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# MAPPING AND UNDERSTANDING BUSHFIRE AND NATURAL HAZARD VULNERABILITY AND RISKS AT THE INSTITUTIONAL SCALE

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An Australian Government Initiative

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- Pauline Cole DCSI SA
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# ECONOMIC GEOGRAPHY OF NATURAL HAZARDS: VICTORIA CASE STUDY

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# ECONOMIC GEOGRAPHY OF NATURAL HAZARDS: VICTORIA CASE STUDY

Aim: to identify, in a semi-quantitative fashion, those sectors and Statistical Local Areas (SLAs) most vulnerable to the natural hazards of bushfire and flood.

# FRAMING NATURAL HAZARD VULNERABILITY

***Economic impacts***

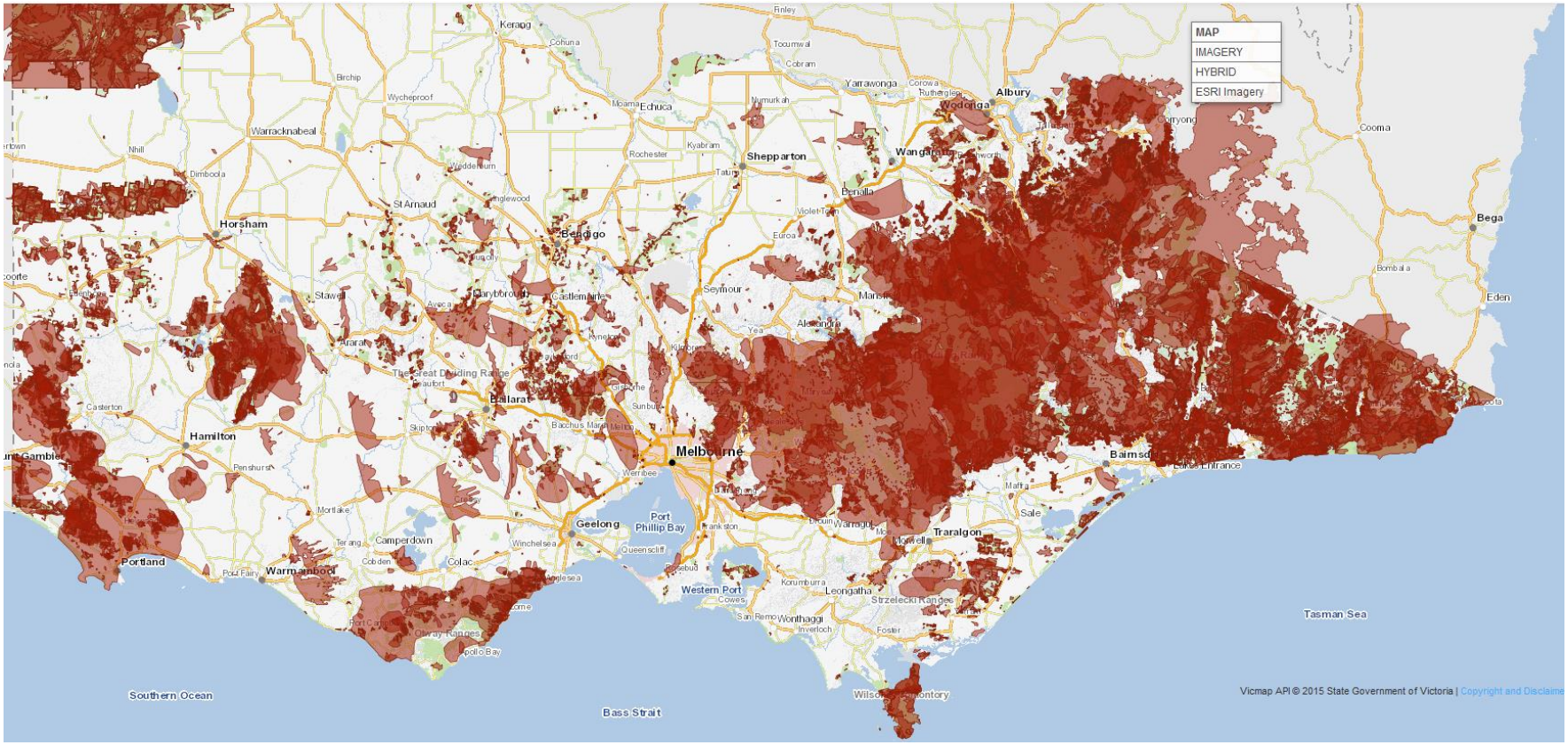
- Impacts are measured by linking economic output to the sensitivity and exposure levels for each SLA.
- Data in this report is at the group level. There are 190 economic groups according to the ANZSIC classification (2006)
- Groups are ranked according to whether they exhibit negligible, low, moderate or high vulnerability to bushfires and floods.

