level of participation towards the end of the day. As a result, some of the exercises were simplified. We also felt that smaller groups offered an opportunity to explore the issues in more depth. The modifications included:

- Simplifying allocation of the risk ownership to institutions activity, removing the RAP criteria to identify the type of ownership.
- Selection of one value for Exercise 2, rather than four.
- Reframing the last exercise to explore preparation for recovery rather than focusing on recovery tasks following an event.

2.2 METHODOLOGY FOR ANALYSIS OF THE WORKSHOP DATA AND LIMITATIONS

The key aim of this analysis was to understand current strategic decision making in relation to the identification of values, risks (including impacts and consequences), ownership of values and risks and needs arising from these areas. A mixture of basic statistical methods and analysis were applied to synthesise the data obtained.

A statistical analysis was undertaken of all the values, risks and consequences and ownership areas. Each value and risk was allocated a value of 1, and categorised according to whether it was perceived as relating to economic, social, environmental or built infrastructure values.

Ownership was allocated to institutional owners covering the three levels of government, business and industry, the community, shared or unowned. In cases where risks and values were given more than one category, the primary area of allocation was selected for further analysis. In cases where no owner was selected or there was incomplete data, no allocation was given. As a result, this analysis does not constitute a quantified assessment, but is an assessment of what groups managed to complete in their allotted time.

A second categorisation subset category to the above values classes was used to assess how groups understood the systems that the values existed with, and to draw out how they perceived this working. These were:

- **Supporting values** – values that are pivotal for another value to be sustained. For example, telecommunications support the finance industry.
- **Dependent values** – these values are dependent upon other values for their existence. For example, ecotourism is dependent upon a healthy environment.
- **Mutually-dependent values** – these values are mutually dependent upon one another to be able to sustain their function.

During the analysis of the conversations and discussions, notes were taken and collated. Key themes and areas of interest were identified. The data collected during the needs, barriers and opportunities activity was also assessed to identify key themes and areas of interest.

Factors that limited the analysis of the data collected from the workshops include:

- The preferences and experience of participants who attended the workshops.
- The variation of skills of the participants on each table in relation to undertaking scenario exercises and strategic analysis.
- The limited time available for each exercise.
- The subjective nature of identifying values and risk.
- The first Melbourne workshop differed in format to the following three workshops.

These findings will contribute to the development of the institutional maps of risk ownership and the application of a process framework. It will also help identify further research needed to support decision making in the area of values at risk and risk ownership.

A summary and snap-shot of the individual state-based workshop findings can be found at Appendix 9 p. 93.

3 SYNTHESIS OF WORKSHOP FINDINGS

3.1 SNAP-SHOT OF KEY THEMES

3.1.1 Systemic risk

Understandings of systemic thinking and strategic decision making are evolving and skills in relation to these areas varied across groups. This is important because natural hazards occur in a dynamic system, so the risks associated with them and the values affected by them, are systemic. Drivers, contexts and impacts are connected and interact with each other – as a result, ownership can change abruptly, creating added uncertainty. The type of process used was a key influence on managing this area of uncertainty. The priorities of different values varied, depending on who was doing the valuing and what the context for valuation was. As these aspects are often dynamic and involve multiple stakeholders, common approaches to longer-term strategic thinking were found to be crucial for effective management.

3.1.2 Overview of different states

Each state has its own characteristic approach to governance, which has been developed over time in response to environmental and social contexts, and to the hazards experienced.

The diverse approaches used were found to have strengths and challenges. Participants from Tasmania, for example, reported low transaction costs involved with activities but lower capacity thresholds in relation to large events. South Australian participants reported a well-established top-down process, but some participants suggested that it might benefit from greater inclusion of non-EMS representatives in areas of decision making. Victorian participants reported a high level of innovation but also very changeable policy and organisational structures as the result of the 'all hazard, all agencies' reforms being undertaken. New South Wales reported a well-established process whose primary hazard focus is fire, and it was suggested that other hazard areas could benefit from further development.

Differences in workshop outcomes between the smaller and larger states raises the question as to whether the smaller states' more compact organisational arrangements have advantages for the implementation of resilience, and what this might mean in terms of arrangements within larger states.

3.1.3 Values and decision making

Two high-level classes of values elicited during the workshop were:

- **Complex values** that provide an umbrella for a group of values and encompass social, economic and environmental values (resilience, liveability, cohesion and connectivity).
- **Simple values** that, although part of a system, can be assessed as autonomous values for specific assessments (building costs, clean water supply).

These categories can be used to help understand the scope of assessment needed to value the costs and benefits of strategic actions, and select the most appropriate tools for the task.

A second categorisation into supporting, dependent and mutually dependent values were used to link the networks of values affected by each hazard-based scenario. Identifying these help to better understand the systemic nature of the hazard and to identify potential areas of 'contagion' or domain crossing. It is also useful for identifying possible areas of vulnerability, and where critical thresholds

may lie. This, in turn, can help the development of more comprehensive mitigation and treatment plans to protect values at risk.

Other findings in relation to values and decision-making were:

- The participating groups did not appear to have difficulty with the exercises in relation to the identification of values and mapping of dependencies.
- The values selected were diverse and many were complex.
- Social values were perceived to have the highest number of connections to other values.
- There is a high level of interdependency between values, particularly with values that have a higher level of complexity, for example, social cohesion.
- Hazards did not appear to be a key factor in the types of values selected.

3.1.4 Values selection and allocation of ownership

Key findings with respect to identification of values and allocation of institutional ownership to these were:

- The two primary types of values identified during these workshops were **complex** values and **simple** values.
- The highest total allocations were to social and economic value categories. Built infrastructure and environmental value categories had equal allocations of 17%.
- Overall, community was allocated the highest level of ownership from the social values category, and business and industry had the highest ownership allocation for economic values.
- Social values category had the highest level of unowned values.
- The private sector was perceived to own 46% of values at risk identified, and the public sector 53%.

Some values, such as resilience, contained multiple contributing values so were labeled complex values. These values, such as hospitals or livestock, need different assessment methods.

All groups were able to map connections between values. The type of connections selected, however, varied between groups, with the larger states (Victoria and New South Wales) allocating more highly to ‘mutual dependencies’.

The ownership of individual values at risk was often allocated more than one institution, and each allocation was listed separately. The total allocation of ownership to institutional categories were as follows: business and industry had the largest overall allocation of ownership with 25%, closely followed by state government (24%), community (21%) and local government (20%). Federal government had the least ownership with 9% of the overall allocation.

The highest ownership allocation to institutional categories differed across groups. State government received the highest allocation of ownership in New South Wales and Victoria, and local government received the highest allocation in South Australia.

The need to understand and incorporate social values more comprehensively into long-term decision-making was a key topic of conversation. Many participants felt they needed better data, tools, methods and processes to be able to achieve this effectively.

3.1.5 Risk and consequence identification and allocation of risk ownership

'People don't value what they don't understand, and I think some values and risks get dismissed because they are seen as too much hard work.'

Victorian Workshop Participant

This part of the workshop tested two different formats for allocating risk ownership. Key findings with respect to identification of risk and consequence and allocation of institutional ownership were:

- The public sector was allocated 73% ownership for risk and consequences, and 69% ownership for risk actions related to the values selected.
- Gaps were found in relation to mapping and identifying risks and consequences, and allocation of risk ownership across long-term strategic timeframes (2+ years).
- The social values category had the highest level of allocated risks and consequences, and unowned risks and consequences.
- Specific allocation of accountability, responsibility and payment was found to be difficult and, at times, contentious.

Shared risk ownership goes beyond contracts and legal boundaries because it is a collaboration across diverse stakeholders. The challenge lies in how you negotiate the relationships and manage the expectations that stem from this process, so that a common understanding and goal can be achieved.

Workshop attendees found shared ownership relatively easy to allocate but difficult (and at times contentious) to determine the different kinds of risk ownership contained within these arrangements. This was particularly apparent during the exercise where accountability, responsibility and payment were being allocated. Clarifying these arrangements was found to be crucial for the identification of risks where ownership may be transferred or unowned.

When allocating risk ownership, the following were found to be particularly important:

- The need to understand not only *who* is allocated ownership, but *what* it is allocated for, *how* it is allocated, and *if* the allocated responsibilities can be fulfilled.
- The targeted allocation of risk ownership needs to be supported by clear process structures, skilled facilitation, and given sufficient time for effective outcomes to be achieved.
- Given the different levels of understanding, there is a need to work towards a common understanding of what risk ownership means and how it can be achieved.
- Ascertaining community values requires stakeholders with diverse expertise and experiences to fully represent the different values and agendas that make up the community.

Most of the risks and consequences identified were in response to the fire scenario, which may indicate a need to develop capacity in other hazard areas. One opportunity is to identify areas of high expertise in specific risk areas within the EMS, and to leverage these to build capacity in other areas.

3.1.6 Data and decision making

'We are drowning in data but I am not sure we have figured out what to do with it or how we should be using it.'

NSW Workshop Participant

Appropriate high-quality data is the basis for evidence-based decision making, and the proliferation of new data tools across the EMS was a key theme across all workshops. Some participants did not feel that access to more data had necessarily resulted in greater clarity. Many discussions centred on the need to be able to identify useful data, and the importance of sense-making between very different types to enable better decision making.

Common themes that emerged during the workshops were:

- How to integrate different data sets to enable better strategic decision making.
- What type of data should be selected and what questions need to be asked to select this data.
- How to maintain data integrity through data collection and use.
- How data could be most clearly represented, communicated to, and used by, the broader community.
- Current data gaps, particularly in relation to social values and vulnerable communities.
- Scalability of different data sets.
- Difficulties in using economic data that related to intangible values (social and environmental) in current decision making.

New data tools are often developed on an ad hoc basis in response to an emerging need, so a general workshop suggestion was that overarching state level strategies may be needed to guide the development of these tools and their integration into the decision-making process. An additional point was that aggregated data does not always fully reflect the specific priorities and needs of smaller communities or groups. This raised the question of how to maintain visibility of important local level values and risks, when data has to be aggregated for higher level, state and federal government decision making.

Some participants also stated they found it difficult to integrate intangible values into expenditure decisions, particularly in the social and environmental areas. This was attributed to a lack of available data, tools and methods to support comprehensive evaluation.

Consultation during and following the workshop identified that the Values at Risk Map tool would be most useful for testing how to integrate different data sets so this could be applied to current tools being used or developed.

3.1.7 Community-led decision making

'We can't do this without our communities and know we can't just keep telling them what to do because that just doesn't work. We have to work it out with them and that takes time and lots of listening, a lot of patience and an acceptance that sometimes it is two steps forward and one back. This is not something we can realistically do in a 12-month program. We have to think about this in the longer term otherwise we are just setting ourselves up to fail.'

Tasmanian Workshop Participant

Engagement with communities and private industry to actively include them in the decision-making process was identified as a core function needed to support the uptake of risk ownership. Current activities identified as supporting this include: Victoria's recent release of the 'Community First, Safer

Together' policy, and Tasmania's Bushfire Ready Program – both of which aim to enable community-led decision making through different forms of engagement. A widely raised point was the importance of having realistic expectations of the time necessary for institutional and organisational structures and risk cultures to adjust to accommodate this.

3.1.8 Strategic decision making

'Planning is the pathway, but strategy provides the destination.'

Liam Fogarty, DELWP, Victorian Government

Strategic decision making is a skill, and during the workshops different levels of capability between the groups was observed. This way of thinking was unfamiliar to some practitioners, and was at times uncomfortable, so it was important to work through this discomfort as a part of the process.

The key findings in relation to strategic decision making were:

- There are gaps in relation to long-term decision making in the 2+ year category, particularly in some areas of risk.
- Participants found it easier to identify long-term actions and ownership through exercises when focused on actions-based activities rather than risk.
- There were different understandings amongst participants of what strategic decisions were.

Strategically-focused exercises directly related to risk identification were seen to be challenging for participants, resulting in patchy results, particularly regarding potential long-term risks posed by heatwave and flood. When exercises were focused on scenarios identifying risk management activities, however, the response was quite different, attracting higher levels of engagement. There is potential to test this further to identify how it can be used to enhance future decision-making processes.

Because different interpretations of what strategic decisions are and what they entail were raised during and after the workshops, it is important to develop a common understanding of these issues across the EMS.

3.1.9 Needs, barriers and opportunities

Communication, continuous learning and long-term policy and investment were articulated as being crucial needs for supporting further development of strategic management and risk ownership. Resistance to change, apathy, lack of incentives and support and short-term policy were considered to be key barriers.

Areas of opportunity identified for improvement across all institutions were: resource management and allocation; engagement and communication; and risk knowledge and risk cultures. The integration and use of new knowledge and data to support decision making across the vast array of stakeholders involved in the emergency management process was also seen as a key opportunity.

3.2 IDENTIFICATION OF VALUES AND ALLOCATION OF INSTITUTIONAL OWNERSHIP

Three exercises were undertaken by each group to examine how values, their connectivity to each other and their ownership, were understood and identified. This was undertaken using three different scenarios (see page 66), and focused on the following key decision-making points:

- identification of values in relation to allocated scenarios
- mapping of relationships between values
- allocation of ownership to values, and
- selection of priority value(s) for the next exercise.

Workshop outputs were recorded on specifically-designed templates that were then transcribed verbatim into spreadsheets. Where multiple institutional owners were identified for values, risks or consequences, these were allocated separately to each institutional owner. Shared ownership was not allocated unless it was specifically specified. Ownership was not allocated to all possible values because of time limitations. As a result, these findings do not accurately represent levels of shared ownership – rather, they show preferences for how participants chose to select their ownership.

The outputs were analysed for each workshop and across all workshops. A basic statistical analysis of value selection, institutional ownership categories and connectivity between values, was conducted. Values were also assessed in relation to hazard type, but as there were no consistent patterns across workshops, hazard type had little impact on which values were selected.

The key findings were:

- Social values were the predominant value group identified.
- Groups did not appear to encounter issues with allocating ownership to most values.
- Connectivity between values had the most allocations across all the workshop exercises with 1,030 allocations made for the four workshops.
- Mutual dependency between values was the most common form of connectivity allocated.
- Energy infrastructure had the highest number of connections with 18 supporting dependencies. Other single values that had a high level of connectivity included, community functioning (17 allocations), resilience (14 connections) and employment (11 allocations).
- Aggregated ownership results show business and industry was the single largest owner of values (25%) and state government the second largest (24%).
- Ownership by community and business and industry (46%), made up nearly half of the allocations.

3.3 IDENTIFICATION OF VALUES AT RISK

In total, 330 individual values were identified across the four categories of social, environmental, economic and built infrastructure values. Social values were identified in 46% of allocations, economic values (23%), and built infrastructure and environmental values both had an overall allocation of 17% (FIGURE 6).

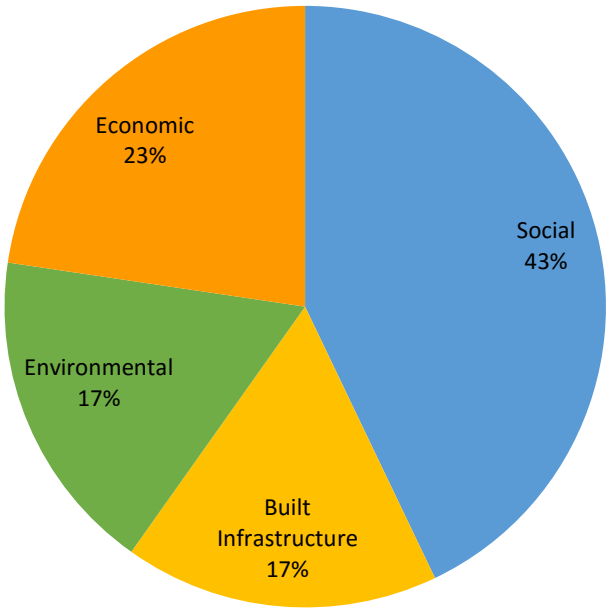


Figure 6: Allocation of values at risk to value categories – all workshops.

Allocations across the different workshop groups showed social values had the highest allocations varying between 34–46%. Tasmania, South Australia and New South Wales all had economic values as their next largest category, with allocations between 20–33%. The environmental value group varied between a 12% allocation in Tasmania where it was the lowest value group, to between 18–20% in the other states. Built infrastructure had the lowest allocations (13%–17%) in all states except Tasmania, which allocated 21% to this category (FIGURE overleaf).

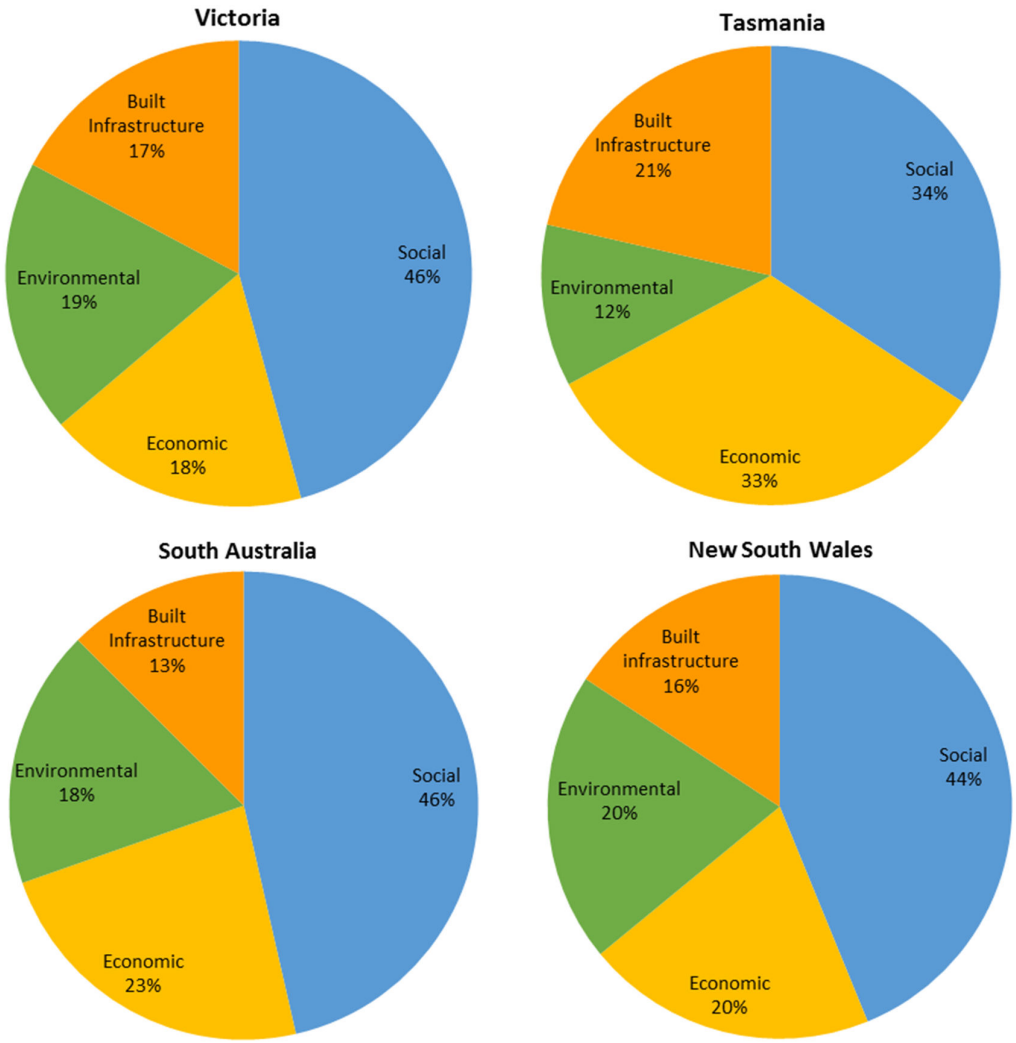


Figure 7: Allocation of values at risk to value groups – by state.

3.4 VALUE CONNECTIVITY

In order to understand how groups understood values they selected were linked as part of a system, all groups were asked to map the connectivity between different values. Across the groups, 989 allocations were made to the following categories:

- Where values were mutually dependent upon each other.
- Where values were dependent on other value.
- Where values were seen to support another value.

Mutually-dependent values were the largest group with 53% of all allocations, supporting values were allocated 26% of the time, and dependent were allocated 21% (FIGURE 8). However, the groupings varied widely between states. Mutually-dependent values had the highest level variation ranging from 34–70%. The dependent values category ranged from 14–39% and allocations in the supporting values category ranged from 16–32%. Victoria had the greatest diversity with mutual dependencies (70%) being the highest, and dependent allocations (14%) the lowest.

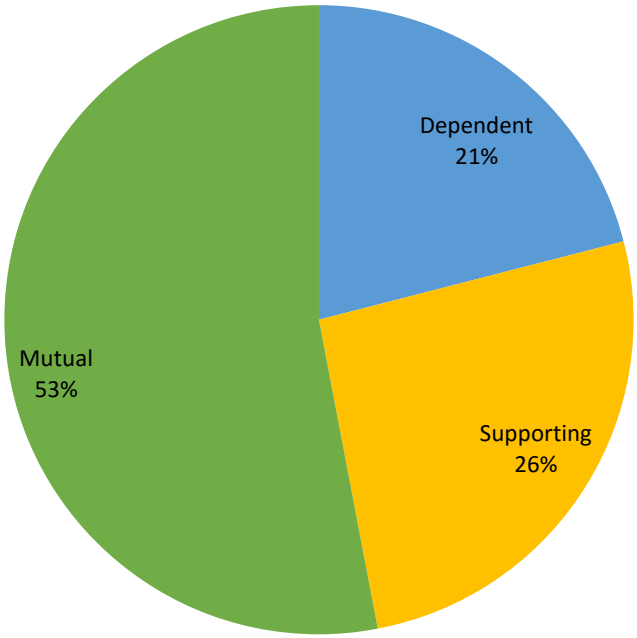


Figure 8: Types of connectivity between values – all workshops.

3.4.1 Individual workshop results

Allocations were noticeably different between the larger (Victoria and New South Wales) and smaller states (South Australia and Tasmania), with the former having higher rates of mutual dependency (FIGURE 9). Whether the smaller states are advantaged by having more direct connectivity and more discrete relationships between values is an interesting question that needs more research.

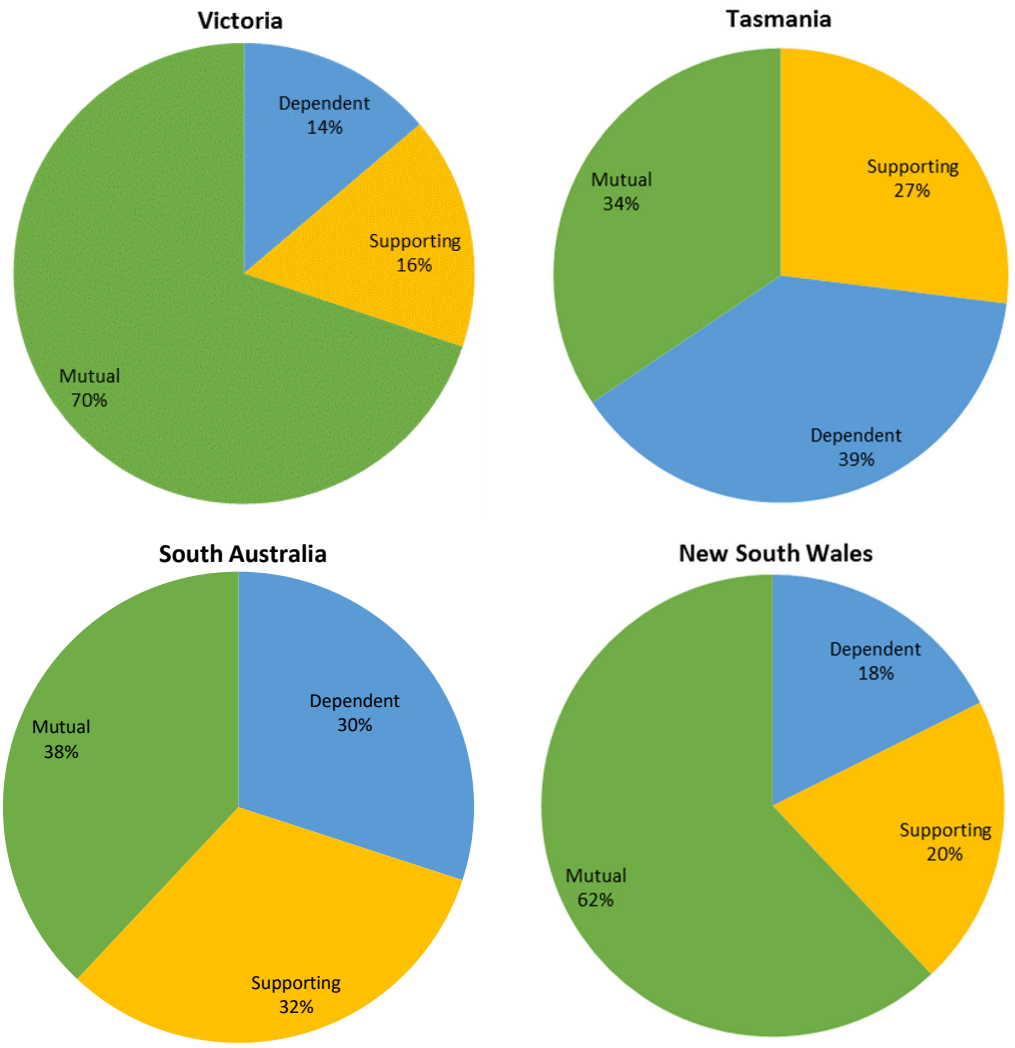


Figure 9: Types of connectivity between values – by state.

3.5 INSTITUTIONAL OWNERSHIP OF VALUES

A total of 621 allocations to institutional owners for values at risk were made across the four workshops. These were made to institutions across five categories: local, state and federal government, business and industry, and community. Allocated ownership was relatively equal with most allocations ranging between 20–25%, with business and industry being considered the largest owner of values at 25% (FIGURE 10). Federal government had the least ownership (9%) of the total allocation, and 1% of values were considered unowned.

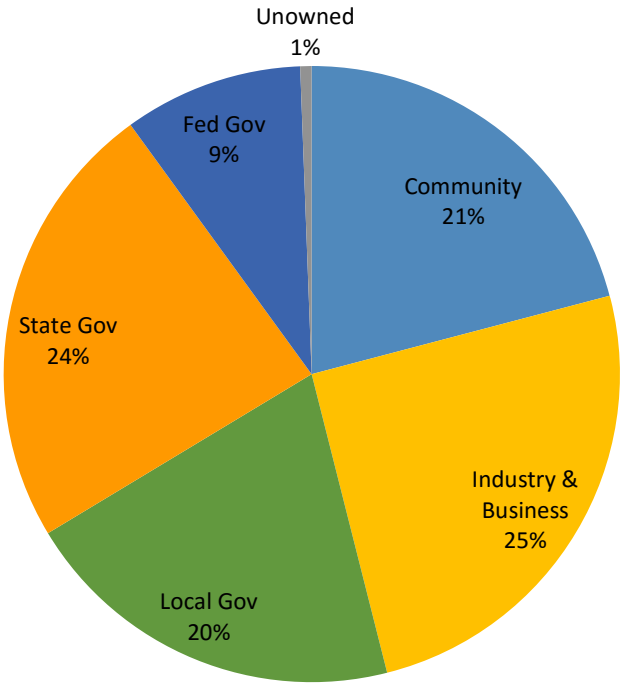


Figure 10: Allocated ownership of values at risk to institutional categories – all workshops.

Institutional ownership of values across all workshop groups was most consistent for community, where allocations ranged between 19–23%. Ownership for business and industry across Victoria, South Australia and New South Wales ranged between 23–25%. Tasmania allocated 33% to business and industry, which was the largest single allocation in this exercise.

State government had the highest ownership of values across Victoria, New South Wales and Tasmania, and allocations ranged between 22–26%. Local government was also consistent across these three groups, with allocations of 19% in all groups (FIGURE 11 overleaf). Federal government had the lowest allocations across all groups, with ownership of values ranging from 7–13%.

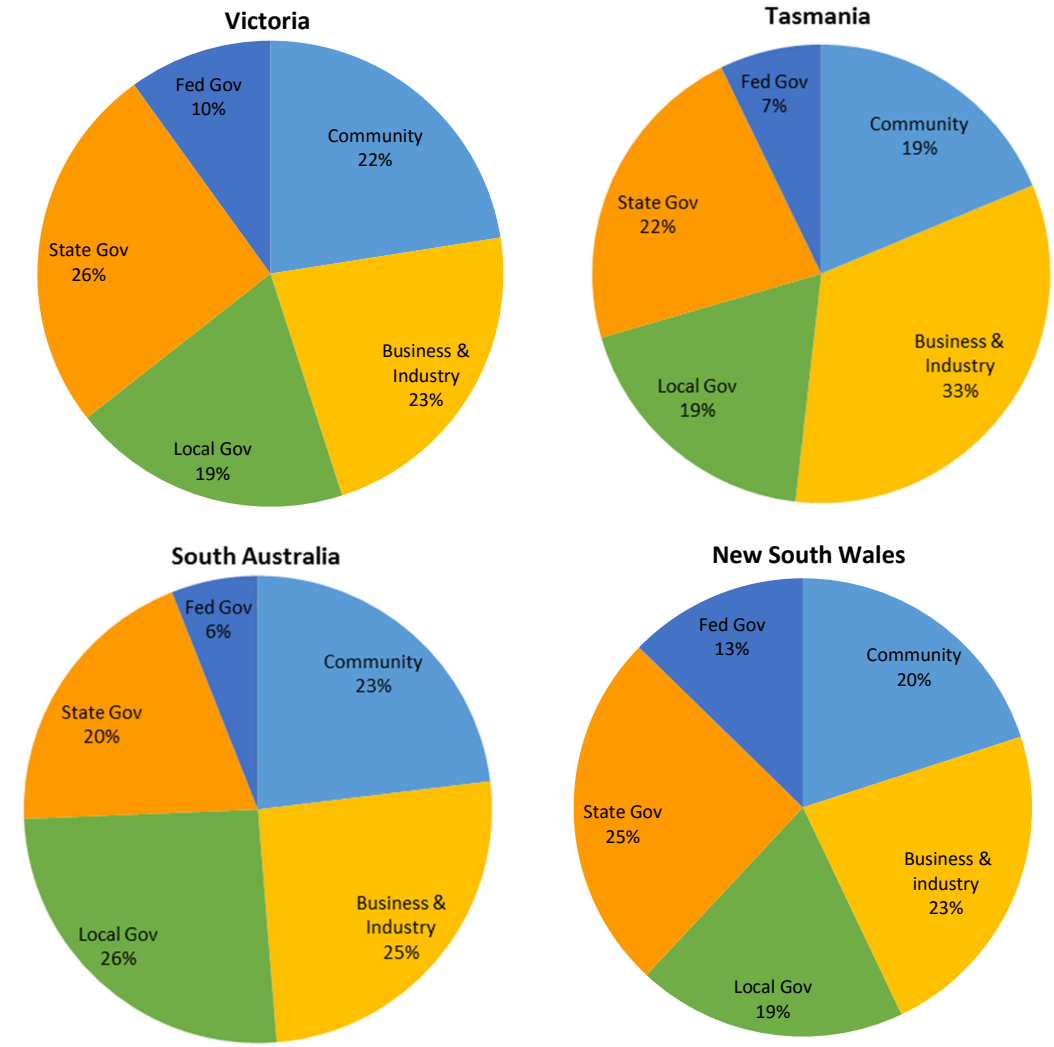


Figure 11: Allocated values at risk to institutions – by state.