# FRAMING NATURAL HAZARD VULNERABILITY

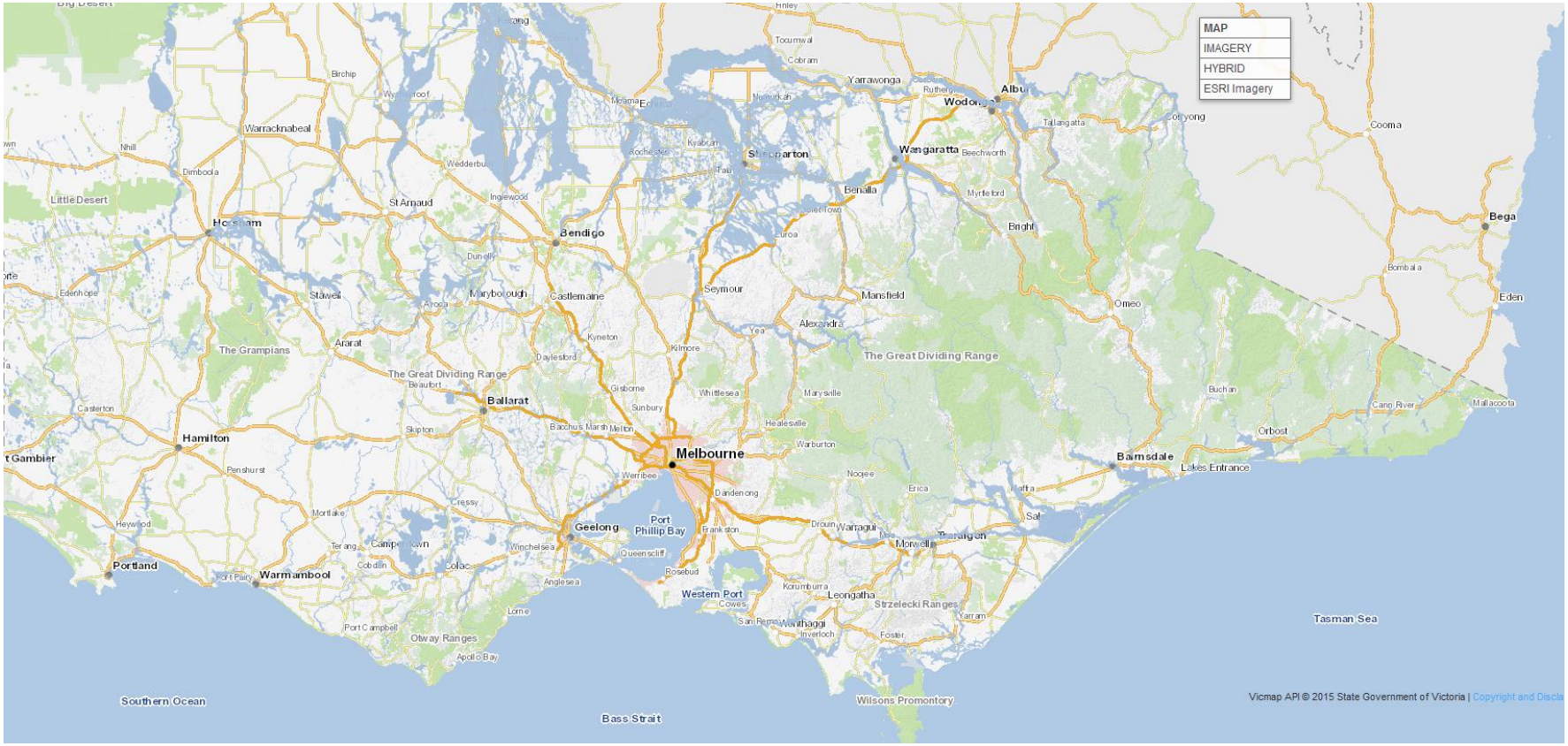
## Vulnerability Matrix

| | Sensitivity | | | |
|---|---|---|---|---|
| **Exposure** | Negligible | Low | Moderate | High |
| **Negligible** | Negligible | Negligible | Negligible | Low |
| **Low** | Negligible | Negligible | Low | Moderate |
| **Moderate** | Negligible | Low | Moderate | High |
| **High** | Low | Moderate | High | High |

# HISTORICAL BUSHFIRE DATA

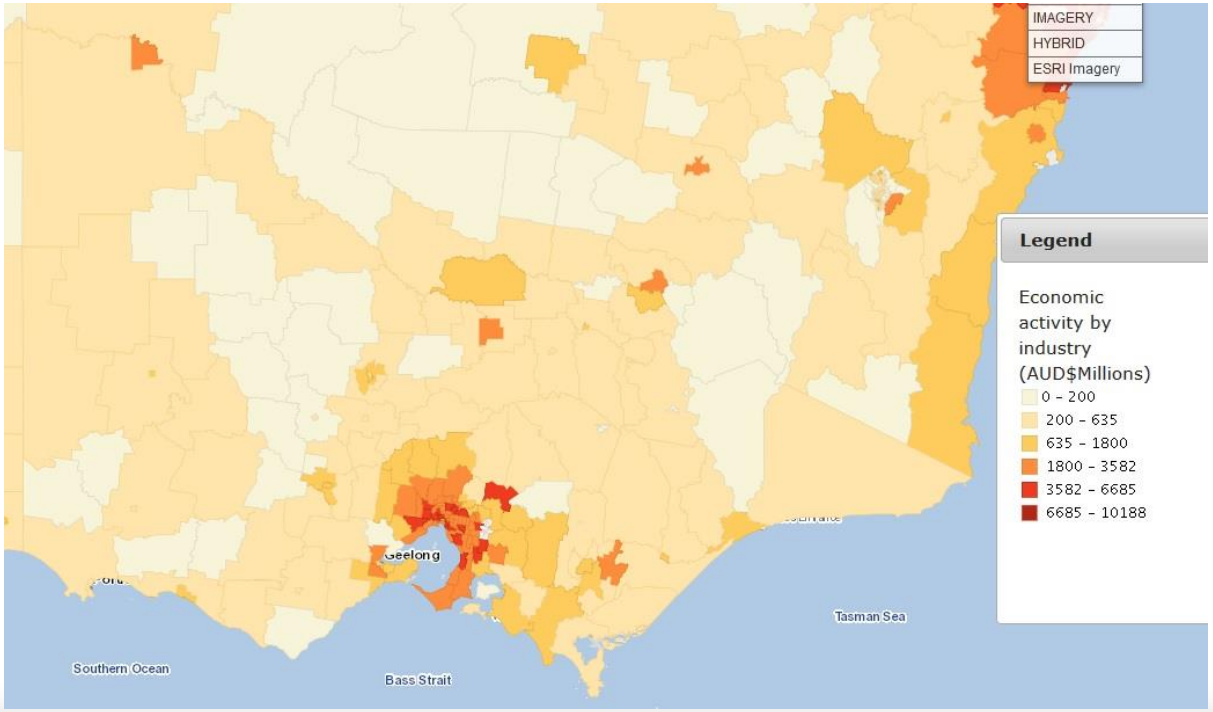


# HISTORICAL FLOOD DATA



# ECONOMIC ACTIVITY

- Total economic activity in Victoria in 2011as measured by the Australian Bureau of Statistics (ABS) was $296.2 billion.
- This figure was categorised into 19 economic divisions