3.6 ALLOCATIONS OF VALUES TO INDIVIDUAL INSTITUTIONS

Across all workshops the social value category was the dominant value category allocated to most institutions (FIGURE 12). Business and industry differed in that economic values were the largest group, and social values the second largest for all groups except Victoria. Community was considered to have the largest ownership of social values, with state government having the second largest, and local government the third largest.

Environmental and economic values had relatively equal ownership across government institutions, but low ownership was allocated in this category to community and industry and business.

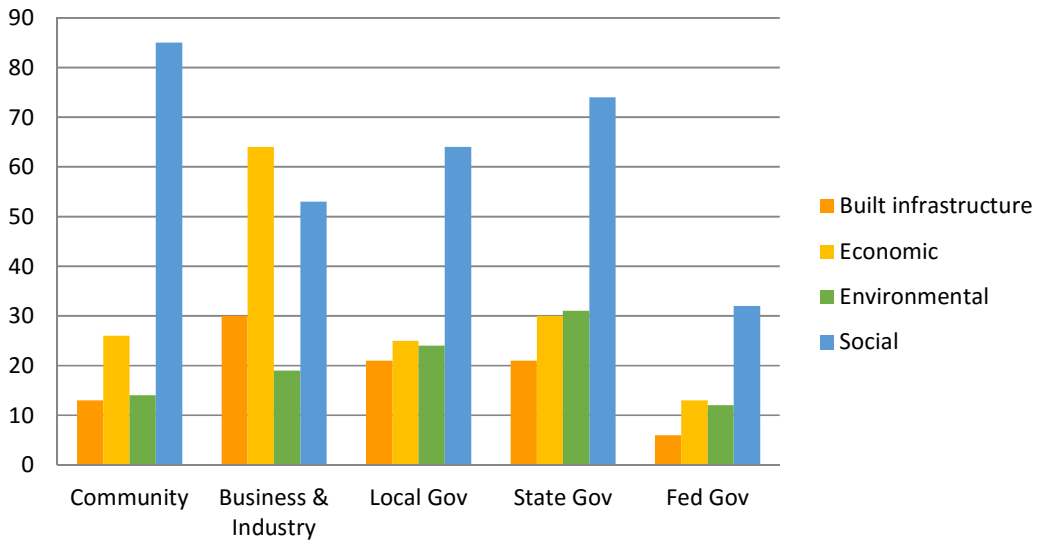
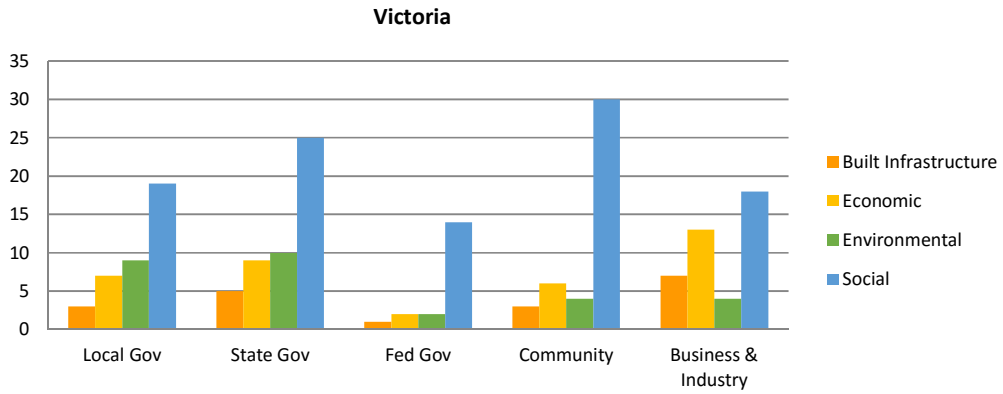


Figure 12: Allocated values at risk by institution – all workshops.

The two biggest variations between the workshops were that both New South Wales and Victoria allocated social values more highly to the federal government than the other two workshops. The business and industry category was also given the highest allocation of ownership of social values by the Victorian workshop, whereas in all other groups the highest allocation to this category was economic values (FIGURE 13).



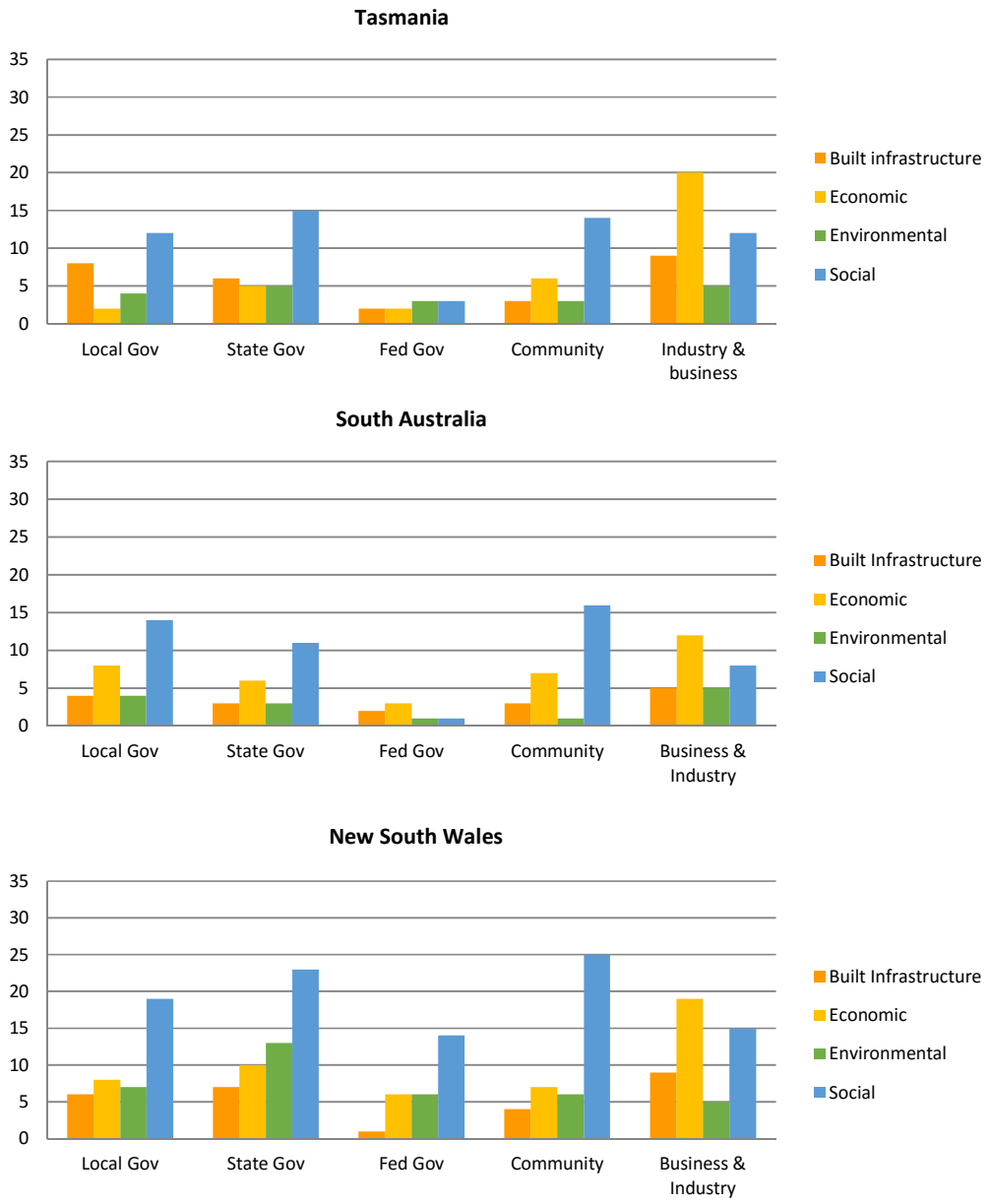


Figure 13: Allocated values at risk by institution – by state.

3.7 UNOWNED VALUES

Understanding ownership of values is important because it enables risk managers to ascertain where the primary ownership of tangible and intangible values lie, and who takes responsibility for them. This assists with being able to map ownership associated with the risk of natural hazards to that value, and consequently where these risks may be transferred or become unowned. Values were only allocated to the unowned category if they were explicitly listed as having no owner by the group.

Of the seven values identified as unowned, five were social and two were environmental. The values identified were as follows:

- flood-caused community disruption
- sustainable demographic mixes
- social connectedness
- visual amenity
- social cohesion
- social capital, and
- food security.

3.8 IDENTIFICATION OF RISK AND INSTITUTIONAL RISK OWNERSHIP

Three exercises examined how the different groups understood risk identification and ownership using three different scenarios (see Appendix 4, p. 66). This was achieved through looking at three aspects of decision making:

- Identification of risks and consequences in relation to the scenario and the value (or in the case of the Victorian workshop, values selected), across different temporal scales and allocated to different risk groups.
- Allocation of ownership to these risks.
- Allocation of ownership to specific tasks related to the identified risks across different temporal scales.

The key findings from this section of the workshop were:

- Social risk was the predominant category identified across all groups with 41% of allocations.
- There were considerable gaps in risk and consequence identification and ownership in the long-term 2+ year category across all groups. However, allocation of specific tasks related to long-term actions (resilience and capacity building) showed less variation, with 56% in New South Wales, South Australia and Tasmania being allocated to the short-term and 44% to long-term actions (preparation).
- Bushfire hazard had the largest overall allocation (44%) of risk and consequence across the four groups, but this was not necessarily the case in individual workshops.
- Allocation to specific areas of accountability, responsibility and payment was contentious, and required more time than was allocated.

3.9 IDENTIFICATION OF RISK AND CONSEQUENCE

Overall, 403 risks and consequences were identified across the four value categories of social, environmental, economic and built infrastructure. In Victoria, each group nominated four per table (one from each value category). For all the other workshops, each group selected one value per table. The majority of values selected were from the social value category (for details see Page 78).

The participants were asked to identify risks across three different timeframes: 2–12 months, 1–2 years and 2+ years in relation to that value. They were also asked to allocate the risks identified across the four value areas of economic, social and environmental and built infrastructure.

Social risks were the largest category with 41% of all risk and consequences being allocated (FIGURE 14overleaf). The lowest was built Infrastructure with 13%. The remaining allocations were economic (25%) and environmental (21%).

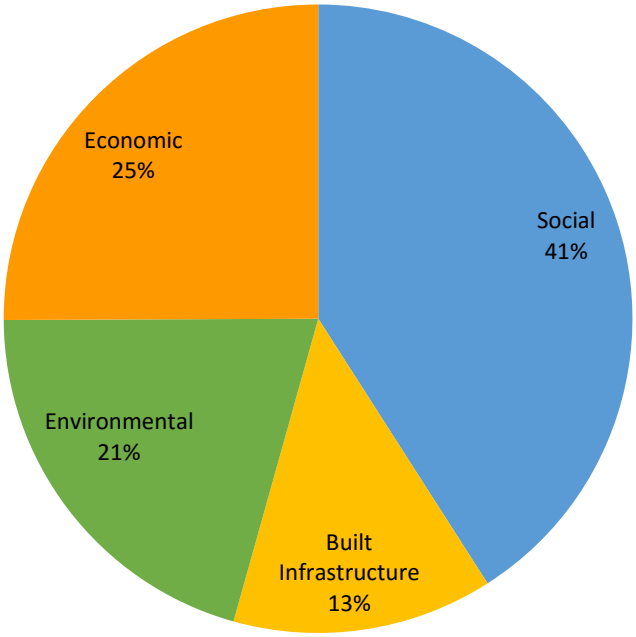


Figure 14: Allocation of risk and consequence to value categories – all workshops.

Allocation of risk and consequence to the nominated values selected across the different state groups varied, but showed some consistency across Victoria, Tasmania and New South Wales, with the social category having the highest allocation of risks and consequences. Allocations ranged between 43–45% (FIGURE 15 overleaf). Built infrastructure was given the lowest allocation, ranging between 8–11%. The economic category was reasonably consistent across the workshops, with allocations ranging between 20–26%. The environmental category was variable with allocations ranging from 18%–27%. It was noticeably higher in the larger states.

South Australia differed markedly, with the largest allocations being to risks and consequences in the economic category (34%) and the lowest to the environmental category (12%). Built infrastructure category was allocated 26% and the social category 28%. The three key values selected for further assessment by this group were all social values, showing their overall decision-making lens was dominated by social values.

These variations point to some interesting aspects of the subjective nature of risk identification, and how different agendas, experience, context and values may potentially influence risk identification and prioritisation.

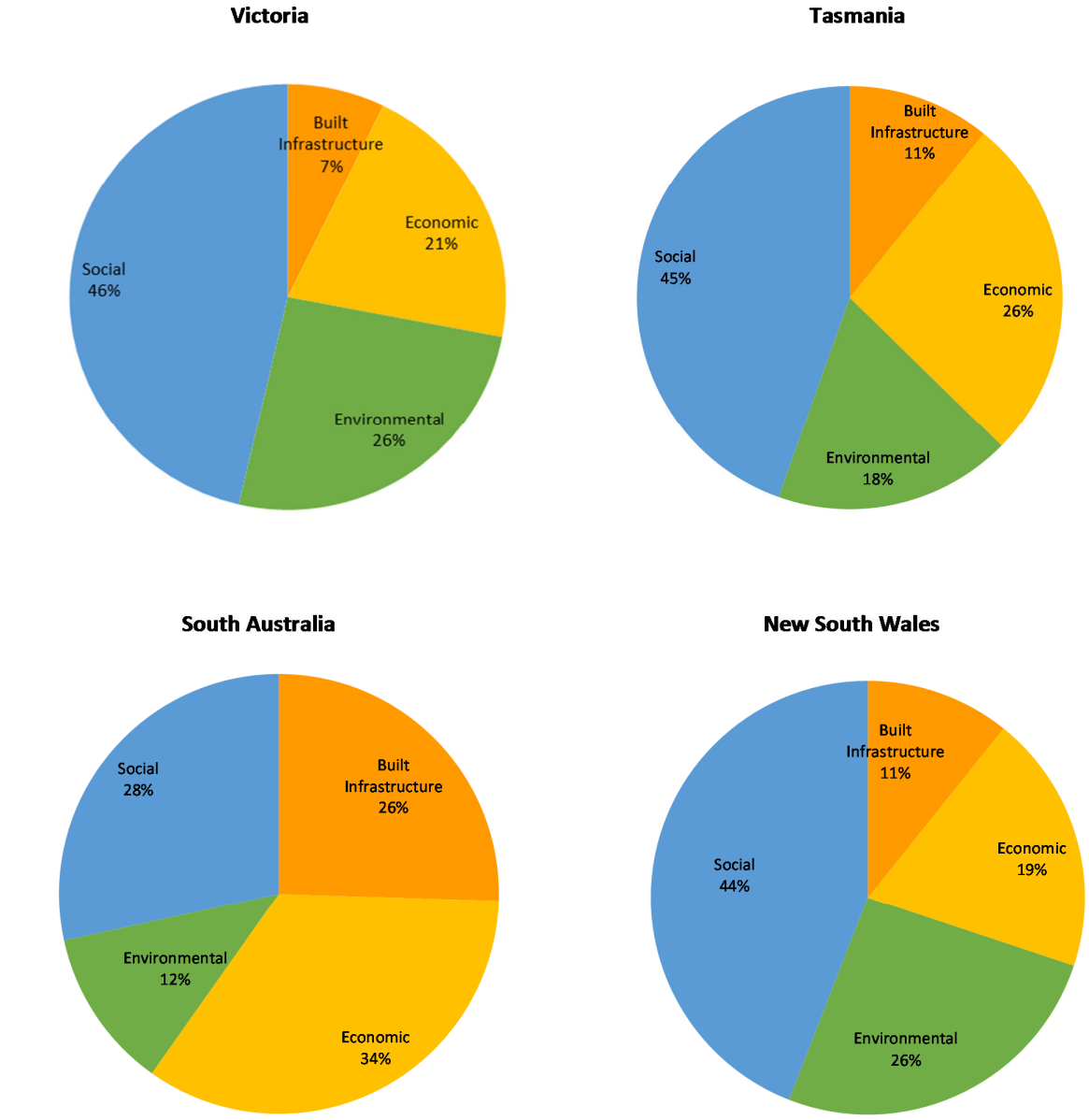


Figure 15: Allocation of risk and consequence to value categories – by state.

3.10 RISK AND CONSEQUENCE IDENTIFICATION FROM A HAZARDS PERSPECTIVE

An analysis of risks and consequences identified by hazard category found 43% of all allocations were related to the fire scenario, 34% to flood, and 23% to heatwave.

Victoria, New South Wales and South Australia produced some consistent results, with the most notable being a consistently higher allocation to the fire category. Tasmania differed in allocating more risks and consequences to flood and heatwave (FIGURE 16).

This result may indicate a bias created by differing expertise or skills of the workshop participants. Further research would be useful to clarify current strengths and gaps in the understanding of risk identification across different types of natural hazards.

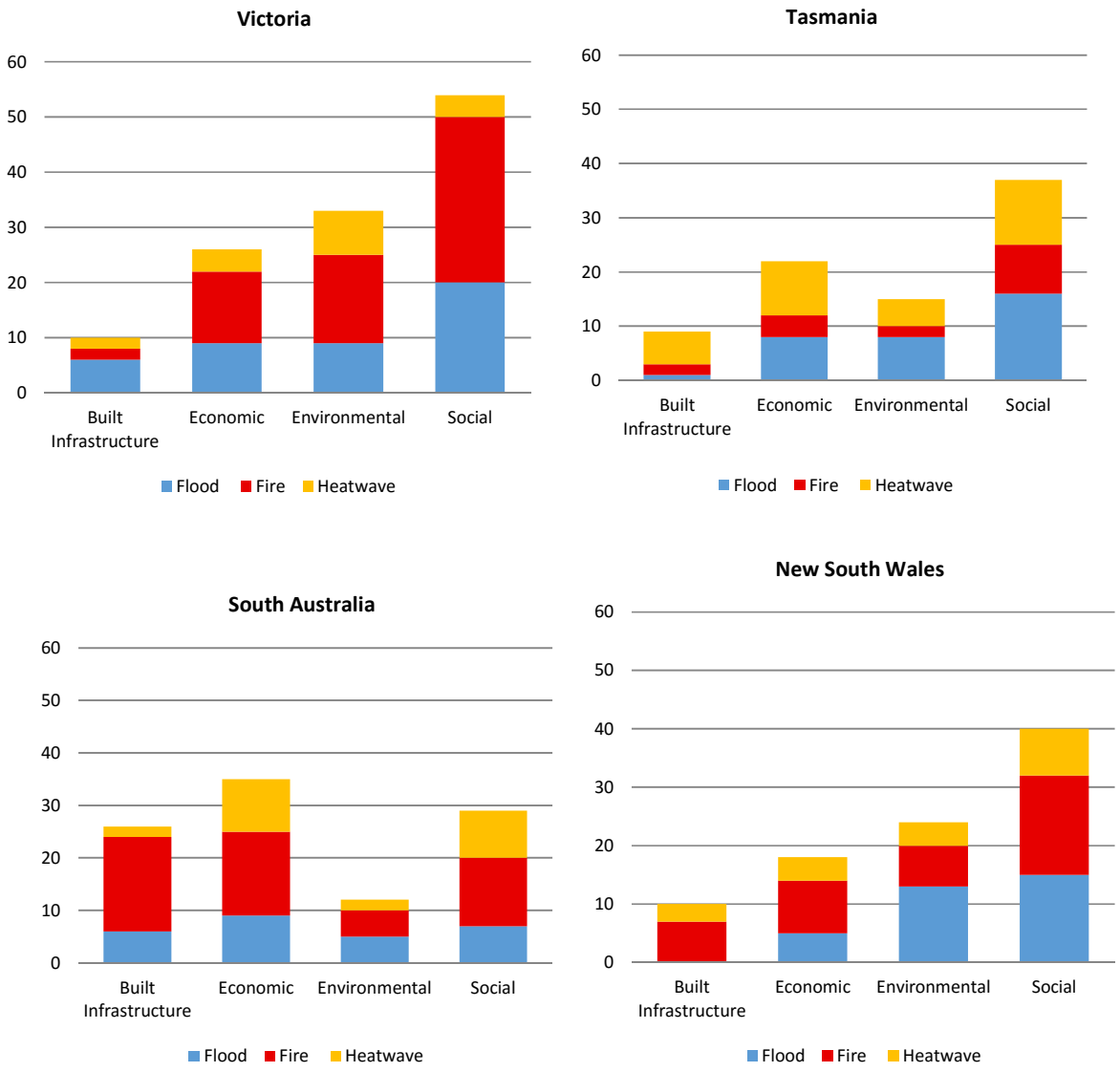


Figure 16: Identification of risk and consequence by hazard across value categories – by state.

3.11 DISTRIBUTION OF RISK AND CONSEQUENCES ACROSS TEMPORAL SCALES

403 allocations of risk and consequence were made across the three different time categories of 2–12 months, 1–2 years and 2+ years. The largest allocations across all four states were consistent. The 2–12 month category had the largest allocation (54–60%), declining to 22–30% for 1–2 years and 10–19% for the 2+ year category (FIGURE17).

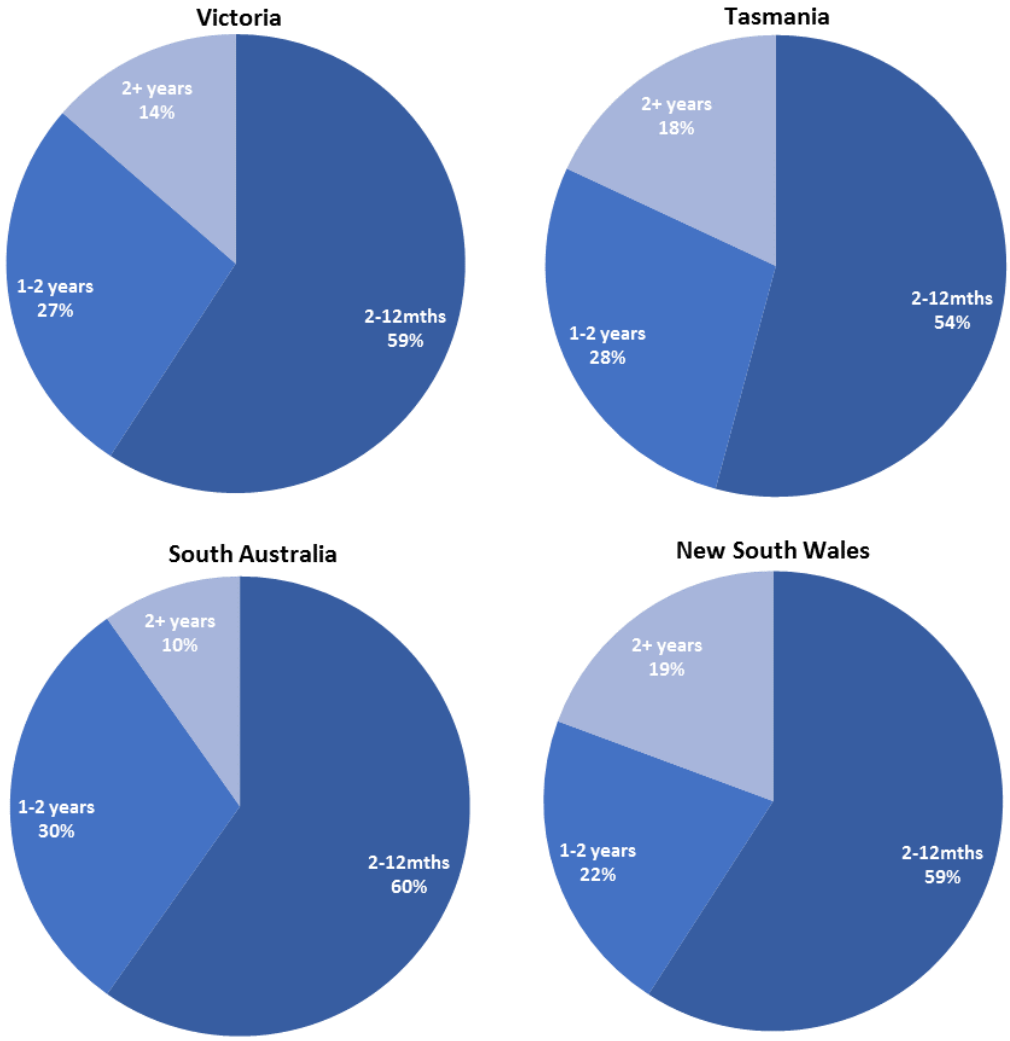


Figure 17: Allocation of risks and consequence across temporal scales – by state.

The decreased amount of allocated ownership of long-term risk and consequences points to a possible knowledge deficit. It may indicate a need to build capacity and skills in this area of risk management to support strategic and long-term planning decisions and activities.

3.12 INSTITUTIONAL OWNERSHIP OF RISKS AND CONSEQUENCES

Groups in each state were asked to allocate risk ownership in two exercises. Both exercises were based on the key value selected after the value-mapping exercise. Participants identified risk and consequences for the key value and allocated them to a temporal scale of 2–12 months, 1–2 years and 2+ years, and categorising them into different risk areas. The second part of the exercise allocated institutional ownership to the identified risks and consequences. This was done in two ways: firstly, directly to the risks and consequences themselves in Victoria; and secondly, in the other groups through identifying key actions and allocating ownership.

The decreased amount of allocations to risk and consequences in the second part, to the long-term category in particular, could be due to several reasons:

- Familiarity with direct impacts and not with long-term consequences resulting from those impacts.
- Inability to complete the exercise in the time allotted.
- A lack of knowledge regarding how to ascertain risk ownership outside of response activities.

Potential knowledge deficits concerning long-term decision making is of concern, suggesting this is an area that warrants further investigation. The need to build knowledge and skills in strategic risk management to support long-term planning decisions and activities was voiced in all workshops.

3.12.1 Allocation of ownership

Over the four groups, 172 ownership allocations were made to the risks and consequences identified for the priority value selected by each group. Groups had varying degrees of success in completing this exercise, and the data collected was particularly patchy for the heatwave and flood scenarios. As a result, this dataset has only been analysed in aggregated form. Notably, 65% of risk ownership allocations were linked to the fire hazard scenarios. This may indicate a possible knowledge gap in relation to the other hazards. It may also indicate an area of skill strength in the fire area that could possibly be leveraged to develop skills in other hazard areas.

In view of the difficulties experienced with this particular exercise, this is an area that would benefit from further research to determine where knowledge and skills support is needed, and also where areas of strength exist.

Overall, the aggregated ownership allocations to institutions for risk and consequences across the different value groups showed that 11% had ill-defined ownership, being allocated as either shared or unowned. State government had the largest overall risk ownership allocation (40%), and local government (27%) had the second largest (FIGURE 18 overleaf). Together, these two categories made up two-thirds of all allocations.

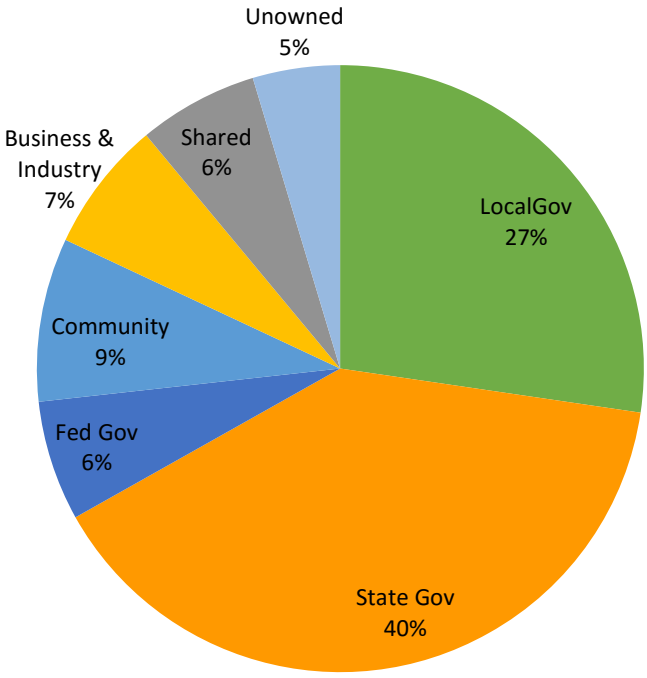


Figure 18: Aggregated institutional ownership of risk and consequences for selected value – all groups.