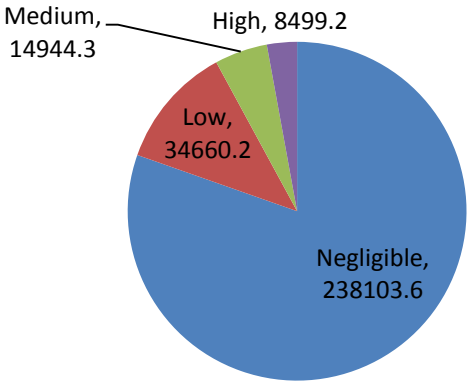


# ECONOMIC DIVISIONS

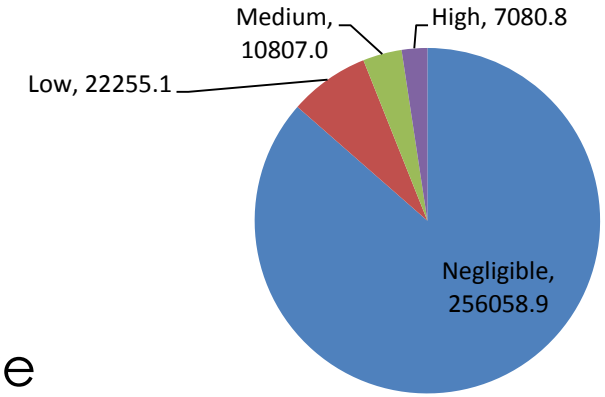
1) Agriculture, Forestry and Fishing
2) Mining
3) Manufacturing
4) Electricity, Gas, Water and Waste Services
5) Construction
6) Wholesale Trade
7) Retail Trade
8) Accommodation and Food Services
9) Transport, Postal and Warehousing
10) Information Media and Telecommunications
11) Financial and Insurance Services
12) Rental, Hiring and Real Estate Services
13) Professional, Scientific and Technical Services
14) Administrative and Support Services
15) Public Administration and Safety
16) Education and Training
17) Health Care and Social Assistance
18) Arts and Recreation Services
19) Other services

# ECONOMIC VULNERABILITY (INCOME)

## Bushfire Vulnerability




## Flood Vulnerability



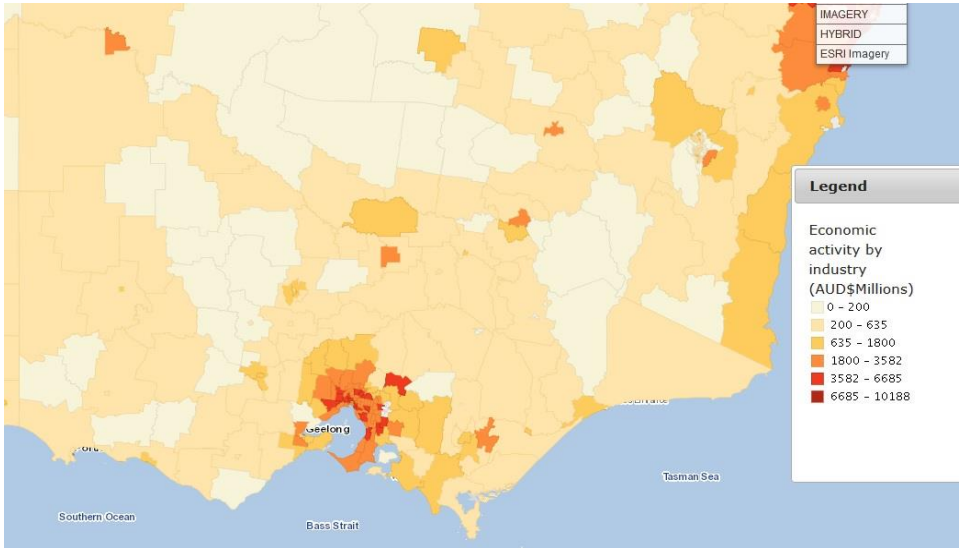

Overall relatively low, but masks enormous regional and sectoral variation, both in absolute sense and relative sense

# SLA ECONOMIC DIVERSITY

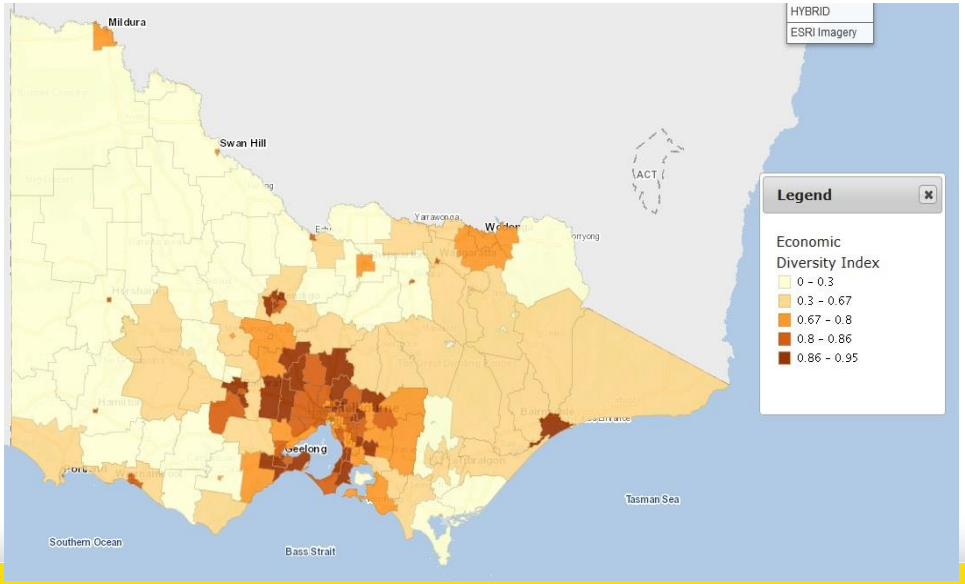
- A more diverse economy will have less variation in economic activity over time, as well as having less vulnerability and greater resilience to natural disasters such as bushfires or floods
- The extent of economic diversification varies from state to state as well as from one SLA to another within a state. Mapping of such economic diversity highlights areas with greater and lesser economic vulnerability.

# ECONOMIC GEOGRAPHY OF NATURAL HAZARDS:

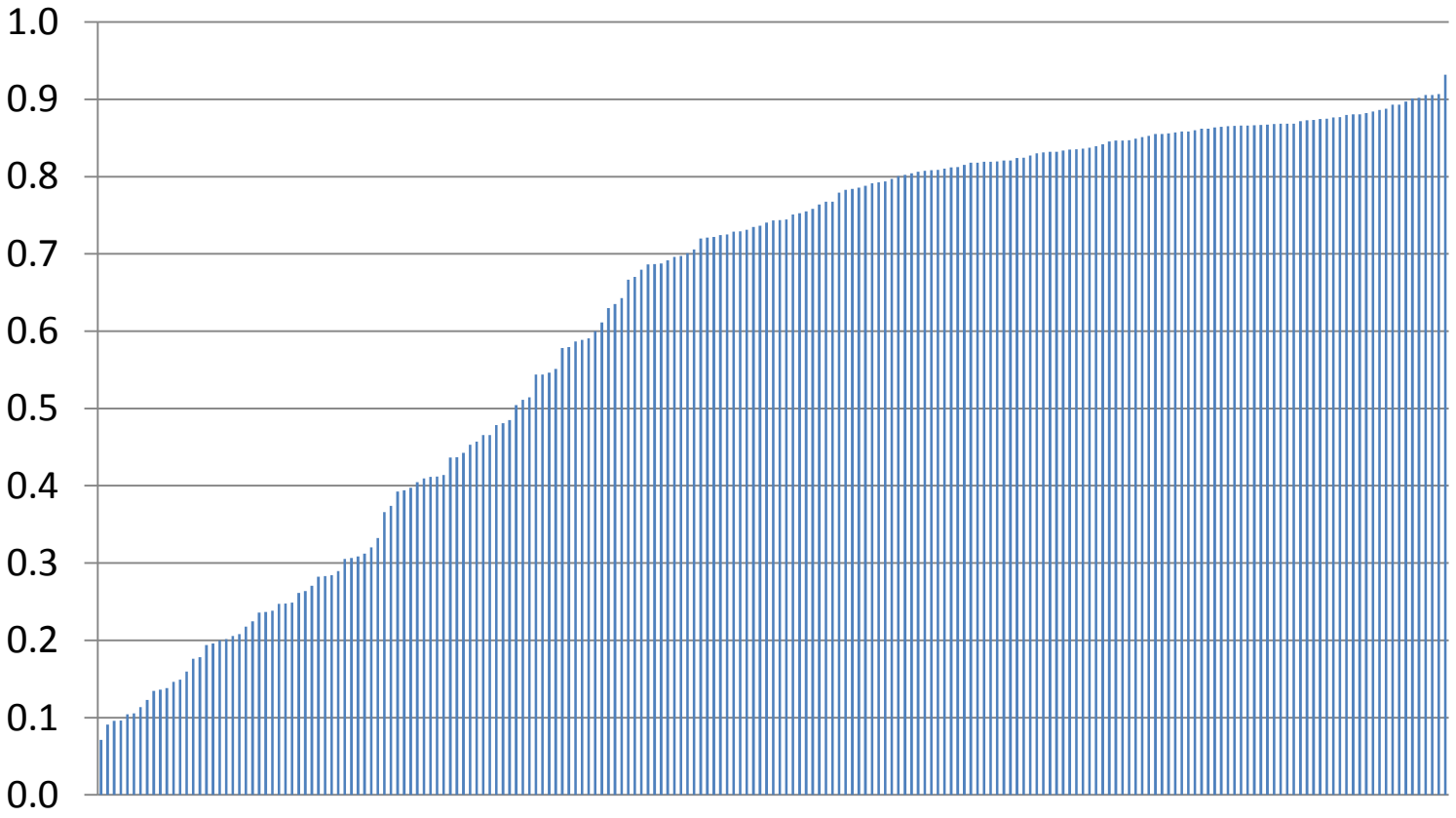
## Economic Income