3.12.2 Allocation of risk and consequence ownership across temporal scales

Across the different timeframes, allocations indicated a perceived increase of ownership for community and local and state government in the 1–2 year category, and a substantial decrease overall across most institutions in the 2+ year category (FIGURE 19). The decrease for local government was less substantial than other categories. It was also interesting to note the increase in ownership, over time, to federal government.

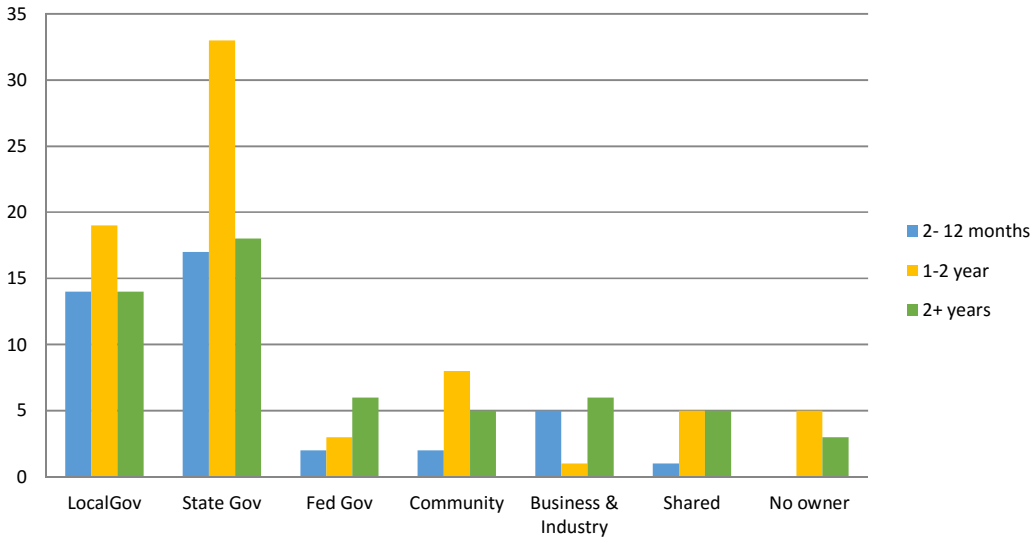
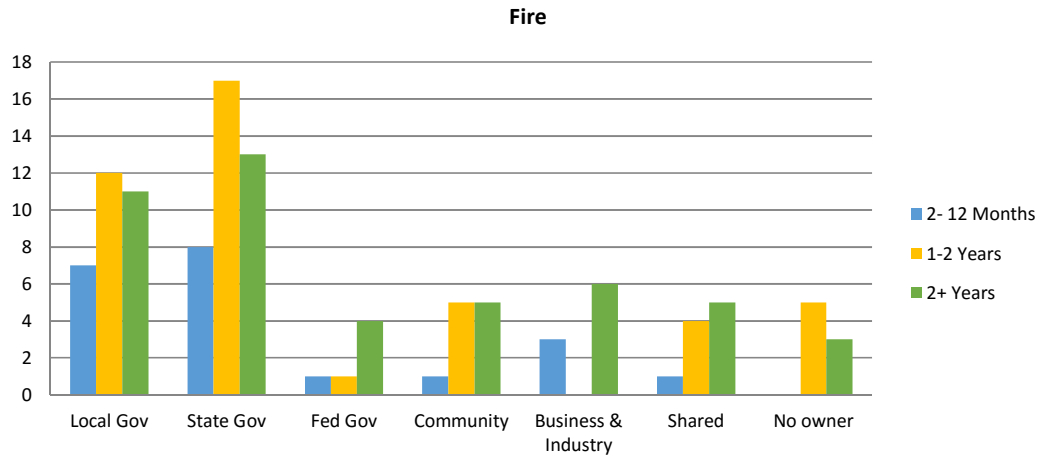


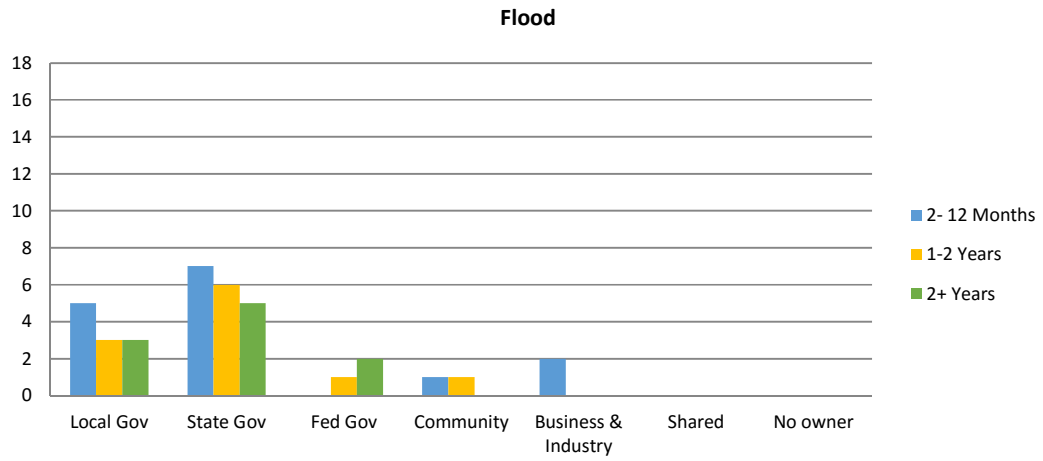
Figure 19: Aggregated institutional ownership of risks and consequences over temporal scales – all workshops.

3.12.3 Ownership allocation from a hazard perspective across temporal scales

Allocation from a hazard perspective over different timeframes showed risk ownership in different hazard areas was variable, with the highest level of risk ownership being allocated to the bushfire scenario in the 1–2 year category, and no risk ownership allocation in 2+ years for the heatwave scenario (FIGURE 20). Allocations across the flood scenario were patchy and decreased over time. Of particular note is the lack of allocation to business and industry risk in the 1–2 year category.

This may reflect the current experience and the nature of particular hazards (such as heatwave and flood), which are harder to mitigate, and in the case of heatwave, impacts are primarily contained within the event itself and perceived to have relatively few long-term effects. In light of the projected increase in extreme events such as these, and the lack of available long-term data following these events, further research would be needed to verify the level of long-term effects. This may reflect a potential risk awareness deficit in relation to these hazards.





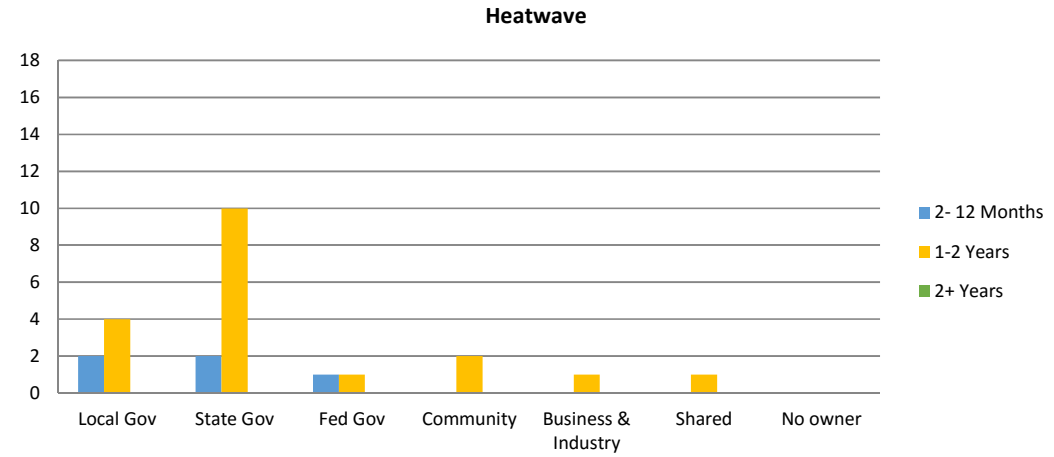


Figure 20: Aggregated institutional ownership of risks and consequences over temporal scales – by hazard.

3.13 ALLOCATION OF INSTITUTIONAL RISK OWNERSHIP TO RISK ACTIONS

Participants were asked to identify risk management actions for their priority value and designated scenario over the short- to long-term, and allocate institutional ownership to these actions. The Victorian exercise was different in format to the other three workshops, so those findings have been synthesised separately.

Across the four workshops, public sector institutions were allocated 69% of risk actions and private sector institutions 25%. Four per cent (4%) of actions were shared and 2% allocated no owner (FIGURE 21). This raises a number of questions in relation to the imbalance between the allocation of private ownership of values at risk in the previous exercise and public ownership for risk actions.

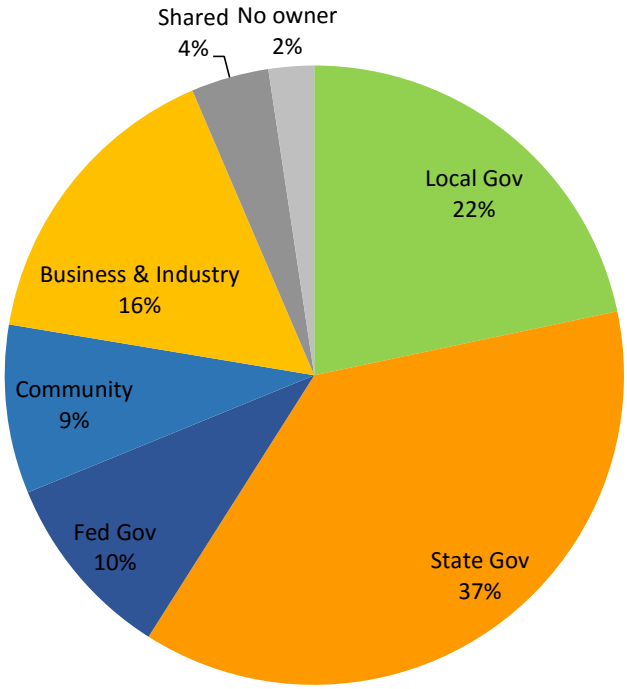


Figure 21: Allocation of institutional ownership of risk actions – all workshops.

3.14 ALLOCATION OF OWNERSHIP USING THE RAP CRITERIA

'People saying it is not my job, is one of the biggest issues, sometimes it is really hard to pin down who is responsible and no-one likes having to pay for it.'

Melbourne Workshop Participant

The Victorian workshop allocated risk ownership to short- and long-term recovery activities using the RAP criteria (Responsible, Accountable, who Pays), allocating ownership across three risk categories (social, environmental and economic). Participants were asked to select the priority risk for each risk area and to allocate risk ownership for this across 2–12 months, 1–2 years, and 2+ years time scales.

The RAP criteria was developed from the previous desktop review and examines:

- Who is responsible for actions?
- Who is accountable for actions?
- Who pays for the actions and impacts?

This criteria was applied in the Victorian workshop as part of Exercise 4, and proved to be highly contentious, resulting in strong debate among many of the participants. The key learning is that these areas need to be negotiated in a structured manner in order to achieve a reasonable outcome and avoid conflict. The other learning was that the time available for discussion was far too short, showing that appropriate time needs to be allocated to allow for negotiation and agreement to be reached.

A key observation was that the understanding of *what* task is allocated to risk ownership is as important as understanding *who* it is allocated to – particularly when risk ownership is shared. Lack of clarity in these areas can result in risks not being fully owned or treated. Where risk ownership is shared, it is important to ensure that tasks are not duplicated across agencies and that there is a clear understanding of who is responsible and accountable for specific tasks.

A basic analysis of the data obtained from this exercise shows State Government allocated as the largest owner of tasks overall (FIGURE 22). It also shows that:

- The largest amount of ownership was allocated in the 2–12 month period.
- Ownership was most evenly allocated across different stakeholders in the 1–2 year period.
- State government had the largest allocation in the 2–12 month and 1–2 year period.
- There was a substantial decrease in risk ownership in the 2+ years period, except for the areas of unowned and community.

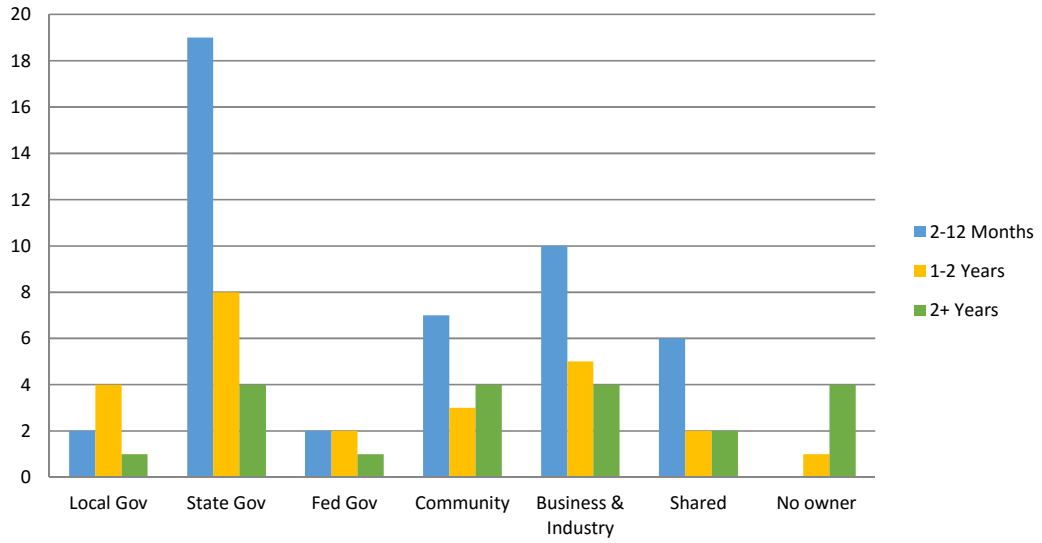


Figure 22: Allocated recovery actions according to RAP – Victoria.

For details of the key tasks and owners see Attachment 5, p. 69.

Although a small sample, this exercise provided some interesting insights:

- In the area of responsibility, the federal government was not allocated any ownership and the largest allocation in the 2+ years category was for No Owner (FIGURE 23).
- The largest allocation for accountability was to state government in the 2–12 month period, with business and industry somewhat lower, with small allocations to the community and shared categories over 2+ years (FIGURE 24).
- In the area of who pays, the state government, the community and business and industry were seen to be the main institutions that pay in the first 12 months, although this was considered to decrease across time. State government retained the most allocations in all time scales in this category (FIGURE 25).

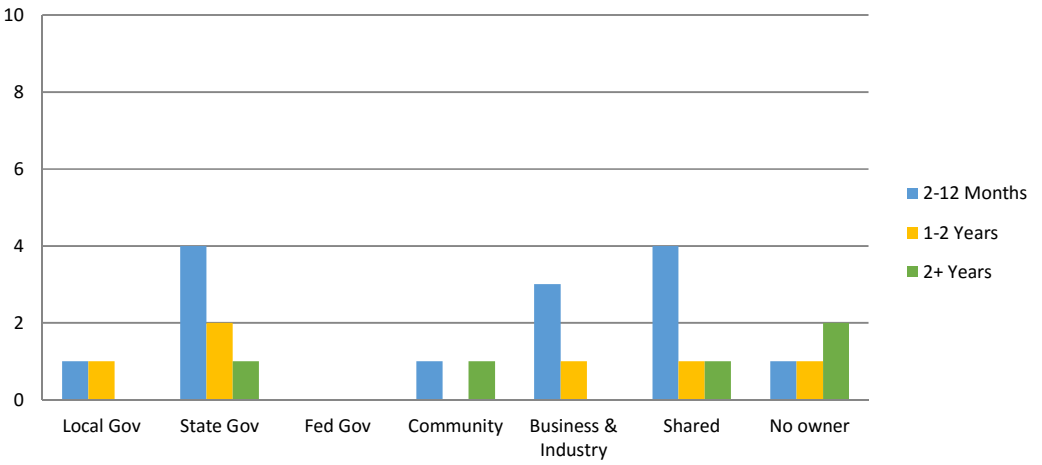


Figure 23: Allocated recovery actions according to who is responsible – Victoria.

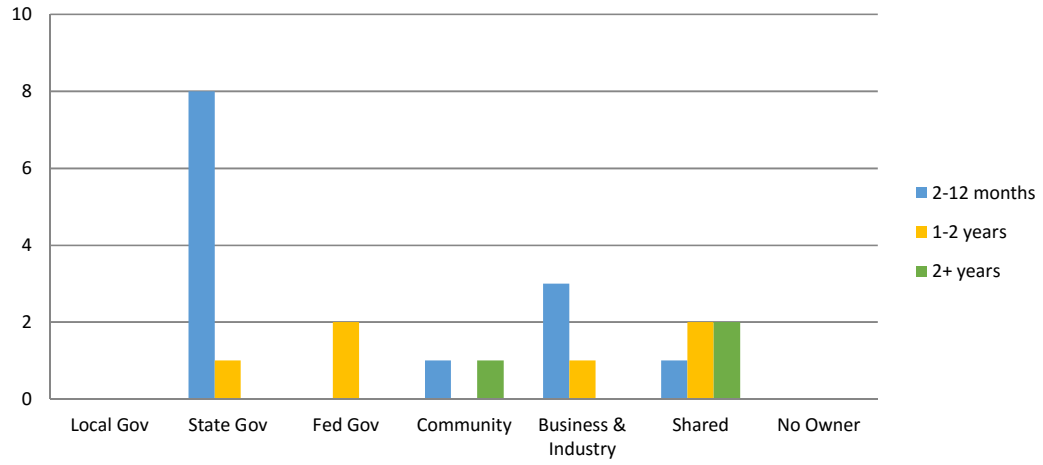


Figure 24: Allocated recovery actions according to who is accountable – Victoria.

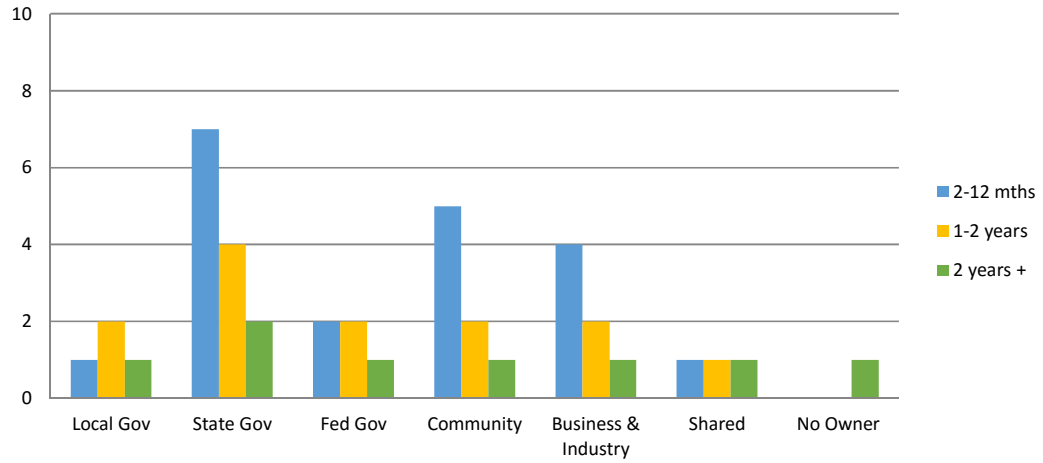


Figure 25: Allocated recovery actions according to who pays – Victoria.

There is potential to apply the RAP criteria across the natural hazard management process to assist in clarification of risk ownership.

3.15 ALLOCATION OF INSTITUTIONAL OWNERSHIP OF SHORT- AND LONG-TERM RISK ACTIONS: TASMANIA, SOUTH AUSTRALIA AND NEW SOUTH WALES

Participants were asked to identify risk management actions for their priority value and designated scenario over the short- to long-term and allocate institutional ownership to these actions.

Overall, the allocations between the short- and long-term activities were more evenly distributed across the short- and long-term timeframes, and allocation in hazard areas were different to the previous risk identification exercise.

Some actions were not given any risk ownership allocations, but participants were more successful in allocating ownership during this exercise, particularly in the long-term category. One group also chose to list a small percentage of their actions as a separate systemic category, and although these actions and their ownership were counted, they were not allocated to a value area for this exercise.

3.15.1 Identification of actions to short and long-term categories

In total, 191 actions were identified across the three groups (see Page 78). Allocations to the short-term (preparation) and long-term (resilience and capacity building) differed from the previous exercise in that there was a slightly larger allocation to the longer-term category (53%), and shorter-term actions were allocated 47%.

It is also interesting to note that all groups had higher allocation of actions to the longer-term than the shorter-term category (FIGURE 26).

This outcome suggests that it is easier for participants to think forward using activity-based exercises rather than more focused risk-based exercises. However, further testing is required in this area to understand why this is so and what it means in terms of practice.

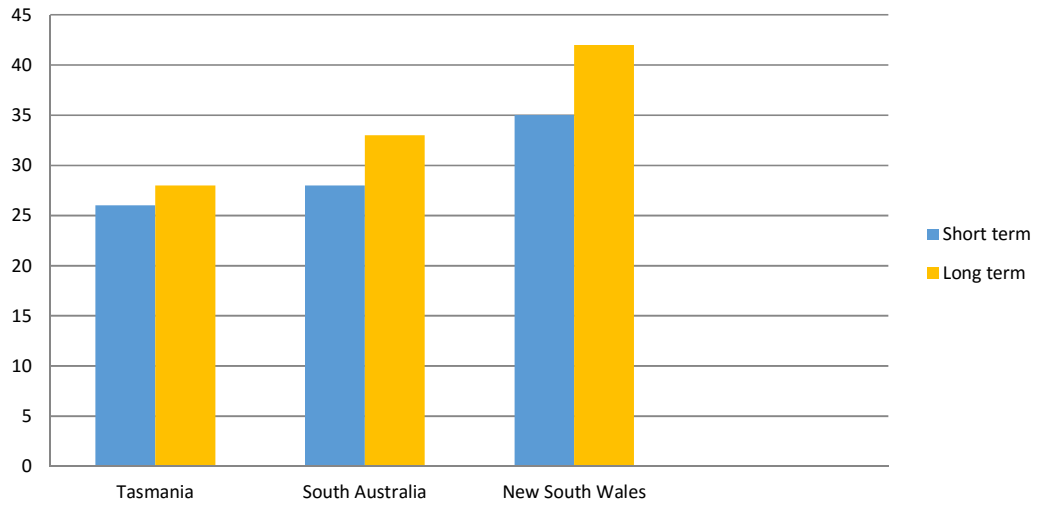


Figure 26: Overall allocation of short- and long-terms actions – TAS, SA and NSW.

In terms of allocation of actions to value categories, social values had the largest percentage of actions (41%). The lowest allocation of actions was to the environmental category (16%) (FIGURE 27).

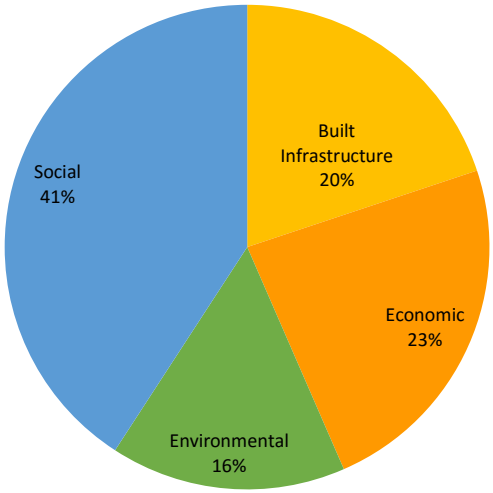


Figure 27: Allocation of risk actions to value categories.

3.15.2 Allocation of actions to hazard area

In this exercise, heatwave was the largest (40%), flood (33%) and bushfire (27%). Other notable outcomes were:

- All groups allocated more actions to the long-term category in the bushfire hazard area. Tasmania allocated no actions to the short-term category in the bushfire scenario (FIGURE).
- South Australia had higher allocations of actions across all hazard scenarios to the long-term activities (FIGURE 28 to FIGURE 30).

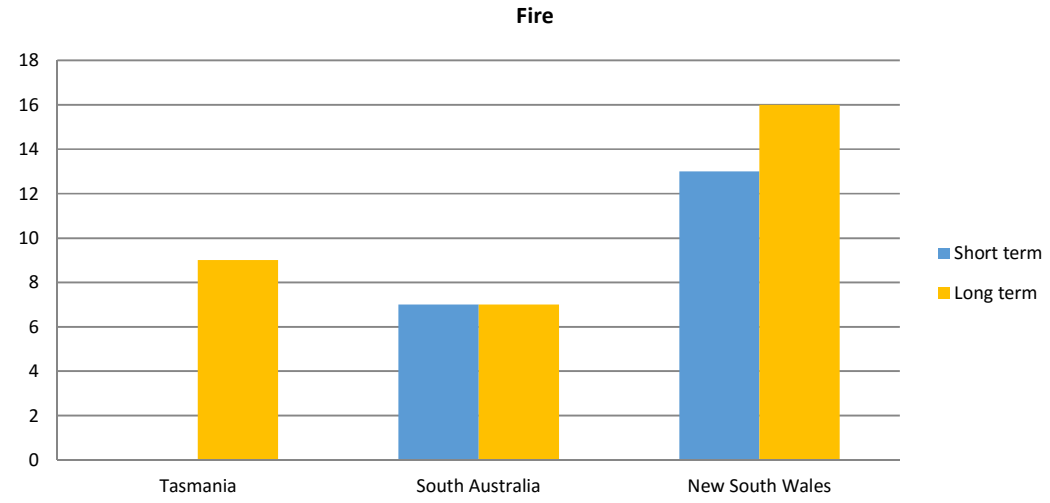


Figure 28: Allocation of short-term and long-term actions to fire scenario – TAS, SA and NSW.

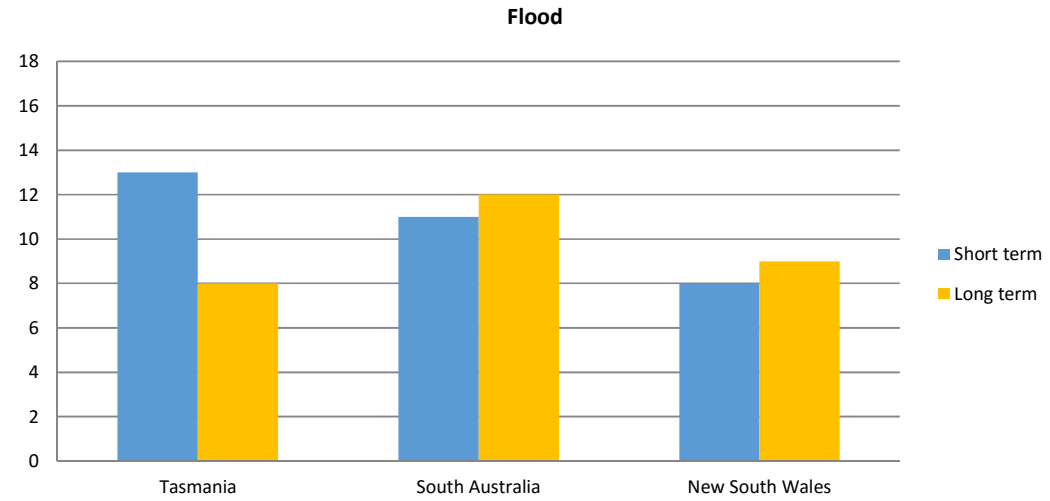


Figure 29: Allocation of short-term and long-term actions to flood scenario – TAS, SA and NSW.

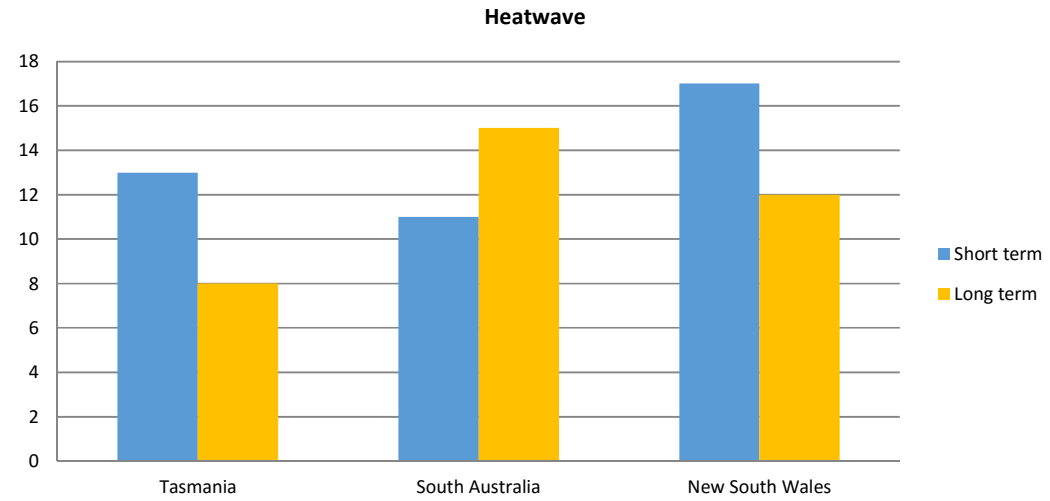


Figure 30: Allocation of short-term and long-term actions to heatwave scenario – TAS, SA and NSW.

3.15.3 Allocation of ownership to risk actions

Ownership allocations were analysed jointly for all workshops (Tasmania, South Australia and New South Wales) and for each individual workshop. In total, 204 allocations were made across all three workshops for 191 actions. State government had the largest allocation of both short- and long-term actions, and community the least (FIGURE 31).

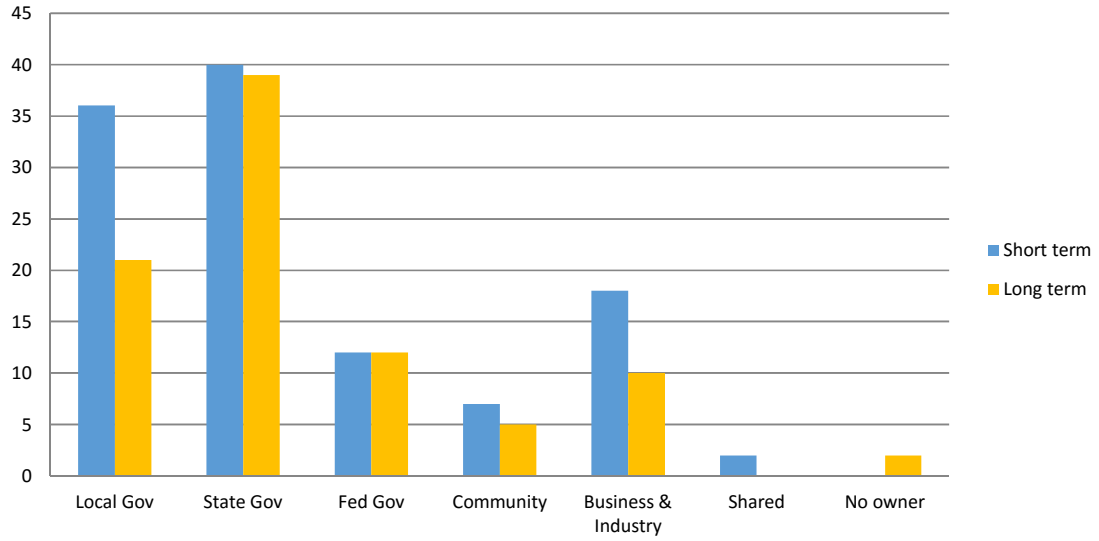


Figure 31: Allocation of ownership to short and long-term actions – TAS, SA and NSW.

When distributed between short-term (preparation) and long-term (resilience and capacity building) actions, state government institutions had the highest ownership allocations in both categories. Local government had the second highest allocations, although the number of short-term actions was substantially high. Federal government had the lowest allocation of the government institutions spread equally across both short- and long-term categories.

Business and industry had a higher allocation of short-term ownership than federal government, and slightly less for the long-term category. Community had the least allocation in both short- and long-term categories, there was a small allocation of shared ownership in the short-term category and unowned category in the long-term.

Allocation between short-term and long-term ownership of actions by individual workshop groups showed local and state government being allocated the most ownership by all groups (FIGURE 32). New South Wales and Tasmanian groups were consistent in that they allocated equal ownership to state and local government in the short-term and a reduced amount of ownership in the long-term. South Australia differed in that ownership allocation increased in the 1–2 year period for state government. Allocations of ownership for business and industry were the highest in New South Wales and lowest in South Australia. Tasmania did not give any ownership allocations to this institution in the long-term category. Community had the lowest allocation of risk ownership actions across all institutional groups.

There were minimal allocations to the shared and unowned categories across all groups. It was also notable that there were more ownership allocations in this exercise with the three groups than were made by all groups combined in the previous risks and consequence exercise.

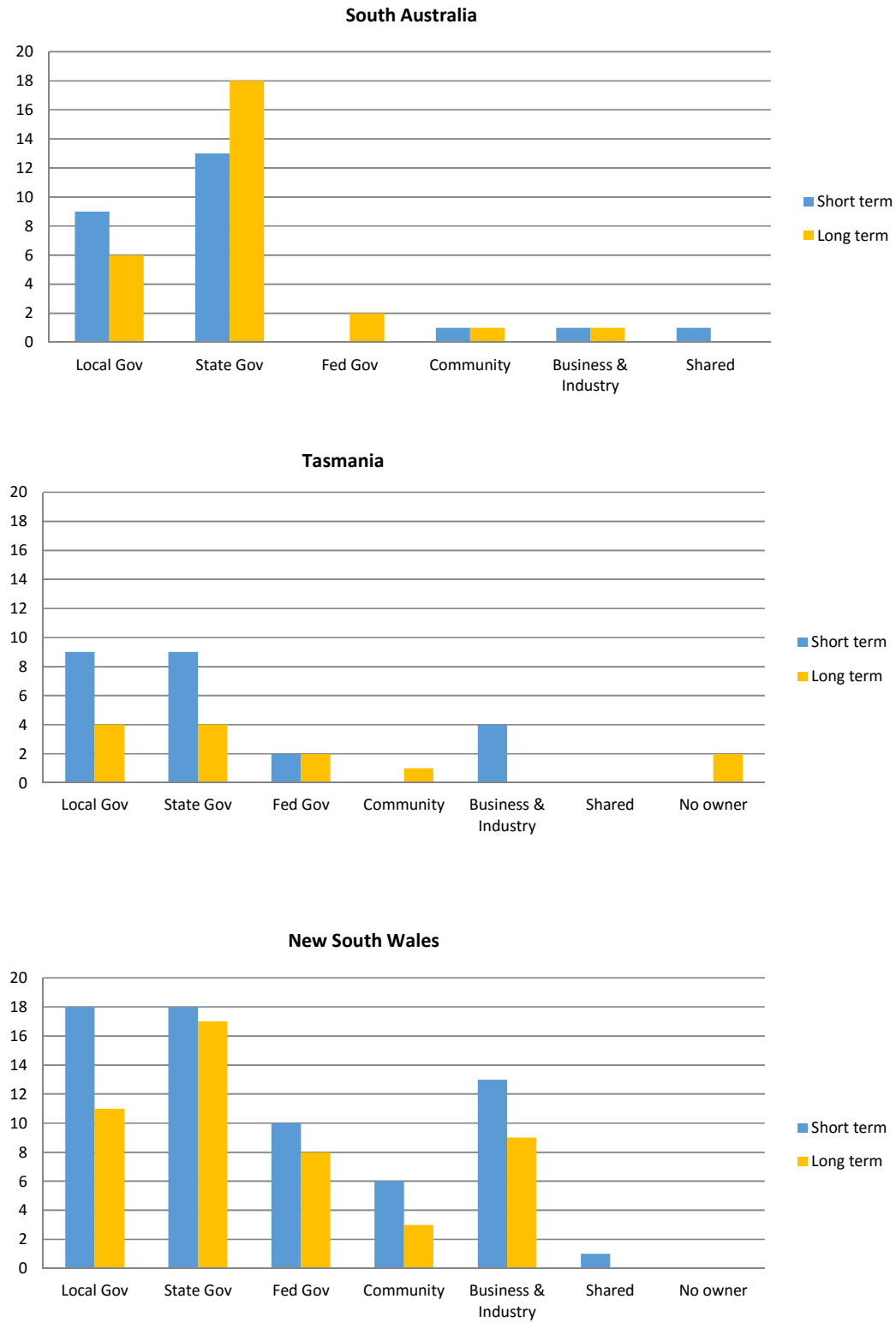


Figure 32: Allocation of ownership to short- and long-term actions – Tasmania, South Australia and New South Wales.

3.16 UNOWNED RISKS

In the risk management process, identifying risks that have no owner is a key part of assessing areas of vulnerability. If a risk has no owner, then it is unlikely to be managed or considered as part of the current decision-making process.

Not all risks were allocated owners during the exercises undertaken, which was particularly noticeable in the area of risk and consequence. This was possibly due to time constraints but is also likely that unfamiliarity with strategic planning across long-term timeframes was a contributing factor. Participants may have also found it easier to allocate owners to specific actions rather than to risk and consequence, as this is a more familiar area for most practitioners.

The levels of unowned risks are likely to be higher than identified in this exercise because only risks that were specifically listed as unowned were categorised, and not all risks had ownership allocated to them in the time available. The unowned impacts, risks and consequences identified were largely intangible risks associated with social values (TABLE 2).

Unowned risk and consequences	Unowned risk actions associated with short- and long-term actions
Flash flood, run-off recontamination	Actions to engage key stakeholders who have an investment
Water quality reduced	Obtain national ownership and responsibility for supporting long-term action.
Loss of community	
Anniversaries and reminders can trigger other responses	
Risk ill health of population beyond area impacted	
Increase in crime	
Anniversaries and reminders can trigger other responses	
Loss of social values	
Social dysfunction	
Loss of income	

Table 2: Unowned risks, consequences and actions.

3.17 RESPONSES TO THE VALUES AT RISK MAP

'Lack of data is not the issue, if anything we have too much data. The real issue is no matter how good the quality or quantity of the data is, it is only as good as the questions you ask. How do you know if your question is the right question, how do you know if you are telling a useful story?'

Melbourne Workshop Participant

Data and data use was a consistent theme across all workshops, and is an important area of innovation. Discussions revealed that the proliferation of spatial tools over recent years has had a profound effect on how data is being used and the results communicated by practitioners and policy makers. Many of these tools had been developed in response to an urgent and/or emerging need, so there was often no over-arching strategy guiding the development process at the state level to integrate those tools into decision-making. This was seen as both a positive and negative, as the bottom-up development meant the tools were directly tailored to address a problem, but that their reach often did not extend beyond the boundaries of a particular purpose or organisation.

There were also different levels of understanding, uptake and skill across the different agencies. Participants felt that 'more data did not mean better decisions' and expressed the need for greater understanding in the following areas:

- The type of data needed for the different levels of decision making and diverse types of decisions used by the EMS.
- A greater understanding of how different data sets could be integrated using technology in a way that maintained transparency of what the data sets represent.
- The need for better communication of what the data actually means in terms of decision-making. In particular, what was the best way to represent data to communities and businesses to support better decision making.
- The need for consistent data to be able to measure 'apples with apples' and where this is not possible to be able to understand the benefits of different types of values, particularly intangible benefits.

As part of the research to date, key end users were asked to complete a questionnaire in relation to different map formats and needs (see Page 61). This was undertaken to assist the development of the draft Values At Risk Map and the workshop, and also to better understand end user needs. Key aspects ascertained with this initial work were as follows:

- Agencies required a tool that they could use themselves to interrogate and combine different data sets to better understand where they were able to aggregate values at risk at a community and state level to assist decision-making.
- That data needs were diverse, but that the type of data selected needed to be led by the people making the decisions.
- That the format needed to be simple (not too many buttons, not too many layers, clear labelling), and the majority preferred a two-dimensional format.
- Use of colour could affect how people might perceive a map. It was particularly important to consider that some people may be colour blind.
- Unfamiliar spatial map representations may look impressive but were harder to understand and interpret.
- That each level of government had different data scale needs (SA1, SA2, SA3) depending on the decisions they were making.
- The most predominant level of decision making in the project end user group was at state government level. Other users would have different data needs, especially in terms of scale, to effectively use such a map in decision making.
- Social and environmental values and assets, particularly the intangible (non-monetary) values, needed to be represented more fully in spatial maps, but that there were challenges to achieving this.

This feedback was used as a basis for shaping the initial Values at Risk Map format, which was developed in collaboration with the Centre for eResearch and Digital Innovation at Federation University. A number of responses in relation to the map were received, and the main theme was sense-making – in particular, how to make sense of the data to support decision making. Other themes that arose included: data use and selection; understanding what useful data means; data constraints such as maturity, quality and availability of data; and how to maintain data quality.

In terms of decision-making, two of the key areas of interest for spatial data were:

- Data to assist understanding of vulnerability, and to be better able to understand where the key areas of vulnerability are so they can be managed.
- Economic data that could support more comprehensive understanding of tangible and intangible costs over different timeframes and support the business case for expenditure in

areas outside of response that have longer rates of return. Also to support decision making, evaluating the consequences of trade-offs that contrast very different kinds of value.

Questions and feedback for the map from the workshop included:

- Data in relation to people with disability, including enough detail to understand notification and evacuations needs. The National Disability Insurance Scheme (NDIS) agency may be able to assist with dataset.
- Include additional layers for marine environment (important assets, values).
- How do we do this? Science, economics, geography: tertiary?
- Flood data?
- Where are the predictive layers? How reliable are they?
- Housing density layer?
- Soft infrastructure – can you map this spatially?
- Maturity level of data, do we have enough to tell people that they are really are at risk?
- How are existing geospatial systems used by risk owners (agencies) for decision-making linked?
- At what level are risk layers publically available? Is it coordinated and understandable (e.g., Holland aggregated risk layers that are fully publicly available [natural hazard]). Helps underpin insurance premiums.
- What other info is needed to add value?
- Is it a tool just for us? How can it empower communities? How can they contribute?
- Who and how do we capture parameters around values? How does the community inform that philosophy around value input?
- Data sets that specifically identify vulnerable group? Is there a link to determine resilience?
- How do you quantify intangible assets? For example, economic values to social factors like human wellbeing. More needs to be done to incorporate social factors, people don't always understand what's important until it's gone. Socio-economics often ignored. Suggestion drought lessons could be used as a proxy.
- Community online: how do you map? Can proxies be used?
- How will the tool capture uncertainty in the data? This may cause more risk. Require transparency in the data reliability/uncertainty.
- Are data sets pure and unconnected, how do you keep the quality? What is the connectivity?
- Need to test the link between data sets and assumptions about risk. For example, are the social data identified reliable indicators of vulnerability? The assumptions may or may not be correct. Suggest discussion with Geoscience Australia.
- How are our decision processes changing based on new and better data?
- What decisions can this tools influence? What can't? For example, statute? Clarify what decisions this relates to?
- Geoscience Australia work on coastal vulnerability. Street level could be a really useful tool for community.
- A portal where community can feedback into the system may build its robustness.
- Where else are people already doing this and how are they doing? For example, Dutch models.

Since the workshops, Emergency Management Victoria and the working group have discussed the future use of the map in more depth. End users were asked to identify the key questions regarding strategic planning and decisions that they would seek to answer with such a map. Our purpose was to use these questions and discussions around them to shape the map's future development. Outcomes from this meeting and the workshop have been:

- Instead of producing a tool for operational use, to use the map as a research tool to explore how to effectively combine different types of data to assist in 'sense-making'. This could be applied to tools being developed or tools currently used by the EMS to address specific questions or data applications.
- To focus on understanding the current tools in use in different areas of decision making and how they may be enhanced.
- Possible focus for regional level decision making.

3.18 NEEDS, BARRIERS AND OPPORTUNITIES

The workshops produced a number of common themes relating to needs, barriers and opportunities. The most common themes raised concerns about limitations of current decision-making structures, approaches, systems and tools. In particular, the inability of these to meet the emerging needs of communities, government and NGOs trying to implement resilience. The following themes were present in all three areas of need, barriers and opportunities:

- The need for longer-term thinking and planning in areas of policy and finance. Also planning to support transformation within and beyond the EMS.
- The development of support tools and systems (methods, processes, instructions, data and understandings) to enable strategic decision making, particularly in areas of social values and risk.
- Being able to assess social and environmental impact costs, especially intangible values, in order to support more effective evaluation during the decision making process.
- Effective engagement and greater inclusion across levels of government and non-government sectors in relation to strategic decision making for natural hazard management.
- Capacity and capability building that can be achieved in the face of resource constraints.
- Collaboration and integration across agencies, different knowledge areas and decision making systems and processes.
- Communication – establishment of common understanding across the Emergency Management Sector and also the broader community of risk, non-monetary valuation and strategic decision making.
- The ongoing development of risk knowledge (continuous learning and education).
- The building of robust risk cultures across society.

Although these themes were consistent across the workshops, the transitional pathways and specific needs were diverse and point towards a need for more flexible, innovation-based practice and funding models to support future development.

Specific actions raised in different states show the current diversity in approaches, contexts and relative levels of maturity related to strategic thinking, risk ownership and resilience. These discussions also highlighted some of the challenges facing the EMS in establishing a common understanding nationally of natural hazards and their strategic management.

3.18.1 Needs

The key themes (Table 4) across all groups were:

- Communication, education and effective engagement particularly with communities.
- Improvement of risk knowledge and understanding.
- Cultural change and transformation across both the public and private sectors.
- To understand vulnerability and both the tangible and intangible costs associated with these events to support expenditure decisions and long-term planning.

- For policy, finance and planning support, to enable activities that are longer term.
- Collaboration and integration across agencies and communities to enable better decision making.

Needs – all workshops			
Melbourne	**Sydney**	**Hobart**	**Adelaide**
1. When allocating risk, look at who can manage best and who may/may not be most affected by liability issues. 2. Provide communities with information so they can assess own risk and have measures to manage them. 3. Knowledge of how to facilitate shared spaces in the community. 4. Focus on natural assets. 5. Assets close to coast. 6. Consequences of land use change from a changing climate. 7. Need to understand impacts if we go this way or that way. 8. People's need –other tools and training are needed. 9. Need to recognise circularity in deriving data VFRR will use this as input in itself. 10. Need to understand what soft and hard infrastructure mean to people. 11. Need soft assessment disruption - no people, no money - no building. 12. Local risks: need to know more about caravans, boarding houses, homeless. 13. (mental health outreach workers) 14. Corporate knowledge integrity: people who know how to access, analyse and tell the story of the data. Get moved, restricted based on politics and changed perception. 15. Need to understand; What are the true costs? What are the social costs? What is the value proposition? 16. Need to know what the services are and where are they? What do people need? 17. Dispersed communities: fluidity of people around disaster events. Traditional support services, need to know where are they located?	1. Better land use controls. 2. Personal responsibility. 3. Acceptance of individual responsibility in managing risk. 4. Improved communication regarding risks and responsibilities. 5. Dollars. 6. Political will. 7. Funding to address the impacts of heatwaves before they occur. 8. Better cross-agency messaging. 9. Better strategic management. 10. Identify triggers for opportunity to improve infrastructure/services e.g. Blue Mountains fire re: built power lines overhead because was quicker but better to place underground if you have to completely replace. 11. Improved interagency and community/stakeholder planning and coordination. 12. Develop comprehensive adaptive. Management 13. Local risks: need to know more about what locals value. 14. Strategy and coordinated multi-agency and community approach. 15. Better understanding of hazard and vulnerability. 16. Risk identification and retrofit prioritisation	1. Access to relevant research. 2. Broader strategic and financial buy-in and preparation and planning. 3. Increased mitigation across hazards. 4. Practical, experiential, educational communication. 5. More education on community resilience. 6. Community engagement in management of bushfires and natural hazards across the PPRR spectrum. 7. More collaboration. 8. State level strategic and proactive leadership/coordination of all hazards disaster preparedness that includes human impacts management. 9. Social contract with government, individuals, NGOs and business to allocate risk management responsibilities. 10. Shift in thinking and responses to events. 11. From response and recovery to mitigation and preparedness. 12. Need ownership of risk by community. 13. Reprioritise EM expenditure on mitigation and preparedness through community development and community led planning. 14. Community consultation, identify risks. 15. Knowledge of risks, costs of impacts and value of solutions. 16. Need to continue funding recovery while shifting resources to mitigation and preparedness.	1. Money. 2. More events/disasters to change the hazard and awareness profile. 3. Commitment at political level to mitigate emergencies. 4. Reshaping culture of emergency management toward mitigation. 5. Greater emphasis on psycho-social impact. 6. Organisational resilience. 7. Educating business on the benefits of resilience. 8. More ongoing education programs around education. 9. Alignment with all levels of government and NGOs. 10. An agreed position and collaboration across all levels of government NGO, communities and individuals. 11. Engagement and education. 12. Risk/evidence based mitigation investment decision making. 13. Managing expectations of community i.e. you're on your own for 72 hours model. 14. Quantification and communication of risk to central government agencies to include risk in policy decision making. 15. Allocate responsibility across all levels of govt, NGOs and business. 16. Appropriate development control. 17. Funding to achieve mitigation treatment. 18. Improved understanding of risks accruing to different sections of the community. 19. Changed thinking, not business as usual or more of the same. 20. Better resilience through better integration of planning across safe and local government. 21. Greater emphasis on learning and communicating from previous incidents.

Table 3: Needs identified in all four workshops.

3.18.2 Barriers

In relation to barriers the key themes, outlined in Table 5, which arose in the workshops were:

- Apathy and complacency – the 'she'll be right mate attitude'.
- Lack of consistency and political will to support longer-term planning and activities.
- Poor communication.
- Lack of finance and funding for long-term activities across agencies and communities – tends to be a focus on more 'white knight' response-based activities.
- Lack of integration between agencies.
- Complexities of governance and lack of clear risk ownership and areas of responsibility.
- Government structures – siloed operational frameworks and lack of integration between agencies.
- Misuse of data and lack of understanding regarding what data to use and how to best use it.
- Lack of understanding of risk and how to value intangible values (particularly social values).
- Poor risk cultures and risk knowledge and the need for transformation across public and private sectors.
- The subjective nature of values – whose values are most important?

Barriers – all workshops

Melbourne	Sydney	Hobart	Adelaide
1. If you have oversubscribed agencies - tells you people at risk, but that is the start of the conversations not the finish.	1. Government budget allocation for risk elimination /reduction.	1. Funding opportunities.	1. Apathy
2. Storm and storm damage is biggest cost, so tends to stay the focus.	2. Clever burning.	2. Costs.	2. Cultural norms "she'll be right", "I deserve…"
3. Shared ownership and community/ individual/business responsibility is fantastic, but there needs to be 1 clear risk owner for it to be managed effectively.	3. Clever property protection: being prepared to safely use a bushfire and not just put it out.	3. Funding/resources.	3. No visual reminders, flood markers, flood maps
4. Complexity of institutional governance system (multi-layered) treasury focus on economic cost benefit analysis only.	4. Adverse to use of other people's skills and ideas.	4. Simplistic interventions.	4. Money.
5. Specific focus on values not currently taken up in planning mitigation effort.	5. Society attitudes, e.g., the fire engine will get to my house in time.	5. Lack of cooperation.	5. Politics.
6. The faster the change, the harder and more costly to place a value on infrastructure	6. Reliance on institutional responses.	6. Socio-economic literacy.	6. Mindset
7. Management and ownership of the asset	7. Community expectations.	7. Isolation.	7. Limited power within emergency management departments to act for mitigation.
8. Values are subjective.	8. Moral hazards (the wrong incentives).	8. Poverty.	8. Culture change from response focus and "she'll be right".
9. Delegation difficult, who owns it?	9. Fears of liability and risk aversion.	9. Understanding of ownership/ responsibility and collaboration.	9. Funding resources complacency.
10. Urban rural area: different perception of risk.	10. Recognition of the threat posed by heat waves.	10. Apathy.	10. Funding.
11. Hard assets easy to keep, intangibles, how do understand it?	11. Funding/resources.	11. Funding	11. Lack of money and resources.
12. Data use: Locally sourced? How do we use it? Data out of date as soon as it is put up.	12. Political will.	12. Communication.	12. Willingness to accept responsibilities and collaborate.
	13. Individual/community perception of need/risk.	13. No all hazards preparedness lead agency/body clearly defined in state EM arrangements.	13. Lack of political will or divers e.g., major events inquiry.
	14. Effective communication and community complacency.	14. Mandate or obligation for stakeholders to manage risk.	14. Working collaboratively across government levels, NGOs, communities and individuals; some strong blockers in government to it being a shared responsibility.
	15. Reactive political decisions overriding strategic plans or taking time to think about BEST response, not quickest.	15. Money and message, communication of risk/opportunities.	15. Competing priorities.
	16. Political willingness to apply change.	16. Poor communication engagement between EM sector and community sector.	16. Government will.
	17. Preference for post disaster response, i.e. a white knight.	17. Community apathy which only changes after a crisis.	17. Most vulnerable communities are precisely those where responsibility is most difficult to allocate,
		18. Policy and planning cycles not long enough for timescale of issue.	18. Free rider effect difficult to overcome without buyin.

Melbourne	Sydney	Hobart	Adelaide
13. Different parts of community value different things: decision making perspective, e.g., indigenous site may have less value for local communities. 14. Infrastructure and tangible assets are generally more known. 15. Policy abuse of data e.g., Brisbane kept wind (flood?) info but developed houses in risk area. They use uncertainty to manipulate – some agencies not happy to release data. 16. Transient populations: how do they know the risks and landscape? 17. Soft data, e.g., social data harder to find and maintain.			19. Vested interests, short-terms thinking/goals, lack of courage/commitment. 20. Lack of integration between agencies.

Table 4: Barriers identified in all four workshops.

3.18.3 Opportunities

The following opportunities, outlined in Table 6, were identified across all groups:

- Greater involvement of communities in the risk management process through meaningful engagement and development of user-friendly tools that enable them to more fully participate in decision making.
- Improvement of risk knowledge and risk cultures across public and private sectors through transformative and change management processes – in particular, the restructuring of organisational frameworks to allow for better collaboration and flexibility to support this.
- Leveraging other agendas such as adaptation to climate change and the associated funding opportunities.
- Increasing collaboration across public/private organisations and communities.
- Working towards an integrated approach to all hazards.
- Engaging and understanding communities and private industry and identifying their needs (what is important to them) in relation to natural hazards.
- Education and building risk literacy, particularly with children.
- Standardising aspects of language and developing common definitions and understandings across the EMS.
- Developing better ways to support long-term actions that are sustainable in the face of short-term thinking and political cycles.
- Better understanding and use of data.
- Development of tools to support decision making, particularly in the area of valuation of intangible assets.
- To understand the future better – potential of technology, future conditions, resource and people potential.
- Improve resource allocation and management through identification of resources, reduction of duplication, pooling of resources and frameworks to support collaborative sharing of resources.
- To encourage community-led activities and improve risk awareness in this area.

Opportunities – all workshops			
Melbourne	**Sydney**	**Hobart**	**Adelaide**
1. Ability to predict which technologies will cause a paradigm shift the way the economy operates and how this changes society and behaviour. 2. Changes in technology. 3. Changes in the value of infrastructure 4. Understanding the back up and redundancy arrangements available to help prioritise relief/recovery. 5. Education system - risk, hazard, resilience, get these things into schools. 6. Linking inter- dependencies between utilities and essential services and have them mapped. 7. Plan for next 30 years, not next election. 8. Communication tool with community. 9. Cooler spaces for heatwaves. 10. Crowd sourcing/ citizen science validation. 11. Understand what people care about e.g., social outcomes. 12. Resilience factors, e.g., community. Connectedness, e.g., football team. 13. Community groups - shared association. 14. The future: anticipating the black swan incidents that can't be picked up by data and require critical lateral thinking to predict and prepare for. 15. Manage expectations about what can and can't be managed effectively by governments. 16. Playful triggers map - Get communities involved, creates education and ownership.	1. Have all development approvals and planning controls supported by ANZ risk management standard. 2. Consistent message from all organisations re: personal responsibility. 3. Education and building social capital. 4. Local planning. 5. Urban planning to mitigate heat island and facilitate social engagement (i.e. more green roofs, green areas and social space). 6. Incorporation of local government into resilience and recovery. 7. Funding to implement resilience capacity building. 8. Engaging with the private sector. 9. Leveraging local expertise, knowledge and resources first. 10. Increased mitigation funding and utilisation of industry knowledge. 11. Tying into the existing bush fire risk management plan and strengthening components of this plan. 12. Consolidating resources and sharing expertise.	1. Identification of solutions. 2. Shared understanding of responsibility. 3. Build on what we have. 4. More community engagement. 5. More communication across agencies/government/community. 6. Collaboration: beginning with local communities through LG, SG, FG private enterprise. 7. Current grass roots approach to resilience in bushfire preparedness. 8. Education of the younger generation to value the strategic management of bushfires and natural hazards across PPRR. 9. Thinking outside the square, with more effective use of current funding across EMS. 10. Redefine state and regional social recovery committees to big social preparedness recovery bodies. 11. Improved outcomes and achievement of objectives through collaboration. 12. For agencies to mainstream disaster resilience language and describe what they do in terms of resilience building. 13. Education and focussed/targeted spending e.g., visible mitigation preparedness. 14. Leverage off review of national disaster funding. 15. Emergency services engage with community (TFS) opportunity led recovery. 16. Model success stories 17. Build in psycho-social recovery literacy.	1. Productivity Commission and mitigation. 2. OAP: leadership to prepare communities. 3. Collaborations with key stakeholders in peace time. 4. Source funding with key agencies. 5. Public private partnership. 6. Using outputs from research: science > EMS practice. 7. Environmental sustainability – flood levies for environmental watering. 8. All hazards education program. 9. Already good information and research, just roll it out. 10. Community engagement to create awareness through education. 11. Development of an emergency risk management framework that directs (or at least influences) resource allocation 12. Leverage off recent events to bring people/organisations to work collaboratively. 13. Educate/inform the children, this will then flow on to households. 14. Collaborative funding coordination. 15. Increase of data around changing climates should allow for better discussion of increasing frequency and magnitude of events. 16. For SA after Sampson Flat Bushfire. 17. Availability of short-term funding. 18. Consideration of natural hazards becomes part of everyday planning, not a special case. 19. Regional/outer metro SA impending industry closures and employment shocks. 20. BNHCRC 21. Climate change adaptation. 22. Next disaster 23. SA small state willing to change/do better. 24. They are all opportunities, we need to look at the benefits to other sectors/individuals from mitigation actions, e.g., green open space for urban heat island effect, benefits community, property value, recycled water use, bushfire mitigation.

Table 5: Opportunities identified in all four workshops.

4 TOWARDS A VALUE-BASED DECISION-MAKING PROCESS FOR RISK OWNERSHIP

The use of values in the decision-making process is not only an important part of understanding what is important to communities impacted by natural hazards, it can also assist communities to develop strategies that build the resilience necessary to sustain these values in a meaningful way. This process is not without challenges, as it requires extensive negotiation, collaboration and meaningful engagement to achieve fruitful outcomes. It is not a short-term process, but a long-term conversation between multiple parties that requires a flexible, robust process to support it.

Key components of the process and questions identified from this process for risk ownership are described in TABLE 6.

Process stage	Key questions
Establish a common understanding of the task	• What is the scope of the assessment, e.g., is it a local community level, state level, business level? • Is there a criteria to establish what an acceptable level of risk is for the group/organisations/community?
Identify values and connectivity between values	• What values are important and why are they important? E.g., what benefits do they provide? • What values are dependent upon other values to sustain their function? • What values support other values to maintain their function? • What values are mutually dependent upon each other in order to sustain their function?
Identify priority values and establish ownership of these and the associated values and gaps in ownership	• What are the priority values for the group and why are they a priority? • What are the benefits of this value, e.g., social, environmental, economic? • Who owns this value/s? • If there are multiple owners of a value, who is the primary owner? • What supporting or dependent values are associated with this value/s? • Who owns these values? • Are there gaps in ownership across the identified values?
Identify how these priority values are at risk and what hazards they are at risk from	• What hazards are likely to impact these values? • What are the likely consequences/risks of these hazard scenarios? • What area do these risks and consequences belong to, operational, system, hazard, financial? • What is the level/degree of possible impact being allocated to the hazard/s? • Do these consequences/risks impact across (short, medium, long-term) time scales? • If they impact across different time scales, do they change or increase across short, medium, long-term time scales?

Process stage	Key questions
Establish who owns the potential risks and consequences	• Who owns the risk? • Who owns the impact of the risk across the short, medium, long-term timeframe? • How do they own this (responsible, accountable, pay)? • If there are multiple owners who are the lead owners in the above areas of responsibility, accountability and payment who is the primary owner in each area?
Identify actions that are needed to address these risks across short, medium and long-term timeframes.	• Can this risk be treated or mitigated? • If yes to the above question, how can this be treated/ mitigated?
Select actions	• What is likely to be most effective of the identified treatments? • What is likely to be the most cost effective, resource efficient action?
Identify owners for these actions; level of ownership, e.g. lead owner	• Who is the obligated owner and how is this obligation placed upon them? e.g., policy, contract, asset or ownership, legal requirement, social contract? • How do they own the action, e.g., are they accountable, responsible and are they paying for the selected action or impact?
Allocate ownership of specific tasks to owners	• Do the obligated risk owners have the capacity and resources to be able to fulfil allocated ownership? • If the selected risk owners cannot fulfil their ownership obligations, are there other ownership options available? • If there are no other options available are there strategies or plans that can be put in place to ensure ownership is achieved or that the risk posed by this ownership gap is mitigated? • If this is not able to be resolved, what is the most likely outcome that will result from this?

Table 6: Stages and key questions for value-based decision making process of risk ownership.

4.1 NEXT STEPS

These workshops have been instrumental in identifying the key needs and questions to support the development of the following outputs:

- A process-based framework for risk ownership to support the current NERAG process.
- The development of an economic geography that is represented spatially and will support decision makers in strategic planning areas.
- An institutional framework for risk ownership.
- A Values at Risk map.

Our next steps will be to consolidate findings to date and to work closely with our end users to develop the framework and support materials for the above outputs.

4.2 FURTHER RESEARCH

These workshops have highlighted the complexity of decision making associated with the strategic management of natural hazard risks. Knowledge gaps and key questions identified as part of the workshop process suggest a potential need for further research in the following areas:

- How to integrate research, practice and everyday understanding of risk into decision-making frameworks for strategic planning.
- Identification of the current and emerging role of data and technology in decision making. This takes on several forms:
    - Hazard data allowing a spatial approach to multi-hazard analysis is not yet in place nationally, despite some significant advances for single hazards, especially fire.
    - Some of the intangible values that were identified as important in the workshops are poorly quantified and would be amenable to data mining techniques and the like.
- Identification and analysis of skills required and current skills gaps related to strategic decision making, and identification of risk across multiple hazards and temporal scales.
- Analysis of effectiveness of current decision-making tools in use.
- Developing a better understanding of risk ownership as a system using applied network analysis.
- Analysis of the current balance of public-private ownership of values and risks.
- Further explorations of the links between risk ownership and institutional arrangements surrounding natural hazard risk management.
- Further development of non-monetary economic valuations for application at the community scale.

5 CONCLUSION

The key findings from these workshops were:

- Many gaps remain, and further work is needed to develop more robust institutional and organisational arrangements that support risk ownership and strategic planning of natural hazards.
- When making strategic decisions it is important to use a structured process that examines the system of values and risks together, rather than assessing these aspects in isolation.
- Allocations made during these workshops indicate imbalances with current public/private sector arrangements between ownership of values and ownership of risk.
- The social value category had the highest allocation of both values and risk.

The workshops explored the role of values and risk ownership in strategic decision making in the EMS. They have highlighted the complexity and the challenges of making value-based strategic decisions in relation to natural hazards and the cultural, political and organisational barriers faced by different organisations. They have also highlighted the importance of social values – in particular the need for greater inclusion of these as part of the decision-making process.

Although the private sector was allocated ownership of half of the values, the public sector was allocated ownership of over two thirds of the risk. Further research is needed to clarify if these findings reflect the real levels of private/public ownership. Also to identify what balance of public/private ownership is going to be sustainable for the future.

'People always seem to talk about disasters as continuity but in my experience it is often disjointed and disconnected.'

South Australian Workshop Participant

One of the key messages from our workshops was that expectations in relation to natural hazards need to be realigned to match current capacities and capabilities across both the public and private sectors. People need to understand the risk properly before they will accept the responsibilities they need to fulfil. There is a unique opportunity to redefine areas of natural hazard risk management to build strategic pathways with communities to support future resilience. This requires working with uncertainty and rethinking how success might need to be measured.

'Plan for the future because that is where you are going to spend the rest of your life.'

Mark Twain

Being able to identify what is valued at a local level, and who owns the natural hazard risk beyond the event, is a foundational step for future resilience. However, as our environment continues to change, we also need to be able to plan strategically to achieve this goal. This enables us to determine the most efficient use the resources, how to build on current areas of strength, and how to develop emerging areas of practice. At the heart of risk ownership are our communities and our businesses, and the need for common understanding and collaboration between them and our public sectors. This is not a short-term proposition – it is one that needs commitment and support for the long-term.

APPENDIX 1: WORKSHOP AGENDA

Understanding values at risk and risk ownership with natural hazards workshop Agenda Date and time: 7th of August, 10.00 - 5.00pm Venue: State Control Centre, Level 4, 8 Nicholson Street, East Melbourne (Bogong & Baw Baw Rooms)		
9.30am	Registration	
10.00am	Workshop introduction	Professor Roger Jones
10.10am	Welcome	Dr Michael Rumsewicz, Research Manager, Bushfire and Natural Hazards CRC
10.20am	Stakeholder overview	Mr Liam Fogarty Director, Knowledge & Engagement, Fire & Emergency Management Land, Fire and Environment, Department of Environment, Land, Water & Planning
10.30am	Project overview	Professor Roger Jones Victoria Institute of Strategic Economic Studies, Victoria University
10.45am	Values at risk and risk ownership presentation	Dr John Symons Research Fellow Victoria Institute of Strategic Economic Studies, Victoria University. Celeste Young Collaborative Research Fellow Victoria Institute of Strategic Economic Studies, Victoria University.
11.15am	Group activity and discussion	Group activity
11.45	Morning tea	
12.00am	Exercise 1 Values at risk mapping exercise, gaps and interactions	Group activity
1.15pm	Lunch break	
2.00pm	Feedback from groups	Group activity
2.15pm	Exercise 2 Risk ownership, allocation and interactions	Group activity
3.45pm	Afternoon tea	
4.05pm	Exercise 3 Needs, barriers and opportunities	Group activity
4.35pm	Observations	Group discussion
4.50pm	Workshop summary	Professor Roger Jones
5.00pm	Close	

APPENDIX 2: LIST OF VALUES FOR CONSIDERATION

Area	Core value
Social/human assets and infrastructure	
	Mobility
	Culture
	Health
	Community
	Equity
	Households
	Children
	Population growth
	Safety
Environmental assets and infrastructure	
	Parks
	Ecosystem health
	Biodiversity
	Amenity
	Agricultural land
	Vulnerable zones
	Environmental stress factors
	Environmental contamination
Built assets and infrastructure	
	Hard infrastructure
	Essential services
	Location of state assets (exposure)
	Location of private assets
	Housing
	Industry and business
Economic (production of goods and services)	
	Income (sector, activities)
	Employment
	Sensitive sectors
	Vulnerable sectors
	Business continuity
	Productivity
	Income/employment diversity
	Importance at the local scale
	Diversity

APPENDIX 3: END-USER SURVEY BNHCRC B2 PROJECT

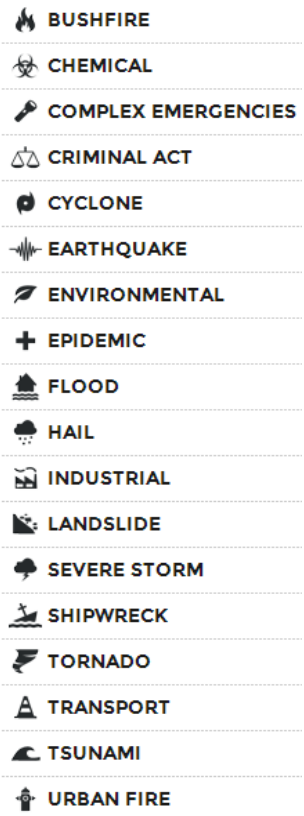
The purpose of this survey

The purpose of this brief survey is to help us understand how you might use the research we are undertaking. In particular, we are interested how you envisage using the values at risk (values at risk) map, what type of format might be most effective for your needs and how this might work with your current operational activities.

We will be contacting you to interview either yourself or an appropriate person in your organisation via phone. It is anticipated that the interview will take between 30 to 60 minutes depending on the responses to these questions.

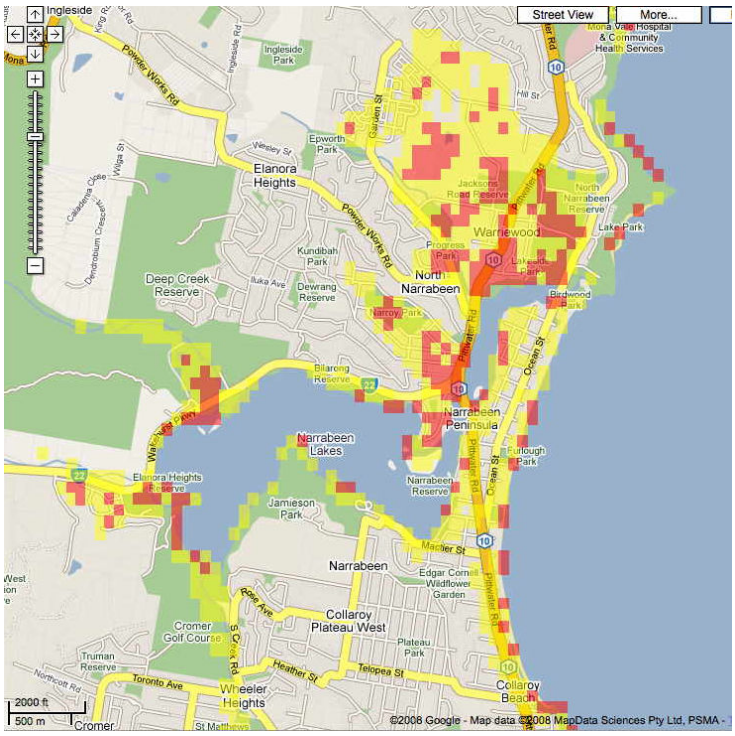
Questions

1. What are the key reasons you would use the values at risk map?
2. What tools (e.g., maps, web based applications, operational tools) do you currently use to make these sorts of decisions?
3. Who else in your organisation do you envisage might use the values at risk map?
4. What tasks would they use it for?
5. Do the symbols shown below make sense in relation to what they represent? If not why and what symbol would you use?

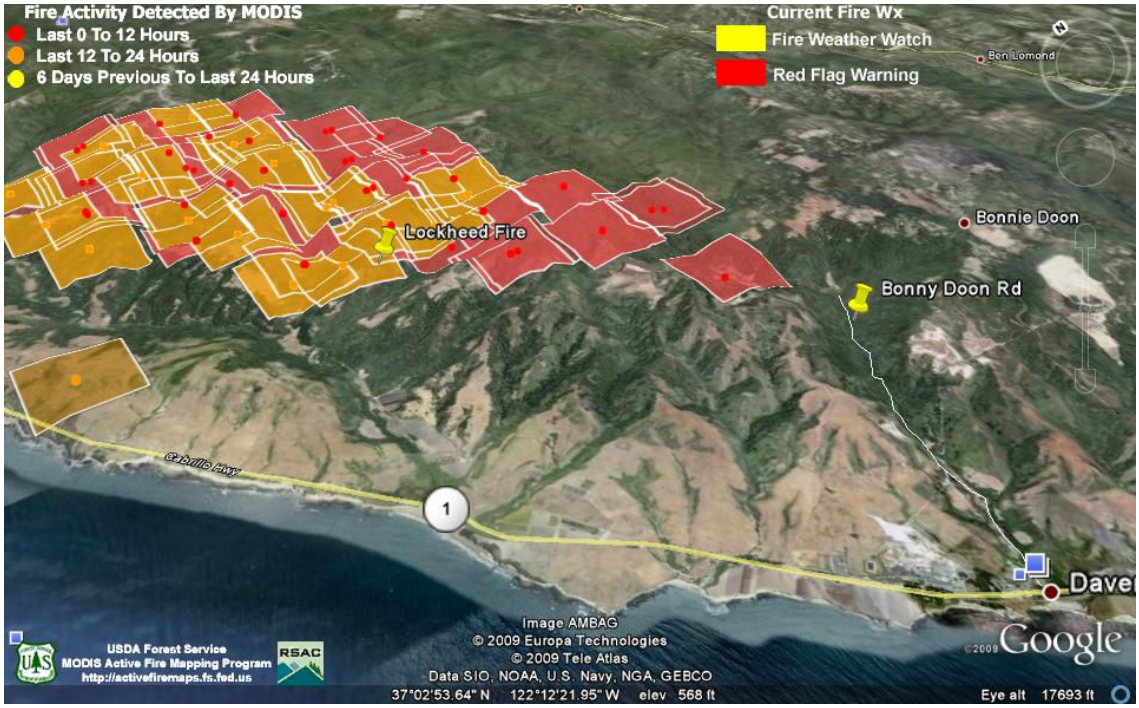


6. How easy is it for you to understand the following maps and why?

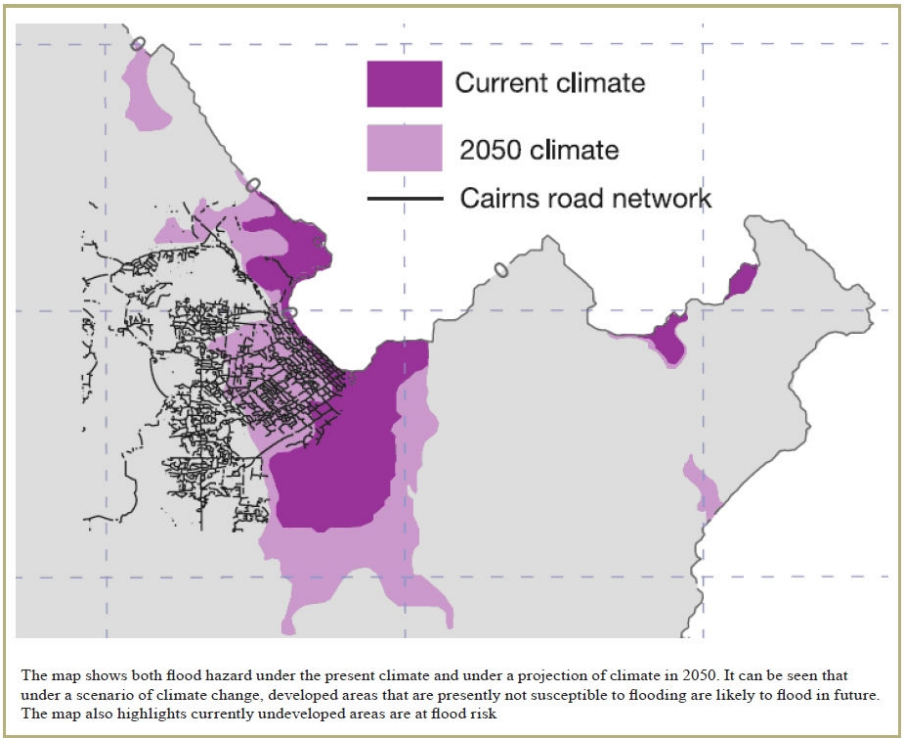
Map 1: Inundation map



Map 2: Google Earth map showing fire activity

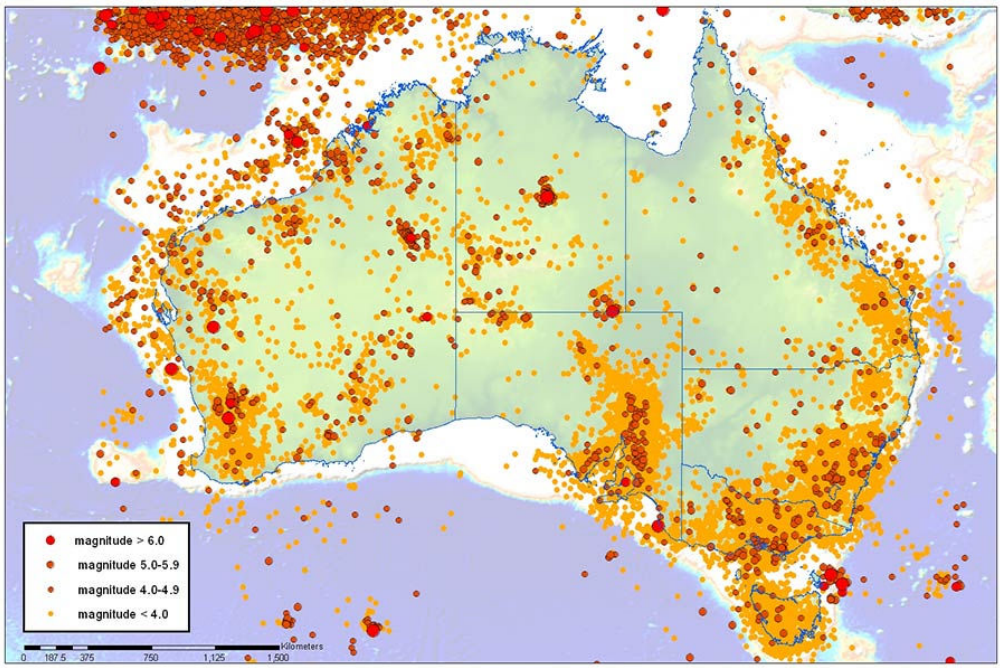


Map 3: Flooding map with scenario

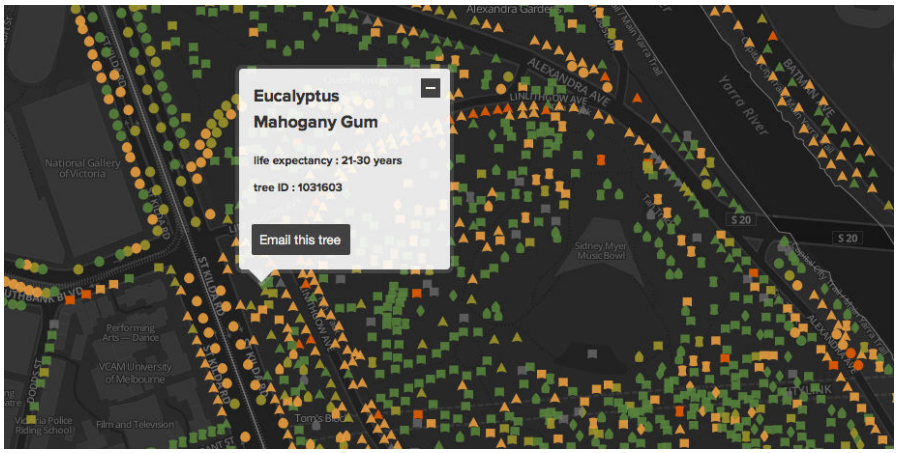


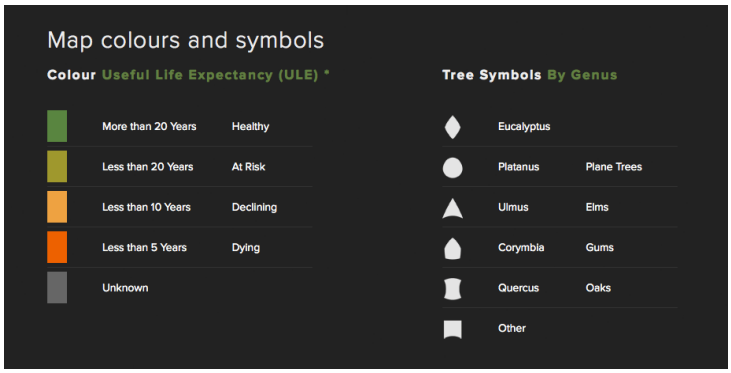
The map shows both flood hazard under the present climate and under a projection of climate in 2050. It can be seen that under a scenario of climate change, developed areas that are presently not susceptible to flooding are likely to flood in future. The map also highlights currently undeveloped areas are at flood risk

Map 4: Earthquake map

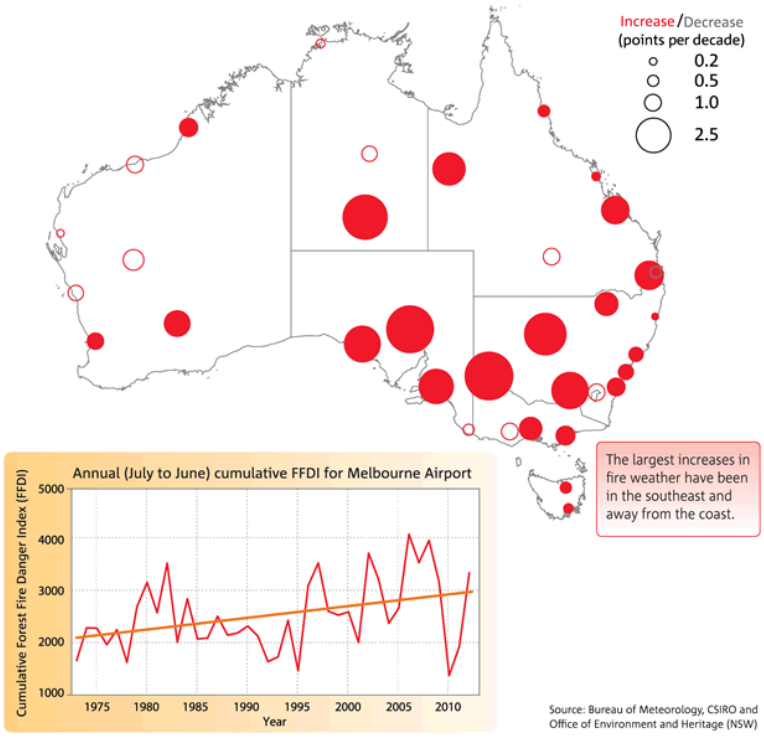


Map 5: City of Melbourne tree map

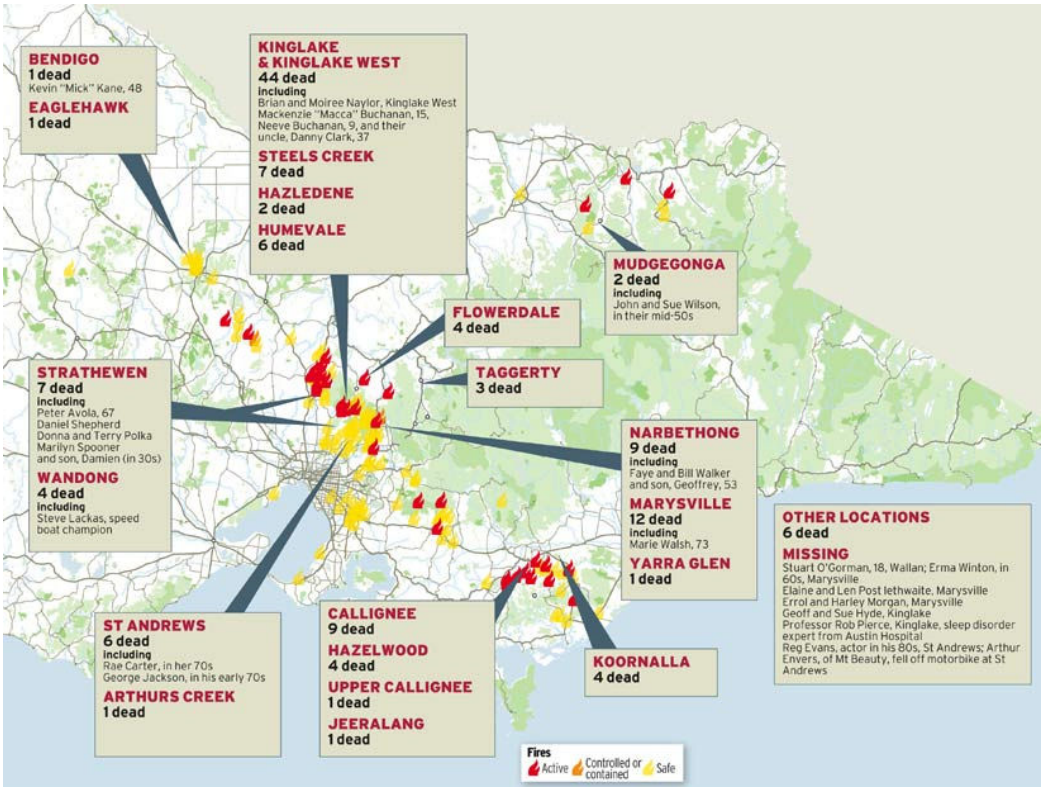




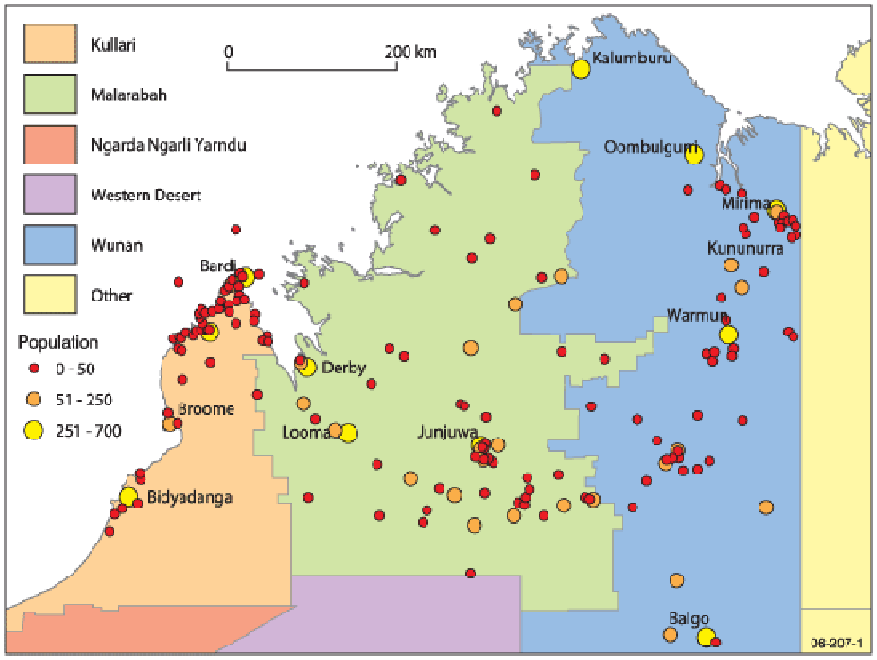
Map 6: Increase in fire weather map



Map 7: Fire case study map



Map 8: Indigenous communities at risk of natural hazards



APPENDIX 4: WORKSHOP SCENARIOS

Note: Each of the following scenarios was slightly modified to fit in with the circumstances of each state in which the workshop was held.

Urban area (acute heatwave)

We are investigating an urban area that is the size of a large local government region of a major city. The population of the area is 150,000. It contains a large proportion of housing, a permanent creek with open trails, meadows and patches of riparian bush and wetlands and a regional urban park. There is some industry, mainly logistics and warehousing.

The transport network is complex with connectivity interrupted by a train line and major freeway (not on the same reservations). The train system is the most important mode of public transport, and a local bus system has high coverage, but long travel times.

The socio-economic profile is low to middle income, with a large expanse of public housing and lower quality private rental in a number of pockets.

Local industries are logistics, warehousing, megastore, factory outlets. Most of the jobs for those in work are outside the region. Local unemployment rate is close to 15%.

Several cultural groups concentrated in areas of cheaper housing are characterised by a high proportion of people who have English as a second language. Older generations often with very poor or no English may rely on family members for translation. Poor quality housing and limited transport access in pockets conceals 'hidden stress'. Many of these areas have limited walkability and/or access to open space. Car ownership is lower than most other metro regions.

The area is serviced by one large hospital, with both public and private health centres. However, the ratio of GPs to population is low due to it being a low income area.

The creek and creek reserve is flood prone and affected by heavy downpours, but little property is threatened, except for a few market gardens, riding facilities, etc. Localised flash flooding is also possible in some streets.

Fire risk is localised. There are patches of high quality flora in linked parkland and isolated nature reserves that contain reasonable fuel loads. Fire risk in the regional urban park is relatively high for one area of remnant bushland 50 ha in extent. Main risk to non-park infrastructure is through ember attack.

Design event: 3 days of 45°C or above with one night >35°C. This has been primed by an earlier event of at least 2 days above 45 °C within the last ten days. Local fire risk is an issue with up to 200 properties being within 80 m of high conservation areas with moderate to high fuel loads (and narrower buffers).

Key vulnerabilities:

- Trains are vulnerable to temps over 36 °C and highly vulnerable to 38+ °C
- Limited scope for night-time cooling in the region accentuate local heat.
- Few areas (natural or built are available locally offering public cooling).

Rural area (flood risk)

A large rural town of 7,000 people is adjacent to an inland river with an extensive floodplain. Part of the town is in the floodplain, separated from the current flood-prone area. East of the town is a large, undulating forest area, with high conservation value box-ironbark forest interspersed with rural properties. On the floodplain and adjacent riverine plains is high value irrigation-fed agriculture, which supplies food manufacturing business within the town.

The population of the town is older typical of rural settings, but employment opportunities have also brought in immigrant families with younger children. Youth unemployment is relatively high and employment opportunities fluctuate seasonally.

A National Park edges up to tree change and rural amenity farmlets and that area is highly dependent on tourism with cross-country cycling and food tourism a growing industry. The boundary of the forest area is high irregular with some pockets having poor access with a number of no-through roads. Fire danger is acute on catastrophic fire danger days, affecting up to 300 properties, recreation and tourism.

Main areas of employment in the town and surrounding area are: tourism 22%, agriculture 18%, food manufacturing 15%, services and commerce 35%.

A capital city railway line runs through town and is vulnerable to being cut in larger floods. There is an equivalent highway coming into town from the state capital with two major routes exiting.

To the west and north is wide access into mixed grazing and farming lands, mainly extensive agriculture. Food manufacturing with intensive agricultural produce source situated on the floodplain.

Design event: Eleven moderate to severe floods linked to La Niña – negative Indian Ocean Dipole have occurred over the past century. These events are expected to intensify due to warmer waters of NW Australia (as occurred in 2010–11). A one in one hundred year flood has the potential to inundate over 50% of the intensive floodplain agriculture and several manufacturing facilities (warehouse and packing). Due to uncertainties about the statistics and changing conditions, the limits around flood ratings have low confidence. Larger floods may be possible at any time, even in drought conditions.

Key vulnerabilities:

- Train line can be washed out and highway to the south cut.
- Due to uncertainties about the statistics and changing conditions, the limits around the 1:100 rating have low confidence. Larger floods may be possible at any time, even in drought conditions.
- The levee has created an air of confidence within the town, but 20% of the housing and 50% of manufacturing is vulnerable to a levee breach.
- The region is subject to multiple risks (e.g., flood, fire, heat).

Forested upland region (risk of firestorm)

This is a hilly, mountainous and forested region of central dividing ranges. Fifty-five percent is forested. The region also contains horticulture requiring winter chill, numerous boutique wineries and is an area of winter sports-summer recreation with bike-riding becoming more popular. The regional population is 85,000, mainly in small towns and villages. The region also contains important water catchments feeding the capital city and large rural cities, in addition to some irrigation supply. Hydro power generation is also important within the region.

Most of the regional income is from agriculture and tourism including food tourism and forestry. Both local timber milling and high volume pulp export take place. However, the region is also a very important water source, although little of it is consumed in the region.

Transport is mainly by road, but due to the mountainous terrain over half of the region is not highly networked, meaning that many areas are only fed by one or two routes.

Design event: the region is most vulnerable to firestorm conditions occurring during catastrophic fire danger conditions. Modelling has indicated which areas are most at risk of burning and where likely refugia occur, but also points to the potential that if a high proportion of vulnerable areas went up, available resources would be exceeded and a high degree of 'triage' required. Worst case would see several communities devastated from an out of control fire, with major disruption to local infrastructure and commercial activities. Increased event frequencies and other hazards (e.g., flash flooding) could upset long-term recovery.

Key vulnerabilities:

- A number of towns and villages are vulnerable.
- The dispersed population in the region means that if the worst case happened many people would be fending for themselves if they had remained in the high fire danger areas.
- Flash flooding following firestorm events, with debris flows, etc, has been recognised as a threat to water supply, especially of potable water, which is 30% of the regional yield and supplies large urban populations.
- Quadruple whammy effect on food, forest, fun and water (smoke tainted wine, water quality loss, tourism interruptions and forestry resources).

APPENDIX 5: RAP EXERCISE OUTPUT

Risk ownership and allocation of recovery tasks RAP exercise– Victoria only

	Up to 12 months	1-2 years	2+ years
Fire			
Social **Social dysfunction**	**R**: LG addresses identified areas, State coordination **A**: State **P**: Pay state and funding, depends on scope	Same as before	No owner
Environmental **Water quality**	**R**: State **A**: State **P**: State	N/Applicable	
Economic **Loss of income**	**R**: No owner → → No owner **A**: B&I → No owner **P**: B&I → Community, B&I → Community, B&I		
Social **Local values lost**	**R**: Shared **A**: State Gov, EMV, ESO **P**: State, charity	**R**: TBD locals (based on capability **A**: Local Government **P**: Gov grant funding	**R:** No owner **A**: Community **P**: State and Fed Gov - community development grants
Environmental **Visual reminder of loss**	No allocations	No allocations	No allocations
Economic **Lack of mojo**	**R**: Insurer, recovery workers **A**: Treasury – political accountability **P**: Insurance	**R**: Small business **A**: **P**: Insurance	**R:** **A**: Government agencies (winding down) **P:**
Flood			
Social **Psycho-social livelihood**	**R:** Collective, NGOs, government, individual, community groups → → → **A**: Individual, and households/family and employers **P**: Government pays and NGOs service, and individual and community		
Environmental **Water quality and supply**	**R**: Land care, collective, water authority **A**: State government, water authorities **P**: Individual, community government	**R**: Landcare, Parks Victoria → **A**: Water authority **P**: Community taxes, rehabilitation of assets	
Economic **Financial aspects of livelihood**	**R:** Collective, government and insurance responsible to support **A**: Individual, insurance, government **P**: Individual community/NGOs, government, insurance	**P**: Government and individual	

Risk ownership and allocation of recovery tasks RAP exercise– Victoria			
Heatwave			
	Up to 12 months	**1-2 years**	**2+ years**
Social **Mental health and psychological impacts**	**R:** Multiple owners **A:** State Gov (system) **P:** Individual and state	**R:** Individual, community Heat-induced crime Not likely to be dedicated program Possibly short-term program	
Environmental **Animal health**	**R:** Owners, operators and rescuers **A:** DELWP > wildlife, DEDJTR domestic and livestock **P:** Owners, operators, SG, insurers	Animal rescue Species surveys, Habitat improvements Relocation Sanctuary Volunteers	
Economic **Reputational risk**	**R:** CEO and board, **A:** CEO, secretary executives, decision makers, **P:** Shareholders, owners, State Gov, insurers	Leadership changes Restructures Share price fluctuation Disinvestment Communications, image management Brand protection	Transformation Rebranding Adaptation Market adjustments New business

APPENDIX 6: IDENTIFIED VALUES BY WORKSHOP GROUPS ACROSS DIFFERENT HAZARD SCENARIOS

Victoria	
Value	**Category**
Flood	
1. Micro economy (boutique)	Economic
2. Manufacturing	Economic
3. Livelihoods	Social
4. Agriculture	Economic
5. Tourism	Economic
6. Climate high level forest and environment	Environmental
7. Emergency services and management agencies	Social
8. Levee, bridges infrastructure (roads, lifelines, communication, irrigation, railway)	Built infrastructure
9. Welfare and wellbeing	Social
10. Homes and placement	Social
11. Faith, values and placement	Social
12. Waterways	Environmental
13. Schooling and education	Social
14. Sports and recreation, community activity	Social
15. Heritage	Social
16. Security	Social
17. Governance and leadership, strategic planning	Social
18. Social cohesion	Social
19. Amenities	Built infrastructure
20. Social cohesion	Social
21. Cultures and community diversity	Social
Heatwave	
22. Economic wellbeing	Economic
23. Law and order	Social
24. Health services	Economic
25. Health	Social
26. Isolation (connectivity)	Social
27. Communication	Social
28. Fire risk	Environmental
29. Flood risk	Environmental
30. Water	Environmental
31. Transport	Built environment
32. CALD communities	Social
33. Economic well being	Economic
34. Social needs	Social
35. Parks and reserves	Environmental
Fire	
36. Income	Economic
37. Tourism	Economic
38. Local business	Economic
39. Recreation and sport	Social
40. CALD (refugee 7 asylum seekers), tourists?	Social
41. Human health (physical and mental)	Social
42. Life	Social
43. Death	Social
44. Quality of life	Social
45. Health services	Economic
46. Pickers	Economic
47. Mentally unwell	Social
48. Old people	Social
49. Homeless people	Social
50. Tourist and caravan	Economic
51. Low income	Economic
52. Community connectedness	Social
53. Community cohesion	Social
54. Roads	Built infrastructure
55. Native plantation	Environmental
Value	**Category**

56. Water quality	Environmental
57. Electricity infrastructure	Built infrastructure
58. Water supply	Environmental
59. Catchment	Environmental
60. Communication network	Built infrastructure
61. Communication network social	Social
62. Food security	Social
63. Biodiversity	Environ
64. Church spiritual	Social
65. Basic social amenities (shops, petrol, town hall, etc.)	Built infrastructure
Heatwave	
66. Public transport	Built infrastructure
67. Transport	Built infrastructure
68. Industry and business	Economic
69. Water supply	Environmental
70. Community functioning	Social
71. Health	Social
72. Local economy	Economic
73. Telecoms	Built infrastructure
74. Banking and finance	Economic
75. Recreation	Social
76. Cultural interests	Social
77. Welfare	Social
78. Amenity	Environmental
79. Energy	Built infrastructure
80. Environment	Environmental
81. Education system and child care	Social
82. Fire safety	Social
83. Housing	Built infrastructure
Flood	
84. Amenity (sport services, education, childcare	Built infrastructure
85. Employment (diversity of employment)	Economic
86. Liveability	Social
87. Diversity community	Social
88. Established services (infrastructure)	Social
89. Environment (high value)	Environ
90. Community cohesion	Social
91. Community sustainability	Social
92. Connectedness (transport) roads and rail	Built infrastructure
93. Safety	Social
94. Levee	Built infrastructure
95. Continuity and access of services	Social
Fire	
96. Hydro power	Environmental
97. Water	Environmental
98. Dispersed built environment	Built environment
99. Roads	Built environment
100. Community buildings (pubs, clubs)	Built environment
101. Communication (cell, internet)	Built environment
102. Community connectedness, physical	Built environment
103. Community connectedness, social	Social
104. Parks	Environmental
105. Rivers	Environmental
106. Employment	Economic
107. Forestry	Environmental
108. Tourism	Economic
109. Wineries	Economic
110. Community as a system	Social
111. Life	Social
112. Wellbeing	Social
113. Livelihood	Social
114. Biodiversity	Environmental
115. Amenity (environmental)	Environmental
116. Political reputation	Social

Tasmania	
Value	**Category**
Flood	
1. Roads and bridges	Built infrastructure
2. Community health	Social
3. Local political economy	Social
4. Water and waste water	Environmental
5. Cultural life	Social
6. Employment	Economic
7. Power infrastructure	Built infrastructure
8. Health and safety	Social
9. Telecoms	Built infrastructure
10. Recreation (sports infrastructure and activity)	Built infrastructure
11. Built assets	Built infrastructure
12. Social services (education health, community welfare)	Social
13. Business	Economic
14. Housing	Built infrastructure
15. Mental health	Social
16. Community connection and cohesion	Social
17. Cultural life	Social
18. Sustainable demographic mix	Social
19. Tourism	Economic
20. Business continuity	Economic
21. Heritage	Social
22. Property values	Economic
23. Farms	Economic
24. Irrigation infrastructure	Built infrastructure
25. Food manufacture	Economic
26. Wetlands	Environmental
27. Livestock health	Economic
28. Environment	Environmental
Fire	
1. Forest	Environmental
2. Tourism	Economic
3. Social connectedness (social capital)	Social
4. Viticulture	Economic
5. Water supply	Environmental
6. Agriculture	Economic
7. Recreation	Social
8. Horticulture	Economic
9. Healthy people (mortality, psycho health, injury, illness)	Social
10. Small business and sole traders	Economic
11. Saw mill	Economic
12. Industry	Economic
13. Energy supply	Economic
14. Roads and bridges	Built infrastructure
15. Community facilities (hospital, school, church, childcare)	Built infrastructure
16. Private facilities	Built infrastructure

Value	Category
Heatwave	
17. Land animals	Economic
18. Water animals	Economic
19. Food	Economic
20. Transport	Built infrastructure
21. Volunteers	Social
22. Emergency services, resources	Social
23. Mobility	Social
24. Biodiversity (bees)	Environmental
25. Agriculture and aquiculture assets	Environmental
26. Community cohesion	Social
27. Communication	Social
28. Schools	Built infrastructure
29. Local income	Economic
30. State income	Economic
31. Recreation	Social
32. Hospitals	Social
33. Public built infrastructure	Built infrastructure
34. Industry productivity	Economic
35. Private infrastructure (pub, shopping centre)	Built infrastructure
36. Community welfare	Social
37. Energy infrastructure	Built infrastructure
38. Tourism	Economic
39. Life	Social
40. Older and ill people	Social
41. Families	Social
42. Environments (social, economic, environmental and built)	Environmental

South Australia	
Value	**Category**
Heatwave	
1. Essential services, power, water, waste water, waste collection, emergency response	Social
2. Volunteering	Social
3. Industry and local outputs	Economic
4. Natural landscapes	Environmental
5. Health	Built infrastructure
6. Social capital	Social
7. Open space	Environmental
8. Employment	Economic
9. Transport	Built infrastructure
10. Resilient landscapes	Environmental
11. Housing (thermal comfort)	Built infrastructure
Flood	
12. Agriculture	Economic
13. Environment	Environmental
14. Business	Economic
15. Tourism	Economic
16. Water source quality	Environmental
17. Viticulture	Economic
18. Critical infrastructure	Built infrastructure
19. Sports and recreation	Social
20. Employment	Economic
21. Indigenous values	Social
22. Public health	Social
23. Individual health	Social
24. Social capital	Social
25. Social fabric	Social
26. Psycho/social	Social
27. Interconnectedness	Social
28. Schools	Built infrastructure
29. Childcare	Social
Fire	
30. Social communication network	Social
31. Waste management	Environmental
32. Communication	Social
33. Sewerage	Environmental
34. Electricity	Built infrastructure
35. Quality of life of future children	Social
36. Life cycle (social)	Social
37. Resilience	Social
38. Critical infrastructure	Built infrastructure
39. Quality of life elderly people	Social
40. Household income	Economic
41. Local employment	Economic
42. Local food production	Economic
43. Horticulture	Economic
44. Future liveability	Social
45. Wellbeing and lifestyle	Social
46. Health	Social
47. Physical health	Social
48. Amenity	Environmental
49. Ecosystems services	Environmental
50. Natural landscapes	Environmental
51. Heritage	Social
52. Social capital cultural	Social
53. Transient population	Social
54. Tourism	Economic

New South Wales		
Value		**Category**
Flood		
1.	Health security (mental health, wellbeing)	Social
2.	Environmental biosecurity (green spaces, forests, livestock, crops, fauna and flora)	Environmental
3.	Diversity	Social
4.	Vulnerable communities (disability, aged pension, very young person, gender, indigenous)	Social
5.	Cohesion	Social
6.	Connectedness	Social
7.	Social order, safety crime	Social
8.	Potable water	Environmental
9.	Sanitation	Built infrastructure
10.	Communication	Built infrastructure
11.	Transport infrastructure	Built infrastructure
12.	Utilities	Built infrastructure
13.	Town	Built infrastructure
14.	Properties	Built infrastructure
15.	Business	Economic
16.	Recreation facilities	Built infrastructure
17.	Employment (agriculture production, manufacturing, small business)	Economic
18.	Employment creation (youth, migrants)	Economic
19.	Livelihoods	Economic
20.	Living memory	Social
21.	Sense of place	Social
22.	Community history	Social
23.	Economic vibrancy	Economic
24.	Social vibrancy (arts culture, theatre, dance literature)	Social
25.	Food security	Social
26.	Liveability	Social
27.	Access and mobility	Social
28.	Authorities (essential services, health medicines, education)	Social
Heatwave		
29.	Social disruption	Social
30.	Air quality	Environmental
31.	Social cohesion - sense of community	Social
32.	Natural environment	Environmental
33.	Labour force mobility	Economic
34.	Transport	Built infrastructure
35.	Productivity	Economic
36.	Supply chains	Economic
37.	Vulnerable communities	Social
38.	Economic (business)	Economic
39.	Biodiversity	Environmental
40.	Employment	Economic
41.	CALD community	Social
42.	Health education	Social
43.	Outdoor workers	Economic
44.	Health of community	Social
45.	Companion animals	Social
46.	Work health and safety	Economic
47.	Power	Built infrastructure
48.	Personal security	Social
49.	Social continuity	Social
50.	Fire risk	Environmental

Value	Category
Fire	
51. Schools	Built infrastructure
52. Community facilities	Built infrastructure
53. Isolation - geographical and social	Social
54. Supply network (communication networks, transport, poles and wires)	Economic
55. Health and wellbeing	Social
56. Communication infrastructure	Built infrastructure
57. Conflict (stakeholders/ individuals)	Social
58. Community cohesion	Social
59. Tourism	Economic
60. Reputation of place	Economic
61. Ecosystems diversity and sustainability (flora and fauna)	Environmental
62. Community and government connectivity	Social
63. Liveability	Social
64. Stability of soils	Environmental
65. Primary producers	Economic
66. Forestry	Economic
67. Supply and demand primary industry	Economic
68. Life (people, pets, tourists)	Social
69. Environmental health	Environmental
70. Identity (individuals and community)	Social
71. Homes (not houses)	Social
72. Cultural heritage	Social
73. Natural heritage	Environmental
74. Sense of place (individual)	Social
75. Historical homes	Built infrastructure
76. Indigenous culture	Social
77. Identity	Social
78. Life (people, pets, tourists)	Social
79. Natural amenity	Environmental
80. Water catchment	Environmental
81. Hydropower	Built infrastructure
82. Water security	Environmental
83. Fish stock	Environmental
84. Water quality	Environmental
85. Tourism	Economic
86. Viticulture	Economic
87. Connectivity	Social
88. Connectivity within communities	Social
89. Livelihoods	Economic

APPENDIX 7: RISK AND CONSEQUENCES IDENTIFIED ACROSS SCENARIOS

Risk and consequences across all scenarios – Victoria					
Value	**Scenario**	**Risk category**	**2–12 months**	**1–2 years**	**2 years +**
Quality of life – health and wellbeing	Fire	Social	• Social dysfunction (conflict through divisions that are exacerbated) • Increase in mental issues, suicide • Physical health impacts • Family dysfunction (family violence) • Displacement • Social disruption	• Social dysfunction (conflict through divisions that are exacerbated) • Increase in mental issues, suicide • Physical health impacts • Family dysfunction (family violence) • Displacement • Social disruption • More rapid deterioration of health in vulnerable people • Anniversaries and reminders can trigger other responses	• Social dysfunction (conflict through divisions that are exacerbated) • Increase in mental issues, suicide • Physical health impacts • Family dysfunction (family violence) • Displacement • Social disruption • More rapid deterioration of health in vulnerable people • Anniversaries and reminders can trigger other responses
Water quality	Fire	Environmental	• Lack available potable water • Risk to livestock and domestic animals • Risk ill health of population beyond area impact • Death • Less vegetation – lots of ash contamination • Water quality reduced	• Flash flood, runoff recontamination • Water quality reduced	• Reduced wellbeing
Income	Fire	Economic	• Lack of tourism, risk income loss for family/community • Trees plantation asset loss • Relief effort can undermine local economy and disempower local people	• Loss of community • Debt	• Community decline

Value	Scenario	Risk category	2–12 months	1–2 years	2 years +
Roads	Fire	Built infrastructure	• Supply chain disruption • Harm to people from damaged surroundings (trees, etc.)		
Welfare and wellbeing	Flood	Social	• Disconnection and isolation • Grief/loss • Mental health/PTSD • Media fatigue • Displacement • Family violence • Loss of livelihood • Sense of place impacted • Sense of purpose impacted • Disempowerment/loss of control/status • Loss of social cohesion • Injury • Impact on services • Lifestyle impacts • Blame/resentment • Survivors guilt • Crime increase/looting • Enhanced community unity	• Repeat event • Outcome of post-event 12 months accentuated	
Forest waterways	Flood	Environmental	• Forest degradation • Catchments impacted • Wildlife impacted • Pollution • Water quality and supply	• Salinity • Soil stability • Weed spreading • Costs of treatment	
Tourism	Flood	Economic	• Industry halt • Disaster tourism – voyeurs • Property damage • Area stigma – reductions in growth • Decrease to property prices • Insurance premiums increase • Loss of stock	• Loss of trust and connection • Industry close down if not resilient	

Value	Scenario	Risk category	2–12 months	1–2 years	2 years +
Roads, levees, bridges, rail	Flood	Built infrastructure	• Significant infrastructure losses • Decreased access • Hospitals inundated/ incapacitated • Under insurance	• Lack of strategic planning of communities • Funding availability	
Community as a system	Fire	Social	• Stress and distress • Link to community severed • Local values lost	• Uncertainty on what to do • Tension between new and old networks	• Disempowerment • High depression/suicide
Recreation and amenity	Fire	Environmental	• Closed parks for environmental reasons • Loss of timber • Loss of amenity and tourism • Paper mill closed	• Clean up deprioritised • Less activity	
Industry and business	Fire	Economic	• Loss of local business • Loss of cohesion, inefficiencies	• Fewer jobs • Slowed recovery • Community uncertainty	• Poor productivity
Health	Heatwave	Social	• Fatalities increase • Increased presentation to facilities • Mental health conditions increase • Responsibility risk, individuals, parents, carers, GPs, Health/community, specialist professionals	• Grief	• Grief
Recreation and amenity	Heatwave	Environmental	• Biodiversity loss • Animal health • Closure of some official amenity • Greater demand on some facilities	• Longer term tree loss • Introduction of new species	• Longer term tree loss • Introduction of new species
Industry and business	Heatwave Heatwave	Economic Economic	• Response costs • Repair costs • Reputational impacts • Maintenance costs	• Legal action	
Energy	Heatwave	Built infrastructure	• Reputational impacts		

Risk and consequences across all scenarios – Tasmania					
Value	**Scenario**	**Risk category**	**2–12 months**	**1–2 years**	**2 years +**
Community Health	Fire	Social	• Disrupted pre-event networks • New networks created • Individual isolation (psycho-social) • Individual support and cooperation • Inequitable engagement in recovery	• Depression, suicide, domestic violence • Disengage (leave) • New families	• Depression, suicide, domestic violence
Community Health	Fire	Environmental	• Loss of sense of place • Environmental triggers > trauma		
Community Health	Fire	Economic	• Reduced local spending on collective activities • Break economic networks	• Reduced local spending on collective activities	• Reduced local spending on collective activities
Community Health	Fire	Built environment	• Physical isolation • Loss of access		
Community Health	Flood	Social	• Disruption of current patterns • Death and injury • Altered decision processes • Displacement • Loss: shared and personal loss • Increased vulnerability • Loss of coping capacity	• Suicide risk • Prolonged trauma • Exit, leaving area • Legal issues with recovery and loss • Potential demographic loss • Cultural diversity • Post-traumatic stress	• Suicide risk • Prolonged trauma
Community Health	Flood	Environmental	• Lack of access – recreation • Disruption of Landcare and “friends of” activities • Loss of amenity (odour)	• Education continuity and social opportunities • Loss of landscape • Renewal and rebuilding	• Lowered community capacity • Renewal and rebuilding
Community Health	Flood	Economic	• Employment • Reliance on social services • Immediate agricultural activity	• Rebuild cost and bounce	• Lowered local productivity • Business closure • Fewer government services • Innovation

Value	Scenario	Risk category	2–12 months	1–2 years	2 years +
Community Health	Flood	Built Environment	• Access disruption and loss: housing and dwelling, public gathering; e.g. sport, service loss, business continuity		
Social Cohesion	Heatwave	Social	• Death, disability, stress – risk increase in health services and cost • Family dysfunction • Domestic violence • Alcohol/substance abuse • Relationship breakdown • Child development and welfare • Undermines community pride, sense of place	• Trauma: risk social breakdown, family and community • Increased mental health incidents	• Risk of isolation • Reduction of nutritional fresh food available at reasonable costs • Intergenerational poverty
Social Cohesion	Heatwave	Environmental	• Stressed environment: loss of amenity, contaminated environment, loss of values, risk further env'l degradation • Algal bloom – risk of loss of potable water supply, health • Bees: risk affect productivity in some food growing	• Increased local food costs	• Reduction of biodiversity
Social Cohesion	Heatwave	Economic	• Loss of income: commerce and industry, • Risk: poverty trap, reduction local income • Loss of livestock, land and water, risk collapse of local business	• Loss of income: commerce and industry, • Risk: poverty trap, reduction local income • Loss of livestock, land and water, risk collapse of local business	• Relocation of people
Social Cohesion	Heatwave	Economic	• Less tourism • Unemployment, loss of specialised skills • Loss of business continuity		
Social Cohesion	Heatwave	Built Environment	• Power: generation, supply, delivery • Aquaculture • Transport: road/ rail • Increase demand: hospitals	• Risk: increased costs for end user • Risk: people can't afford electricity	

Risk and consequence across all scenarios – South Australia					
Value	**Scenario**	**Risk category**	**2–12 months**	**1–2 years**	**2 years +**
Wellbeing	Fire	Social	• Community disruption: people move out, loss of social capital, connections, loss of sense of place • Isolation, impact psychological health, lack of understanding • Loss of routine • Lack of cohesion: impact of family conflict • Reduced resilience • Isolation, impact psychological health, lack of understanding • Family breakdown • Exacerbation of pre-existing vulnerability	• Community leave area • Isolation, impact psychological health, lack of understanding SHD • Isolation, impact psychological health, lack of understanding SHD	• Isolation, impact psychological health, lack of understanding • Isolation, impact psychological health, lack of understanding
Wellbeing	Fire	Environmental	• Change in environment, decreased wellbeing • Native animal death • Reduced quality of environment	• Reduced quality of environment (increases)	• Reduced quality of environment

Value	Scenario	Risk category	2–12 months	1–2 years	2 years +
Wellbeing	Fire	Economic	• Loss of breeding stock • Loss of employment • Communities relocating to other locations and decrease economic revenue in the area • Loss of income impacting quality of life • Loss of household income • Loss of employment • Loss of industry	• Loss of breeding stock • Loss of employment • Communities relocating to other locations and decrease economic revenue in the area • Loss of income impacting quality of life • Loss of household income • Loss of employment • Loss of industry	• Different community reside in the area, decrease of resilience and social capital • Potential increase in crime
Wellbeing	Fire	Built infrastructure	• Lack of potable water and waste management • Loss of communication • Loss of connection with community, family • Loss access to property • Loss of home/property/shelter • Communication breakdown • Access and egress issues • Potential health problems SG LG • Relocation of education facilities SG • Physical loss of buildings • Lose shelter • Loss of private property and unable to rebuild • Frustration re insurance/rebuild, psych health impacted	• Reduced connectivity, loss of self esteem • Consequences of loss of communication • Loss of connection with community, family • Loss of school and loss of identity of community	• Loss of connection with community, family
Social Capital	Heatwave	Social	• Deaths, injuries • Grief, mental health • Increase unemployment • Break in networks • Increase crime • Increase anti-social behaviour • Increase domestic violence		

Value	Scenario	Risk category	2–12 months	1–2 years	2 years +
Social Capital	Heatwave	Environmental	• Reduced natural area/open space	• Reduced natural area/open space, amplified by subsequent events	
Social Capital	Heatwave	Economic	• Increased health costs • Increased social costs • Increase power/water costs • Unemployment • Business closures	• Increased health costs • Amplified by subsequent events • Increased social costs • Amplified by subsequent events • Increase power/water costs • Amplified by subsequent events • Unemployment, amplified by subsequent events • Business closures, amplified by subsequent events	
Social Capital	Heatwave	Built environment	• Increased Infrastructure repairs and community built environments	• Increased Infrastructure repairs and community built environments, amplified by previous events	
Social Capital	Flood	Social	• Social media • Psychological effects • Displacement • Volunteering • Unexpectedly homeless	• Psychological effects • Psycho-social effects • Sports clubs	• Social divisions
Social Capital	Flood	Environmental	• Recreational amenity • Environmental amenity • Source water quality	• Increased bushfire fuel load • Fauna and flora impacts	
Social Capital	Flood	Economic	• Loss of productive income > self-worth, community worth • Loss of employment • Business working at a loss • Drop in tourism	• Unemployment • Land value • Business closure	• Unemployment • Business closure
Social Capital	Flood	Built environment	• Community centres, sports grounds • Telecommunications • Ability to move about, e.g. roads • No house to live in > emigration, social displacement	• Community centres, sports grounds	• Community centres, sports grounds

Risk and consequence across all scenarios – New South Wales					
Value	**Scenario**	**Risk category**	**2–12 months**	**1–2 years**	**2 years +**
Social cohesion	Heatwave	Social	• Domestic violence • Deaths and injury • Volunteers unable to function • Pressure on police resources • Pressure on refuges, counselling services • Substance abuse • Mental health	• Family separation/homelessness	
Social cohesion	Heatwave	Environmental	• Bush care groups stopped • Water demand/stress • Arson in bushland • Aquatic temp thresholds exceeded		
Social cohesion	Heatwave	Economic	• Job losses • Small business disruption • Demand on emergency services • Pressure on operational budget		
Social cohesion	Heatwave	Built infrastructure	• Increased vandalism • Energy demand • Transport failures		
Socio economic vibrancy	Flood	Social	• Disruption to networks • Dislocation and/or resettlement • Isolation • Social disorder (anti-social behaviour) • PTSD increase mental health issue • Loss of control and ownership • Loss of social opportunities and sense of place • Loss of people and personal effects – grief and bereavement • Disruption to routine – education, employment	• Disruption to networks • PTSD increase mental health issue • Loss of people and personal effects – grief and bereavement	• Disruption to networks • PTSD increase mental health issue • Loss of people and personal effects – grief and bereavement

Value	Scenario	Risk category	2–12 months	1–2 years	2 years +
Socio economic vibrancy	Flood	Environmental	• Decreased productivity due to destroyed crops/yields • Loss of livestock • Soil erosion/loss of beaches • Loss of seed beds/immature plants • Pollution of water sources • Salination • Changes to watertable • Changes to embankments and watercourses • Damage to community reserves and parks	• Decreased productivity due to destroyed crops/yields • Changes to watertable	• Decreased productivity due to destroyed crops/yields • Changes to watertable
Socio economic vibrancy	Flood	Economic	• Unemployment/self-esteem/financial hardship • Loss of recurrent income • Threat to business and trade (oversupply of relief)	• Ongoing economic volatility • Who pays for recovery?	
Livelihoods	Fire	Social	• Community discombobulation (falls apart) • Fracturing social community • Movement of people, relocated • Grief risk withdrawn, disconnection, disruption • Risk of breaking trust with government and agencies and between community members	• Resentment conflict • Risk fracturing social/ community • Domestic violence/breakdown of families • Risk government agencies not able to service the community • Influx of new individuals into community	• Risk of increasing inequity • Loss of continuity • Loss of long-term trust • Loss of community • New communities at higher risk due to not understanding the risk • Risk of increasing inequity • Loss of continuity
Livelihoods	Fire	Environmental	• Risk loss of species • Mortality of plants and animals • Disruption of ecosystem services	• Loss of environmental productivity and ability to support economic life • Loss of community	• Loss of economic, social environment • Risk ghost town

Value	Scenario	Risk category	2–12 months	1–2 years	2 years +
Livelihoods	Fire	Economic	• Loss of income and income potential • Lack of local skills/tech expertise • Decrease in property value • Risk decreased potential investment	• Loss/disruption of tourism and primary production • Increased costs to rebuild and reinsure • Risk skill erosion	• Loss of economic, social environment • Risk ghost town
Livelihoods	Fire	Built environment	• Disruption of essential services • Loss of built environment (home and shelter) • Damaged road infrastructure and loss of supply network • Risk: Fracturing social community	• Loss of services due to lack of trust in government and agencies • Risk inability to sustain services due to lack of built environment	• Increase of insurance costs • Risk of lack of affordable housing for locals

APPENDIX 8: SHORT- AND LONG-TERM ACTIONS, TASMANIA, SOUTH AUSTRALIA AND NEW SOUTH WALES

Short and long-term actions: Tasmania

Hazard	Short-term	Long-term
Flood	1. Road barriers 2. Flood signs 3. Customised education and knowledge sharing environmental vulnerability types 4. Evacuation training and planning 5. Engaging community in recovery processes/ empowering community to lead own recovery 6. Make an app, flood, learn local vulnerability 7. Planning and exercising translation from response to recovery 8. Bunding 9. Business continuity plan 10. Relocate 11. UPS 12. Stockpiling sandbags 13. Asset hardening	1. Emergency response plans 2. Community to empower itself about own risk 3. Multi-agency exercises 4. Pollution control measures 5. Flood modelling 6. Build cultural capacity to respond to local vulnerability 7. More mitigation funding 8. Improved land use planning 9. Better Australian standards 10. Levees
Heatwave	1. Awareness program on effects of heatwave 2. Accessing funding for articulating community values to create greater understanding 3. Education to build community leadership programs: rebuilding social inclusion 4. Urban planning to reduce heat 5. Bee research 6. Respect the risk 7. Contingency plan for power failure 8. Develop business leaders group for heatwave resilience 9. Program that looks at house design to reduce heat in new houses and pre-existing buildings 10. Transition plan to less vulnerability or more robust ways of doing things 11. Mentors/business coaches for natural disasters 12. Contingency plan for power failure 13. Develop business leaders group for heatwave resilience	1. Deep collaboration to develop a comprehensive plan for understanding the risk at a deeper level 2. Upskilling facilitators to run programmes so they empower and encourage risk ownership 3. Strategic plan for how people see where they are going 4. Engage key stakeholders who have an investment 5. Obtain national ownership and responsibility supporting long-term action 6. Experiential learning 7. Strategy for business resilience 8. Behaviour change

Hazard	Short-term	Long-term
Fire		1. Maintain resilient connections individuals 2. Capacity building: develop resilient networks that can function during and after event including local leaders/ champions 3. Build common understanding of hazard, values, objectives risks, strategies 4. Inclusive prep programs and comprehensive engagement framework 5. Appropriate governance frameworks for delivery programs 6. Build community resilience for social connectedness 7. Promote importance of supporting local businesses in the short and medium-term after an emergency 8. Awareness that cash not goods is the best support as donation 9. Communities proactively vision, strategically plan their direction

Short and long-term actions: South Australia

Hazard	Short-term	Long-term
Flood	1. Education: message on preparation needed 2. Hazard leader and control agency: reduce psychological impact of experience from individual awareness > reduced long-term psycho-social impact 3. Social “flood safe program” 4. Community events 5. River management 6. Insurance (adequate, appropriate) 7. Business continuity 8. Building/construction 9. Preparing access and maintenance of/to public infrastructure 10. Upgrading/rebuild/retrofit crucial community infrastructure (memorial halls, sporting facilities, churches) 11. Social “flood safe program”	1. Education: (cultural change) how to deal with emotional/psychological impact, e.g., storm birds 2. Generate demand for this type of education – hazard leaders 3. Social media using to generate knowledge/concern 4. Targeted community building connections 5. Significant sites protected (short-term maintenance, long-term planning) 6. River planning (NRM boards) 7. Greater regulation of insurance to be more consistent 8. Education – long-term planning for resilience and business growth 9. Building/construction 10. Preparing access and maintenance of/to public infrastructure 11. Upgrading/rebuild/retrofit crucial community infrastructure (memorial halls, sporting facilities, churches) 12. Social media using to generate knowledge/concern

Hazard	Short-term	Long-term
Heatwave	1. Identify communication channels across CALD communities, e.g., using schools as children are interpreters/messengers 2. Develop history of heatwaves – stories and education SES hazard leader 3. Survey data – research 4. Build perception of heatwaves 5. Learnings from events and stories 6. Education programs 7. Analyse data 8. Addressing free riders towards social capital 9. Low incentives for mitigating heatwave 10. Build appreciation of public gathering spaces as social important 11. Activation of space	1. Build perception of heatwaves 2. Learnings from events and stories 3. Education programs 4. Analyse data 5. Reduce heat islands 6. Greener urban landscape 7. Water policy to encourage behaviour: rainwater tanks, alternative water sources 8. Industry mitigation trading hours 9. Heat interruption insurance 10. Financial arrangements for heat tolerance 11. Industrial relations, flexible working hours 12. Incentives for watered green open space to counter heat island effect 13. Housing design, integrated design: heat, water use, insulation, power, open space 14. Resilient infrastructure (power, transport) link to procurement 15. Retrofitting infrastructure
Fire	1. Program for getting risk into decision making, long-term risk and systemic risk 2. Managing expectations: e.g., what sort of help would you need for 72 hours 3. Education of the nature and habits of bushfire: prepare infrastructure, prepare EM plans 4. Reassess and capacity resources tools to develop a program 5. Planning agency meetings state level already, but get together social clubs: Lions, Rotary, sports clubs to discuss plan and what they can contribute 6. Longer term resource engagement plan for CFS Education campaigning, ongoing	1. Bushfire management committee EMC zone emergency management committees more inclusive, change management program ongoing 2. Burnoff 3. Replanting 4. Develop business continuity program and encourage uptake of these 5. Education re records 6. Develop a business case for renewal of pipes and obtain funding to implement 7. Land use planning codes to ensure not building more infrastructure in high bushfire prone areas

Short and long-term risk activities: New South Wales

Hazard	Short-term	Long-term
Flood	1. Public flood plans publicised seasonally 2. Floodwatch seasonal planning 3. Flood warning, social media, phone trees 4. Floodsafe for vulnerable people, house ready and evacuation plans 5. Strategic prep, pre- flood (planting, weed control) 6. Levee bolstering 7. Levee stabilisation 8. Develop code for rebuilding, damaged buildings	1. Education on weather and floods 2. Community involvement in local emergency management committees 3. Actions that help build strong harmonious cohesive communities 4. Community driven preparedness strategies 5. Environmental management and flows program for extreme events 6. Siting of caravan parks (problem of who pays, existing use rights) 7. Flood insurance clarity, legal reform, planning support 8. Business continuity planning 9. Develop code for rebuilding, damaged buildings

Hazard	Short-term	Long-term
Heatwave	1. Support for community groups working with people at risk. Link to heat message into community events 2. CALD community events that are friendly to a range of cultural groups 3. Link to heat message into community events 4. Public messaging, early warning systems, resilience training (coping skills, capacity building) 5. Media training (to ensure unsensationalised coverage) 6. Identify species that are less heat tolerant 7. Investment in habitat resilience and protection 8. Programs to engage community with environment that boosts community value of natural assets 9. Address heat island affect with planting 10. Promote flexible working hours and remote working 11. Business continuity plans that identify alternative supply chains 12. Insurance (and education about need for it) 13. Security planning for commercial evacuation/refuge points 14. Promote leading practice internationally 15. National framework for temperature scenarios 16. Defined responsibilities in recovery plans 17. Regional lessons identified post event	1. Investment in science education (primary, secondary, tertiary) 2. Develop community cohesion, ask funding bodies to prioritise programmes that support community cohesion 3. Learning from climate analogues 4. Urban planning and suburb development to consider green spaces 5. Promote flexible working hours and remote working 6. Business continuity plans that identify alternative supply chains 7. Insurance (and education about need for it) 8. Security planning for commercial evacuation/refuge points 9. Promote leading practice internationally 10. National framework for temperature scenarios to mage 11. Defined responsibilities in recovery plans 12. Regional lessons identified post event
Fire	1. Community preparation campaigns 2. Community street meetings 3. Facilitatory knowledge exchange 4. Contextualise risks in a personal context 5. Evacuation emergency planning plans 6. Strategic prep, pre flood (planting, weed control) 7. Identification documents – company awareness of how to respond strategies 8. Accessible insurance essentials 9. Contract preparation arrangements for accommodation within the community for areas affected 10. Encourage facilities, e.g., aged care to network and share resources to temporarily accommodate residents, establish networks 11. Building infrastructure, Retrofit campaign, hazard management 12. Pre incident planning and response capability 13. Reduced insurance premiums for built environment resilience measures	1. Recontextualise risk around loss of livelihood 2. Run research on social demographic to understand cultural vulnerability 3. Pre approve access to low interest loans to cover costs 4. Alternative work options ready to activate, recovery planning 5. Adaptive management of parks and forests 6. Land use planning and conservation offsets 7. Fire impacts on catchment hydrology research 8. Encourage participation in community Bushcare programs 9. Encourage community investment in natural areas 10. Business continuity planning 11. Diversify economic sectors 12. Land use planning controls 13. Building controls 14. Project management for reconstruction to reduce costs 15. Regulation to protect vulnerable people, build local economy, use local leverage, stop profiteering 16. Plans in place for facilitating development approvals

APPENDIX 9: STATE SNAP-SHOTS AND SUMMARY OF INDIVIDUAL WORKSHOPS

MELBOURNE - VICTORIA

The Melbourne workshop was attended by 51 participants with representatives from Departments across federal, state and local government, research, private industry and NFPs. It was facilitated in collaboration with Emergency Management Victoria. The highest representation was from state government agencies with 52% participation, the largest representation from a sector was from the EMS, with 29% participation.

Presentations were provided by: Dr Michael Rumsewicz, the Research Manager from the Bushfire and Natural Hazards CRC; Mr Liam Fogarty Director, Knowledge and Engagement, Fire and Emergency Management Land, Fire and Environment, Department of Environment, Land, Water and Planning; and Professor Roger Jones, Dr John Symons and Ms Celeste Young from Victoria University.

Snap shot of the Victorian context

(Adapted from Victorian Emergency Management Strategic Action Plan 2015–2018 (Emergency Management Victoria 2014).)

Victoria is Australia's second smallest state, covers a land mass of 227,416 square km, and is one of the most densely populated states with 5.967 million people in 2015 (ABS 2016). It has a diverse demographic (based on 2011 census data), where 14.2% of the population are aged over 65, 6.4% are aged under 5 and 23.1% of people speak a language other than English.

It has a varied terrain, spanning desert, bushland, farmlands and alpine regions. It has over 1,500 crown land reserves and public land covering 8 million hectares, which includes reserves, parks and catchments managed by the State Government (DELWP 2016).

The majority of the population live in the Port Philip region. Melbourne is Australia's fastest-growing city with its population projected to increase significantly over the coming decades. According to DSDBI's Business Atlas (Department of State Development Business and Innovation 2013) "Melbourne has 24.9 per cent of Australia's workforce, with approximately 2.9 million people in employment in 2013". Seventy-five per cent of Victorian jobs are based in Melbourne and approximately 693,000 enter the CBD during office hours. It also has a large transient community of tourists with a recorded 2.321 million international visitors for the year ending 2015 (Tourism Research Australia 2015).

Victoria's transport system includes trains, trams, ferries, planes and buses. Some stretch across the State, providing critical tourist and freight access to other states and territories. It also has extensive freeway and arterial road networks with a rail network that provides radial access to the central city and major regional centres. The Port of Melbourne is Australia's largest maritime port and is inter-linked to national road and rail networks and plays a pivotal role in logistics.

Melbourne's growth is extending beyond the central areas of the city into expanding urban growth areas that abut grasslands, bushlands, coastal plains, flood plains and or industrial landscapes. Peri-urban areas such as Ballarat and Bendigo and coastal centres have also experienced recent rapid growth. Demographic changes accompanying these population

increases present a number of cultural challenges in relation to risk understanding and response.

The Victorian gross state product totalled $329 billion in 2011–12. Health care and social assistance, retail trade and manufacturing were the largest employing industries (Victoria 2016). Currently, Victoria accounts for more than one quarter of Australia's agriculture, forestry and fishing sector, despite having just three per cent of Australia's private arable land. Land usage across Victoria is highly diverse. Victoria's agricultural industries occupy a total land area of 10.6 million hectares with about 6.1 million hectares mainly for grazing, and 4.5 million hectares mainly cropping. The gross value of agricultural commodities produced was $11.6 billion (Victoria 2016). Tourism is also a growth industry with travellers to and within Victoria spending a total of $21.2 billion in the year ending December 2014, which equates to 22.8 per cent of total tourism expenditure in Australia (Victoria 2015).

Victoria is one of the most fire-prone states in Australia and is also subject to extreme weather, flood and heatwave risk on an annual basis. Less frequent natural hazard risks are earthquakes and tsunami.

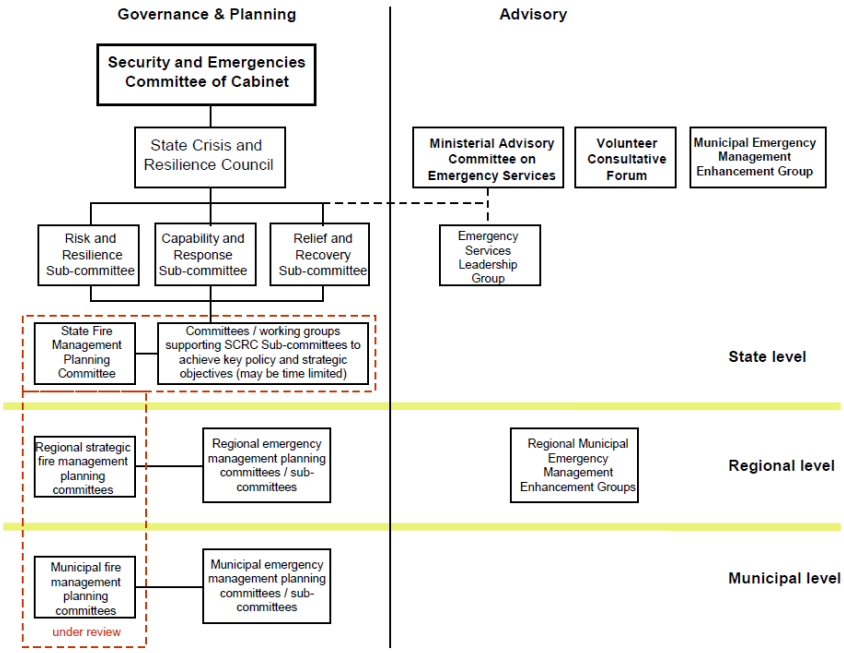


Figure A9.1: Principal emergency management governance, planning and advisory committees, Victoria (EMERGENCY MANAGEMENT VICTORIA 2014).

Key observation: Victoria includes resilience explicitly in its governance structure and has an all-hazards all-agencies approach (FIGURE A9.1). The management and integration of this is overseen by Emergency Management Victoria. During the workshops it was described as currently being a very fluid environment, particularly in the policy area. The development of policy around resilience and strategic planning is inducing cultural changes and the uptake of less familiar approaches being integrated into policy and practice. The key focus of the change articulated was a change from a top-down focus towards a more bottom-up, community-led approach.

SUMMARY OF WORKSHOP FINDINGS

Identification of values at risk

116 values were identified across all the value groups with social values being the largest group with a 46% allocation. Built infrastructure, had the smallest allocation (17%). Other allocations were to environmental values (19%) and economic values 18% (see FIGURE A9.2).

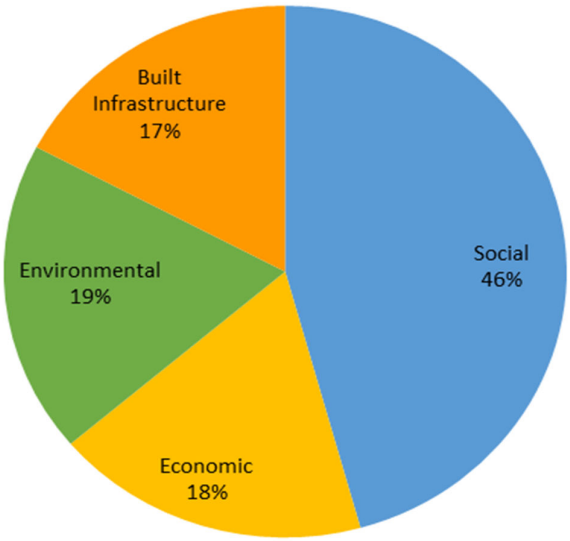


Figure A9.2: Allocation of values at risk to value groups – Victoria.

Value connections

In total, 314 connections between these values were listed. Social values had the most with 51% mutual dependencies, 21% were allocated to built infrastructure, 20% to environment, and 8% to economic categories. Of the types of connections, mutual dependencies were the largest group with 70% of all connections (FIGURE , Page 25). The complex value with the highest allocation connections was community functioning, with 11 mutual dependencies, and a further 6 supporting dependencies.

Allocation of ownership of values of risk

In terms of ownership of values at risk (FIGURE A9.3), 191 allocations in total were made. State government had the largest allocation (26%), Business and industry (23%) and community (22%), closely followed by local government (19%) and federal government (10%). For state government, social values at 35% were the largest value type allocated. In fact, social values were the highest allocated group for all institutions, with 70% of ownership allocated to the community being social values. (For detailed data see Page 71)

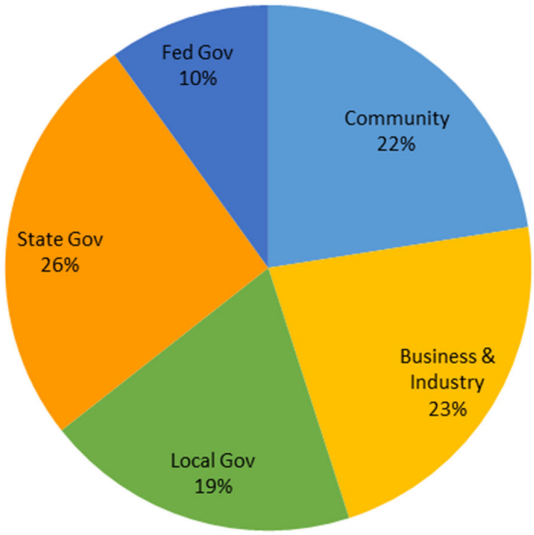


Figure A9.3: Allocation of values at risk to institutions – Victoria.

Allocation of risk and consequence

The values selected for this exercise were lost community values, social dysfunction and loss of income. Risks identified for each hazard areas varied and were allocated to the hazard areas in the following way: fire (49%), flood (36%) and heatwave (15%).

A total of 122 risks and consequences were identified across the values selected. The largest allocation of risks and consequences were allocated to the social value category (46%) and the least to built infrastructure (7%). The remaining allocations were environmental (26%) and economic (21%) (FIGURE A9.4).

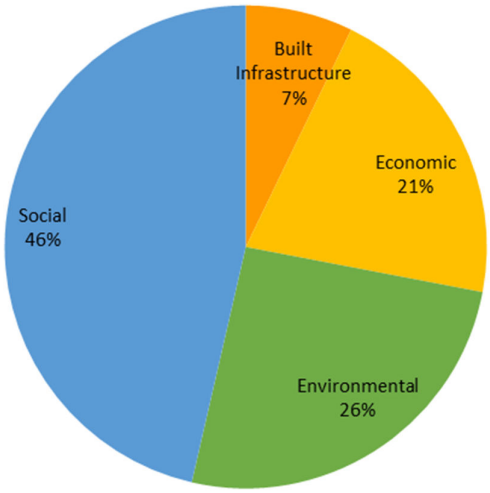


Figure A9.4: Allocation of risk and consequence to value groups – Victoria.

Allocation of institutional ownership to risk actions

In terms of institutional ownership of risk actions, 91 allocations were made using the RAP criteria across the 12 values selected (see Page 69 for details). The largest allocation was to state government with 34% of across the areas of ownership of mitigation and preparation. Business and industry had the next largest ownership with 21%, community was the third largest (15%) and local government had the smallest (8%). Shared ownership was allocated to 11%, and 5% of allocations were identified as unowned.(FIGURE A9.5)

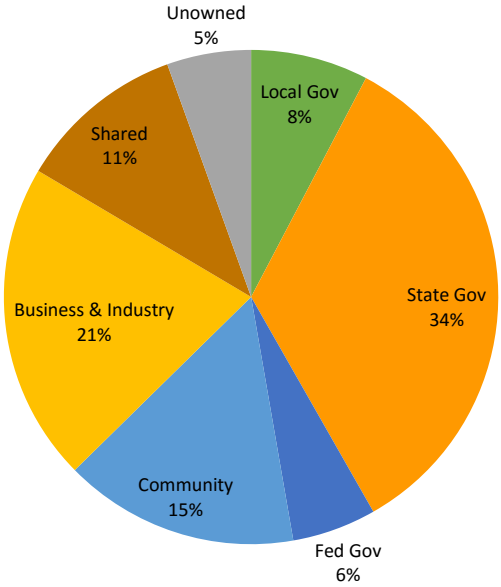


Figure A9.5: Allocated institutional ownership of risk actions – Victoria.

HOBART – TASMANIA

The Hobart workshop was attended by 18 participants with representatives from state government agencies, research, emergency services, business and industry and NFP and community organisations. The highest representation was from state government agencies with 55% participation, the largest sector-based representation was from the EMS (44%). It was co-facilitated with the Department of Police and Emergency Services Management, Tasmania. Presentations were provided by: Mr Chris Irvine, Senior Planning and Education Officer, State Emergency Services, Department of Police and Emergency Services Management, Tasmania; and Professor Roger Jones, Dr John Symons and Ms Celeste Young from Victoria, University.

Snap-shot of the Tasmanian context

(Adapted from Tasmanian Emergency Management Plan Issue 8 (Department of Police and Emergency Management 2015))

Geographically, Tasmania is Australia's smallest state covering 68,401 km, and located south of the Australian mainland. It has a diverse topography, with 42% of its land mass being listed as a reserve or national parks. The total of all public and private reserves is estimated at 50.1% (Parks and Wildlife Service Tasmania 2015).

Its population is relatively small and dispersed at 516,630 (Economic Analysis Unit 2016) and it has one of the higher median ages (42) (ABS 2014) in the nation. Based on 2011 census data, 6.3% of the population were under five years of age, 16.6% were over 65 years and 4% of the population is indigenous, which was the highest out of the four participating states. It had 199,000 international visitors to the state in the 12 months ending September 2015 (Tourism Research Australia 2015).

Eco-tourism and agriculture (in particular the growth of boutique farmers and food producers) are an important part of the economy. Tasmania has an advantage in this area due to its small island status enhancing its ability to control disease and maintain a clean environment. Controlling environmental pollution on land and at sea in the face of natural hazards is essential for maintaining these parts of the economy.

Transport networks are of critical importance with numerous seaports and airports enabling access to other parts of the country, as well as internal road and rail networks. Exports are a key part of the economy with exports being valued at $2,760 million in 2013–2014 (Department of State Growth 2016).

Generation of electricity in Tasmania is principally hydro generation and wind, supplemented by a gas-fired thermal plant and Basslink (a sub-sea inter-connector). Natural gas is supplied from the mainland via a transmission pipeline, and petroleum products are supplied to the state via sea tankers from mainland refineries and terminals.

Tasmania's relatively low humidity, temperate weather and forest and tourism industries mean that bushfire and flood are Tasmania's most prominent natural hazards. Storms, landslip and tsunami are also identified natural hazards that may affect the community.

Key areas of emergency management governance are shown in (FIGURE A9.6 overleaf)

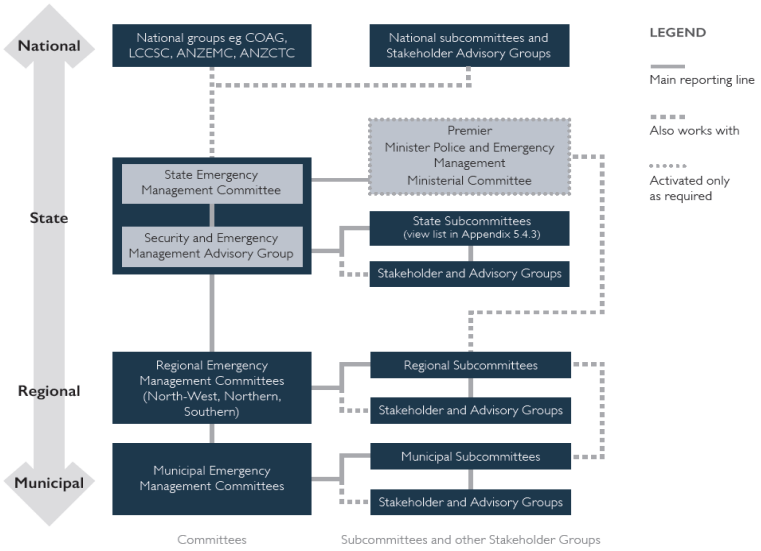


Figure A9.6: Consultation framework for Tasmanian emergency management which shows key areas of governance.(DEPARTMENT OF POLICE AND EMERGENCY MANAGEMENT 2015)

Key observation: Participants in Tasmania articulated a high level of perceived connectivity between agencies, and that if you wanted something done 'it only took a few phone calls' to achieve certain outcomes and, as a result, it was much easier to develop connections across local communities. The state was perceived as being vulnerable if faced by the type of 'big events Victoria has' due to limited resources. They also emphasised a strong focus on active and meaningful engagement with communities.

SUMMARY OF WORKSHOP FINDINGS: TASMANIA

Identification of values at risk

70 values were identified with the largest category being social values with 34% of all allocations. Allocations to other categories were economic (33%), built infrastructure (21%), with environment recording the lowest allocation (12%) (FIGURE A9.7).

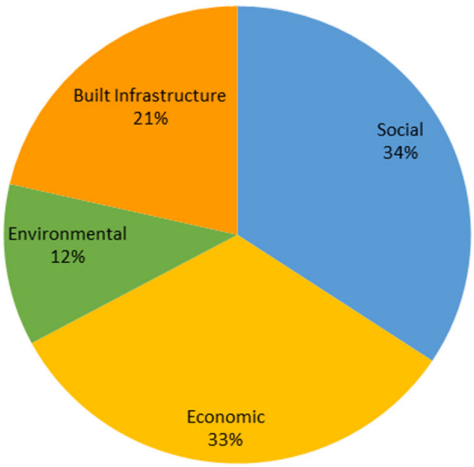


Figure A9.7: Allocation of values at risk to value groups – Tasmania.

Value connections

A total of 241 connections were listed, with social values being the largest category with 40% connections between values. Economic areas had 27%, built infrastructure (22%) and environment (11%). Supporting values were the largest group with 39% of all allocations (FIGURE). Energy infrastructure was the single value with the largest number of connections with 18 supporting connections.

Allocation of ownership of values at risk

139 allocations for ownership were made across the three key values selected (see Attachment 6. p.71 for details). The largest ownership of values at risk allocation was to business and industry (33%), the next largest being state government (22%). Local government and community were both allocated 19%, and the federal government had the smallest allocation with 7% (FIGURE A9.8). The largest value ownership area for business and industry was economic with 57% of all allocations. The social value group was also the dominant value group across community and local and state government institutions.

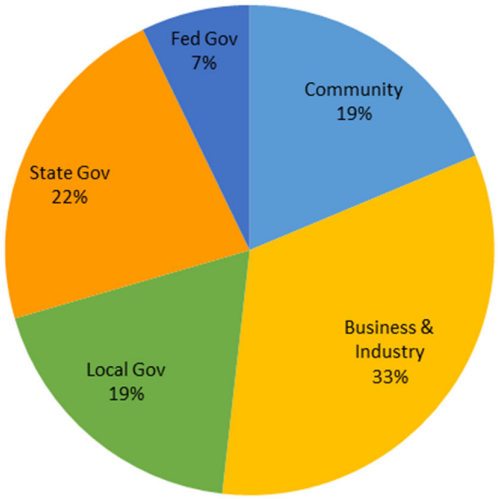


Figure A9.8: Allocation of ownership of values at risk to institutions – Tasmania.

Identification of risk and consequence

The single values selected by the three groups for risk ownership were social connectedness/capital, social cohesion and community health.

Risks identified for each hazard areas varied, with fire and heatwave having the highest identification of risk and consequence with 40% each, and flood having the lowest allocation (20%).

A total of 83 risks and consequences were identified. The largest allocation of risks and consequences across all groups was to social values (45%), and the least to built infrastructure (11%), with allocations to environmental (18%) and economic (26%) (Figure A9.9).

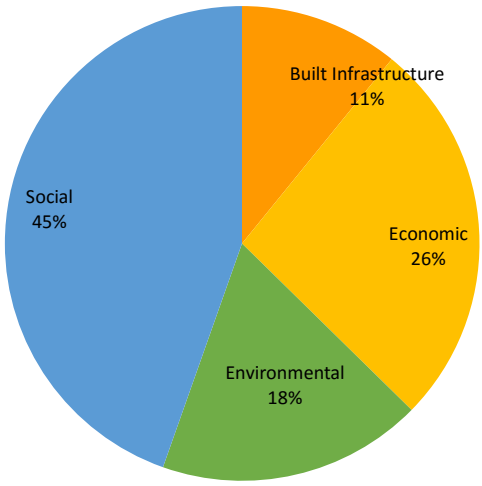


Figure A9.9: Allocation of risk and consequence to value groups – Tasmania.

In terms of allocation of risk and consequence across the different temporal scales, 54% of the risk and consequences were allocated to the 2–12 month category, 28% to the 1–2 years and 18% to the 2+ years category.

Allocation of institutional ownership to risk actions

In terms of institutional ownership of short (preparation, mitigation) and long-term actions (resilience, capacity building), 37 allocations were made to the 53 actions identified.

The largest allocation of institutional ownership of actions was to state and local government with 35% each (FIGURE A9.10). The next largest was to federal government and business and industry, with both being allocated 11% and 3% to community actions. There was a 5% allocation of unowned risk. These actions were 'engage key stakeholders who have an investment' and 'obtain national ownership and responsibility supporting long-term action'. Both actions relate to the longer-term category. Allocations to the short-term ownership of actions were higher with allocations of 65% and 35% allocated to the longer term.

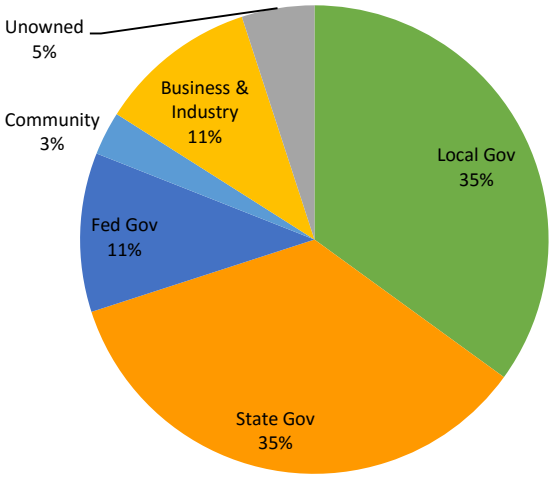


Figure A9.10: Allocated institutional ownership of risk actions – Tasmania.

Allocations to the short-term ownership of actions were higher with allocations of 65% and 35% allocated to the longer term.

ADELAIDE – SOUTH AUSTRALIA

The Adelaide workshop was attended by 24 participants, with representatives from state and local government agencies, research, emergency services, business and industry and NFP organisations. The highest representation was from state government agencies with 50% participation, the EMS had the largest representation from a sector with 25%. The workshop was co–facilitated with SAFECOM and SAWater. Presentations were provided by: Mr Ed Pikusa, Principal Project Officer RAMMS Projects (Risk Assessment, Measurement and Mitigation Subcommittee) South Australia Fire and Emergency Services Commission; and Professor Roger Jones, Dr John Symons and Ms Celeste Young from Victoria University.

Snap-shot of the South Australian context

South Australia has a land mass of 983,482 square km and is the fourth-largest state in Australia. Its terrain is extremely diverse and contains some of the most arid parts of Australia. There are 352 separate protected areas covering a total land area of 21,095,704 ha or 21.5% of the state's area (Department of Environment Water and Natural Resources 2015). It has a population of 1.7 million and around 90% of the state's population reside in coastal areas (Government of South Australia 2016). According to 2011 census data, 16.6% of the population are over 65, 6.6% are under the age of 5 and 14.4% speak a language other than English (ABS 2016). It also had 392,000 international visitors during the 12 months prior to September 2015 (Tourism Research Australia 2015).

Climatic conditions in South Australia are generally cool and wet during winter with low humidity and hot, dry summers. The average daytime temperature in summer is about 29 degrees Celsius, occasionally peaking in the low 40s, and balanced by mild winters averaging about 15 degrees (Government of South Australia 2016).

Its key industries are manufacturing 9.6% of the total state gross value added product, health care and social assistance 9.2%, construction 8.6%, financial and insurance services 8.5%, agriculture, forestry and fishing is also a key industry. It has a growing tourism industry with 5.6% (share of the economy as % of industry gross value added less ownership of dwellings) (Bank of South Australia 2014).

Flood and fire are the most common natural hazard risk faced in South Australia. Heatwaves and extreme weather are also annual events and varied in intensity from year to year. There is also a lesser risk of earthquakes and tsunami.

Current Emergency Management governance is shown in FIGURE A9.11 overleaf.

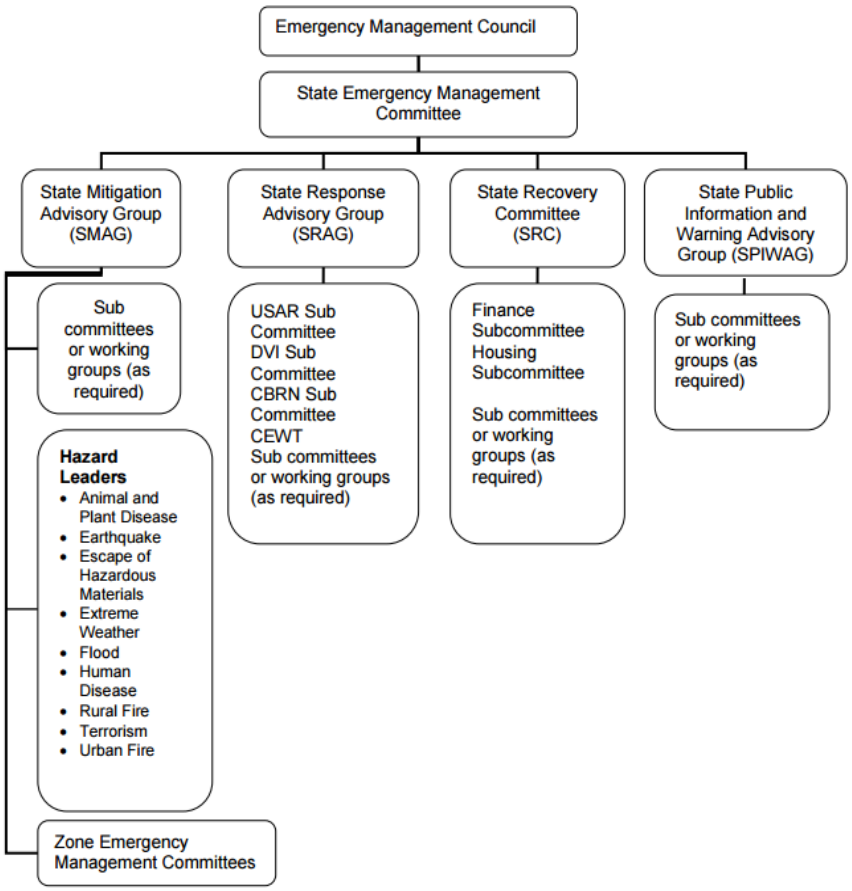


Figure A9.11: South Australia emergency management committee structure.(STATE EMERGENCY SERVICE 2015)

Key observation: Participants in Adelaide articulated a sense that they were well connected and 'all knew each other'. Some participants raised concerns that the same people served across a number of the different committees, which they felt may reduce diversity and potentially reduce community input and sense of ownership. Participants also felt they had a more of a 'top-down' approach than other states, where the state government actively led and controlled activities across the planning, preparation, response and recovery (PPRR) spectrum.

SUMMARY OF WORKSHOP FINDINGS: ADELAIDE

Identification of values at risk

Fifty-five (55) values were identified in total, with social values being the largest with 46% of all allocations. Other categories were economic (23%), environment (18%), and built infrastructure (22%) (FIGURE A9.12).

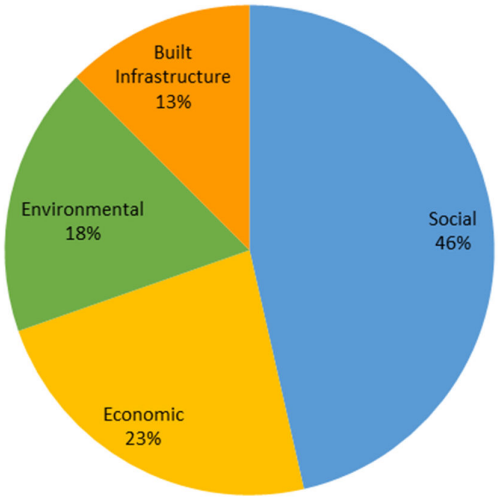


Figure A9.12: Allocation of values at risk to value groups – South Australia.

Value connections

Total connections between values were 213 with 42% connections being in the social category, economic (28%), environment (17%), and built infrastructure (13%). Mutual dependencies were the largest group of connections with 38% of all allocations (FIGURE 9, Page 25).

Resilience was the single value that had the highest allocation of connections with 14 allocations made up of four dependent, eight supporting and two mutual dependencies.

Institutional ownership of values at risk

In relation to ownership of values at risk, 126 allocations were made with the largest allocations given to local government (26%) and business and industry (25%). Community was allocated 23%, state government (20%) and federal government (6%) (FIGURE A9.13). Social values were the dominant value group for local and state government, with the latter being allocated 48%. The largest allocation to business and industry was economic values (40%). Social values made up 59% of the values allocated to community.

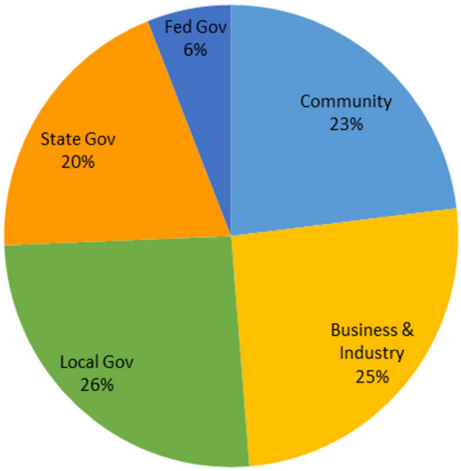


Figure A9.13: Allocation of values at risk to institutions – South Australia.

Identification of risk and consequence

The key values selected by the groups for the risk ownership exercise were community health (by two groups) and social cohesion (by one group). The risks identified for each hazard areas varied, with fire having the highest allocation with 51% of the aggregated risks and consequence. The flood area was allocated 26% and heatwave 23%.

A total of 105 risks and consequences were identified across these values. The largest allocation across all groups was to the Economic category (34%), and the least to the environmental category (12%), with allocations to social (28%) and built infrastructure (26%) (FIGURE A9.14).

Across time scales, 60% of risk and consequences were allocated to the 2–12 month category, 30% to the 1–2 years and 10% to the 2+ years category.

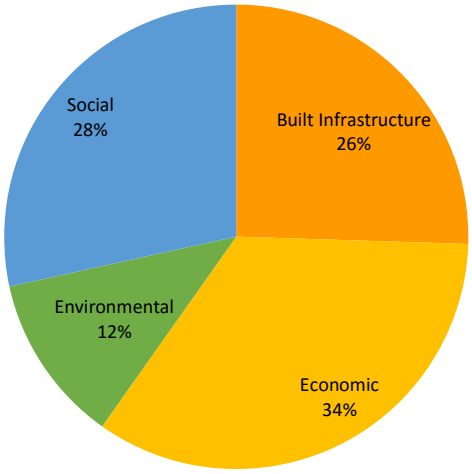


Figure A9.14: Allocation of risk and consequence to value categories – South Australia.

Allocation of institutional ownership to risk actions

Institutional ownership of short- (preparation, mitigation) and long-term actions (resilience, capacity building), made 53 allocations for the 63 actions identified. The largest allocation was to state government (59%), and the next largest to local government (29%). Federal government and community were both allocated of 4% of risk ownership, and business and industry had the smallest allocation (2%). Shared ownership was allocated 2% of risk actions (FIGURE A9.15).

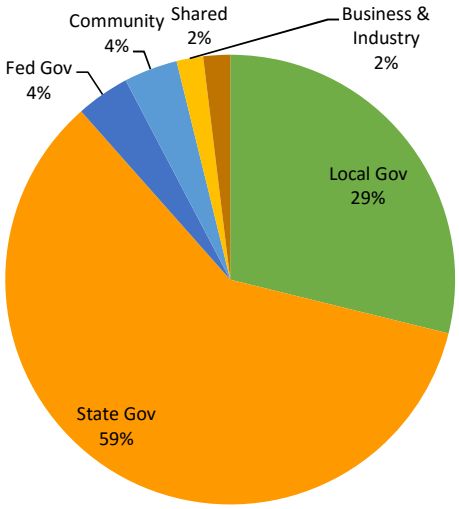


Figure A9.15: Allocated institutional ownership of risk actions – South Australia.

Allocations to the long-term actions (resilience, capacity building) were slightly higher, with 53% of the ownership leaving 47% allocated to short-term actions (preparation).

SYDNEY – NEW SOUTH WALES

The Sydney workshop was attended by 25 participants, with representatives from federal, state and local government agencies, research, emergency services, business and industry and NFP organisations. The highest representation was from state government agencies with 48% participation, the largest representation was from a sector was from the EMS (40%). The workshop was co-facilitated with the NSW Rural Fire Services. Presentations were provided by: Patrick Schell, Senior Project Officer, Community Planning, Community Resilience, Operational Services, NSW Rural Fire Service; and Professor Roger Jones, Dr John Symons and Ms Celeste Young from Victoria University.

Snap-shot of the NSW context

(Adapted from the New South Wales State Emergency Management Plan, 2012 (Ministry of Police and Emergency Services NSW 2012))

Geographically, NSW covers an area of 800,642 square km, approximately 10% of the total Australian land mass. The landscape is highly diverse, ranging from arid through to temperate, tropical and alpine regions. New South Wales also includes Lord Howe Island. The resident population for New South Wales was 7,618,200 in June 2015 (ABS 2016) most of which is

concentrated on the coastal strip with around 75% located in the Greater Metropolitan Region. It has a diverse demographic with 14.7% of the population being over 65 and 5.5% of the population being under 5 and 22% of people speaking a language other than English (based on 2011 Census data) (.id The Population Experts 2016). It had 3,339,000 international visitors (Tourism Research Australia 2015) in the 12 months prior to September 2015.

Climatic conditions values at risky greatly across the state. Conditions range from hot, dry continental conditions in the west, through the subtropical, wet conditions in the northeast and the alpine cold of the southeast. The Great Dividing Range has a significant impact on the State's climate. The degree of this impact, particularly on rainfall, results in four distinct climate zones. The coast has a relatively mild climate. Climate ranges from temperate in the north through to Alpine conditions above 1,200 m in the south. Rainfall is generally east of 'the Divide'; the Western Slopes and Plains have a generally hot and dry climate with a cool winter. Rainfall tends to drop away and significant thunderstorm activity can be generated, particularly to the north.

Key industries economically in NSW are: financial and insurance industry (46% of the national output), Information, media and telecommunications industry (45%) and of professional scientific and technical services (35%) (Department of Industry 2016b). Other key economic sectors include tourism which contributed A$27.9 billion in 2013/2014 (Department of Industry 2016c) agriculture and food value added 48.6 billion in 2013–2014 (Department of Industry 2016a). Mining, resources and energy sector generated about A$26 billion in 2012–2013 (Department of Industry 2016d). NSW has a considerable infrastructure of roads, rail and harbours in the Sydney area with 40 per cent of all international flights going through Sydney Airport (Department of Industry 2016e).

NSW has a high risk of flood, fire and extreme weather on an annual basis. There is also the risk of earthquakes and tsunami. Key governance for emergency management are shown below (FIGURE A9.16)

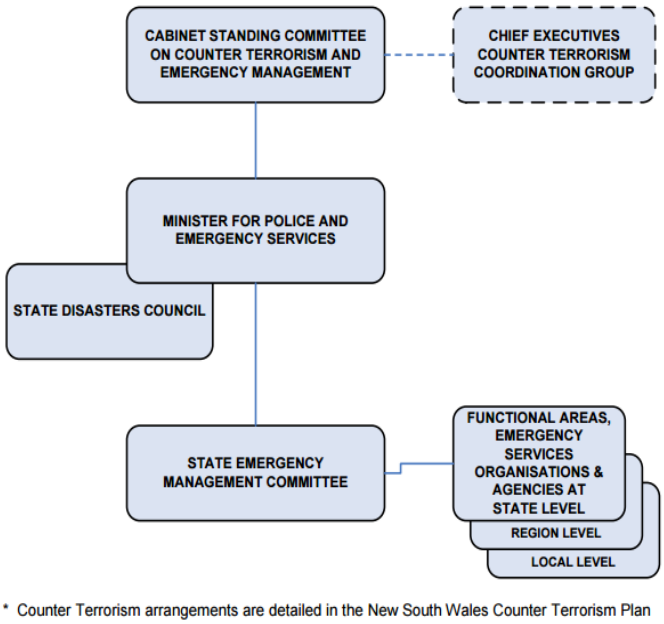


Figure A9.16: New South Wales governance arrangements.(MINISTRY OF POLICE AND EMERGENCY SERVICES NSW 2012)

Key observation: New South Wales has an established system for assessing assets at risk at a community level and is currently undertaking a review of its state emergency planning processes. The principal focus to date has been on fire and it was stated that there is an opportunity to develop other hazard areas to same level of competency. Collectively, the workshop described an established structure of emergency management committees that engage with local government. This state had the highest level of participation from local government in the workshops.

SUMMARY OF WORKSHOP FINDINGS: NEW SOUTH WALES

Identification of values at risk

Mapping identified 89 values at risk across all value categories with the largest allocation being to social values at 44%, environment 20% and economic 20%, with the lowest allocation to built infrastructure 16% (FIGURE A9.17).

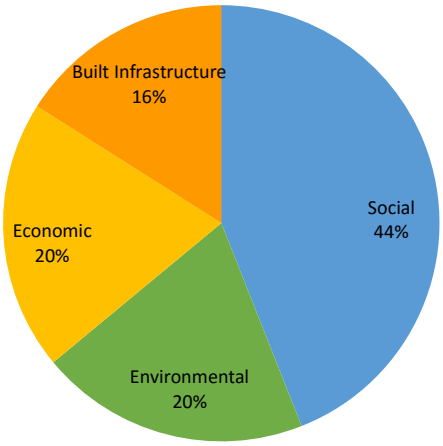


Figure A9.17: Allocation of values at risk to value groups – New South Wales.

Value connections

A total of 221 value dependency connections were listed; the social category was the highest with 49% of connections, followed by economic (25%), built infrastructure (13%) and environment (13%). Mutual dependencies were the largest group of connections with 64% of all allocations (FIGURE , p. 45). Employment was the single value with a high of 11 connections with six supporting and mutual dependencies allocated.

Allocation of ownership of values at risk

Ownership of values at risk received 205 allocations, with the largest being to state government (25%) and business and industry (23%). Community was allocated 20%, local government (19%) and federal government (13%) (FIGURE A9.18). The largest value group at state government level was social values (43%). Business and industry had the largest ownership of economic values (40%). Social values were the dominant value group for local, state and federal government and community, the latter being 61%.

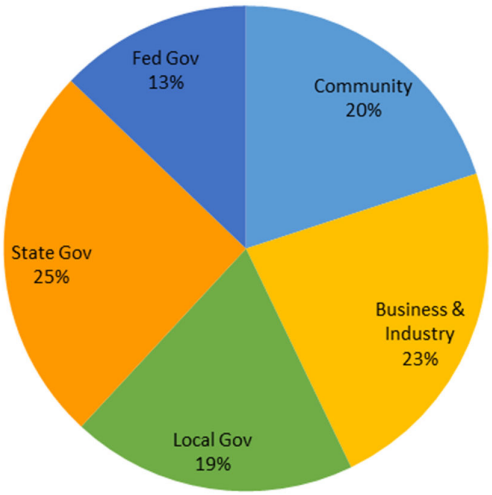


Figure A9.18: Allocation of values at risk to institutions – New South Wales.

Identification of risk and consequences

The values selected by the groups for the risk ownership exercise were social cohesion, socio-economic vibrancy and livelihoods. In terms of hazard areas, fire had the highest allocation with 43% of the aggregated risks and consequences. Flood had an allocation of 37% and heatwave 20%. A total of 93 risks and consequences were identified across the different value areas (FIGURE A9.19). The largest allocation of risks and consequences was to the social category (44%) and the least to built infrastructure (11%), with allocations to environmental value (26%) and economic values (19%)

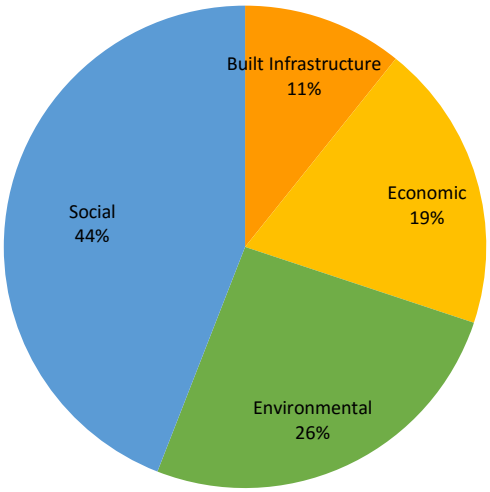


Figure A9.19: Allocation of risk and consequence to value categories – New South Wales.

Allocations of risk and consequences to time scales, saw 59% allocated to the 2–12 month category, 22 % to 1–2 years and 19% to the 2+ years.

Allocation of institutional ownership to risk actions

In terms of institutional ownership of short (preparation, mitigation) and long-term actions (resilience, capacity building), 114 ownership allocations were made to the 75 activities identified. The largest allocation was to state government (31%), followed by local government (25%), business and industry (19%), federal government (16%) and community (8%). Shared ownership was allocated 1% of risk actions (FIGURE A9.20).

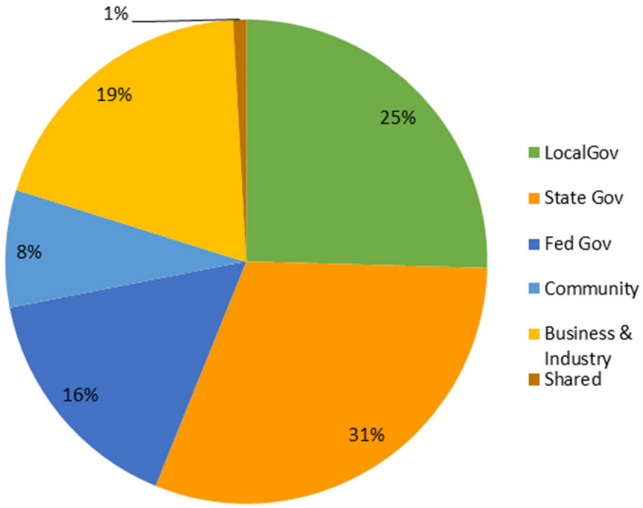


Figure A9.20: Allocated institutional ownership of risk actions – New South Wales.

Allocations to long-term actions were in a slight majority with 58% of the ownership and 42% allocated to short-term actions (preparation).

GLOSSARY

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 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, 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, through incentives and through 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).

Shared ownership. Shared ownership is where multiple owners hold responsibility of some kind for an asset or a risk.

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.

Catastrophic natural disaster. This is an extreme hazard event that affects one or more communities, resulting in widespread, devastating, economic, health, social and environmental consequences, and that exceeds the capability of existing State or Commonwealth Government emergency and disaster management arrangements. An event could be of sudden impact or sustained impact over an extended timeframe (Emergency Management Australia 2010).

REFERENCES

.id The Population Experts (2016) Community profiles. .id The Population Experts. http://home.id.com.au/demographic-resources/community-profiles/. Accessed 9 January 2016

ABS (2014) Australian demographic statistics: June quarter 2014. 3101.0, vol June Quarter 2014. Australian Bureau of Statistics, Canberra ACT

ABS (2016) Australian demographic statistics: September quarter 2015. 3101.0, vol September Quarter 2015. Australian Bureau of Statistics, Canberra ACT

AEMI (2011) Community recovery. Australian Emergency Management Handbook Series, vol 2. Australian Emergency Management Institute, Attorney General's Department, Canberra

Australian Emergency Management Institute (2014) National emergency risk assessment guidelines. Australian Emergency Management Handbook Series, vol Handbook 10. Australian Emergency Management Institute, Canberra ACT. doi:978-1-921152-15-3

Bank of South Australia (2014) State economic report: Sa economic outlook 26 may 2014. Bank of South Australia, Adelaide

Bordo MD, Murshid AP (2001) Are financial crises becoming more contagious?: What is the historical evidence on contagion? In: Claessens S, Forbes KJ (eds) International financial contagion. Springer, New York, pp 367-403

Burton I, Kates RW, White GF (1993) The environment as hazard. Guilford Press, New York, NY, USA

DELWP (2016) Managing land. Department of Environment, Land, Water and Planning. http://www.delwp.vic.gov.au/parks-forests-and-crown-land/managing-land. Accessed 7 January 2016

Department of Environment Water and Natural Resources (2015) Protected areas information system – area statement: Summary of protected areas in south australia. Department of Environment, Water and Natural Resources. Government of South Australia, Adelaide

Department of Industry (2016a) Agribusiness and food. NSW Department of Industry. http://www.industry.nsw.gov.au/business-and-industry-in-nsw/key-industry-sectors/agribusiness-and-food. Accessed 9 January 2016

Department of Industry (2016b) Economic and business climate. NSW Department of Industry. http://www.industry.nsw.gov.au/business-and-industry-in-nsw/nsw-business-environment/economic-and-business-climate. Accessed 9 January 2016

Department of Industry (2016c) Industry strengths and capabilities. NSW Department of Industry. http://www.industry.nsw.gov.au/business-and-industry-in-nsw/key-industry-sectors/tourism/industry-strengths-and-capabilities. Accessed 9 January 2016

Department of Industry (2016d) Mining resources and energy. NSW Department of Industry. http://www.industry.nsw.gov.au/business-and-industry-in-nsw/key-industry-sectors/mining-resources-and-energy. Accessed 9 January 2016

Department of Industry (2016e) Tourism. NSW Department of Industry. http://www.industry.nsw.gov.au/business-and-industry-in-nsw/key-industry-sectors/tourism. Accessed 9 January 2016

Department of Police and Emergency Management (2015) Tasmanian emergency management plan: Issue 8. Tasmanian Government, Hobart

Department of State Development Business and Innovation (2013) Industry atlas of victoria 2013. Victorian State Government, Melbourne

Department of State Growth (2016) Export statistics. Tasmanian Government. http://www.stategrowth.tas.gov.au/home/about_us/divisions/industry_and_business_growth/exporters/export_statistics. Accessed 9 January 2016

Economic Analysis Unit (2016) Population (abs cat no 3031.0). Department of Treasury and Finance, Tasmanian Government, Hobart

Emergency Management Australia (2010) Natcatdisplan national catastrophic natural disaster plan vol Version 1-0. September 2010. Emergency Management Australia, Attorney-General's Department Canberra, ACT

Emergency Management Victoria (2014) Emergency management manual: Part 5. Emergency Management Victoria, Melbourne

Government of South Australia (2016) Economy, lifestyle and climate. Government of South Australia. http://www.sa.gov.au/about-sa/economy,-lifestyle-and-climate. Accessed 9 January 2016

Haraguchi M, Lall U (2015) Flood risks and impacts: A case study of thailand's floods in 2011 and research questions for supply chain decision making. International Journal of Disaster Risk Reduction 14:256-272

Hewitt K, Burton I (1971) The hazardousness of a place: A regional ecology of damaging events. University of Toronto, Toronto

ISO (2009) Iso 31000:2009 risk management - principles and guidelines. International Organisation for Standardisation, Geneva

Jones R, Young C, Symons J (2015) Risk ownership and natural hazards: Across systems and across values. Paper presented at the Bushfire and Natural Hazards CRC & AFAC annual conference 2015, Adelaide SA

Jones RN, Patwardhan A, Cohen S, Dessai S, Lammel A, Lempert R, Mirza MMQ, von Storch H (2014) Foundations for decision making. In: Field CB, Barros V, Dokken DJ et al. (eds) Climate change 2014: Impacts, adaptation, and vulnerability. Volume i: Global and sectoral aspects. Contribution of working group ii to the fifth assessment report of the intergovernmental panel on climate change. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA

Jones RN, Young CK, Handmer J, Keating A, Mekala GD, Sheehan P (2013) Valuing adaptation under rapid change. National Climate Change Adaptation Research Facility, Gold Coast, Australia

Kambil A, Layton M, Funston R (2005) Disarming the value killers. StrategicRISK June 2005:10-33

Ministry of Police and Emergency Services NSW (2012) New south wales state emergency management plan. State Emergency Management Committee, Sydney

Parks and Wildlife Service Tasmania (2015) Reserve listing: National parks and reserves declared under the nature conservation act 2002. Parks and Wildlife Service Tasmania. http://www.parks.tas.gov.au/index.aspx?base=5710 Accessed 9 January 2016

Productivity Commission (2014) Natural disaster funding arrangements, draft inquiry report. Canberra

PwC (2013) Black swans turn grey: The transformation of risk. PricewaterhouseCoopers Limited, Hong Kong

State Emergency Service (2015) State emergency management plan, version 2.15. Government of South Australia, Adelaide

Tourism Research Australia (2015) International visitors in australia: Year ending september 2015.2

Victoria A (2016) Agriculture in victoria. Agriculture Victoria. http://agriculture.vic.gov.au/agriculture. Accessed 7 January 2016

Victoria T (2015) Tourism victoria annual report 2014–2015 Tourism Victoria, Melbourne

Young C, Jones RN, Symons J (2015a) Understanding our values at risk and risk ownership workshop context paper. Victoria Institute of Strategic Economic Studies, Victoria University, Melbourne

Young CK, Symons J, Jones RN (2015b) Whose risk is it anyway? Desktop review of institutional ownership of risk associated with natural hazards and disasters. Bushfire and Natural Hazards Cooperative Research Centre, Melbourne