## Economic Diversity

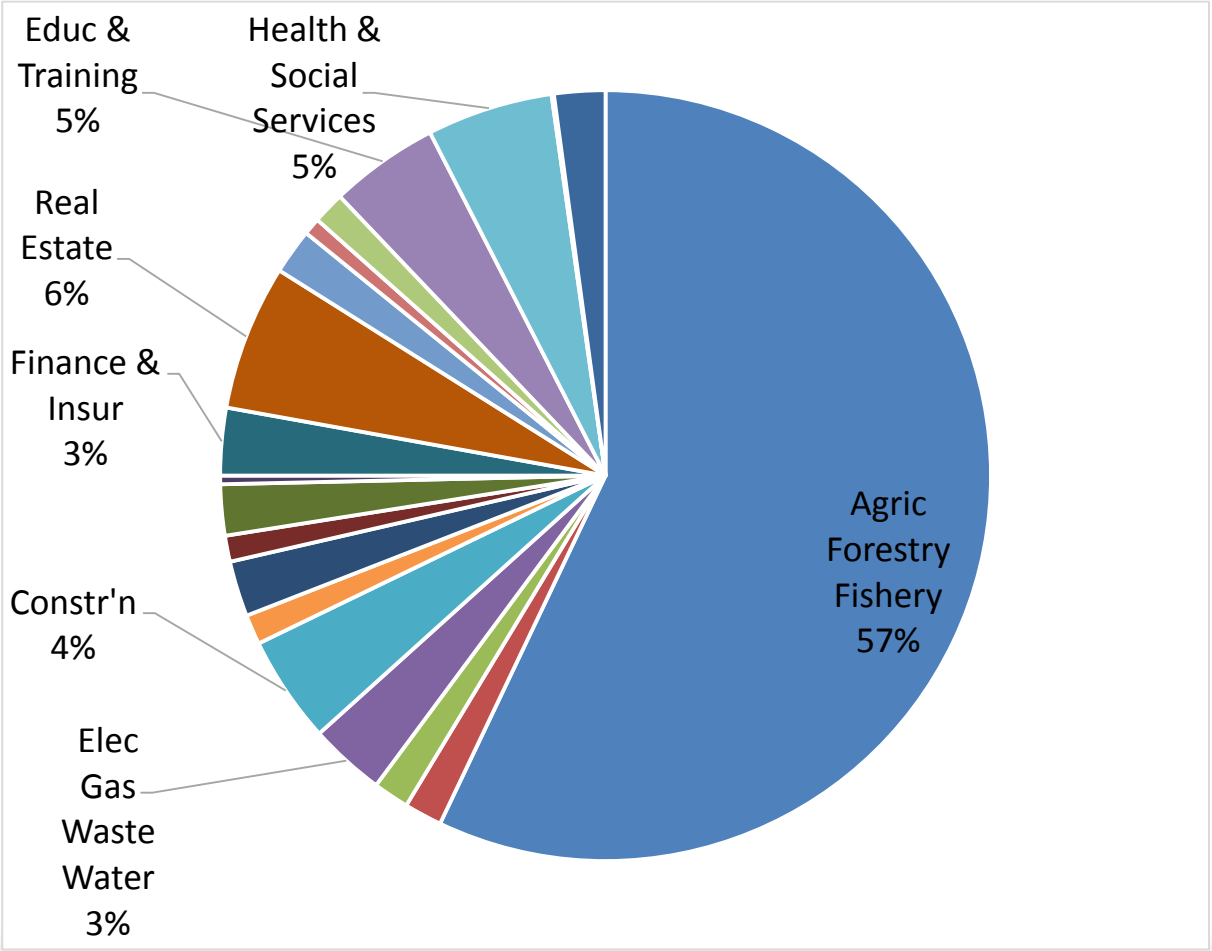


# SLA ECONOMIC DIVERSITY DISTRIBUTION



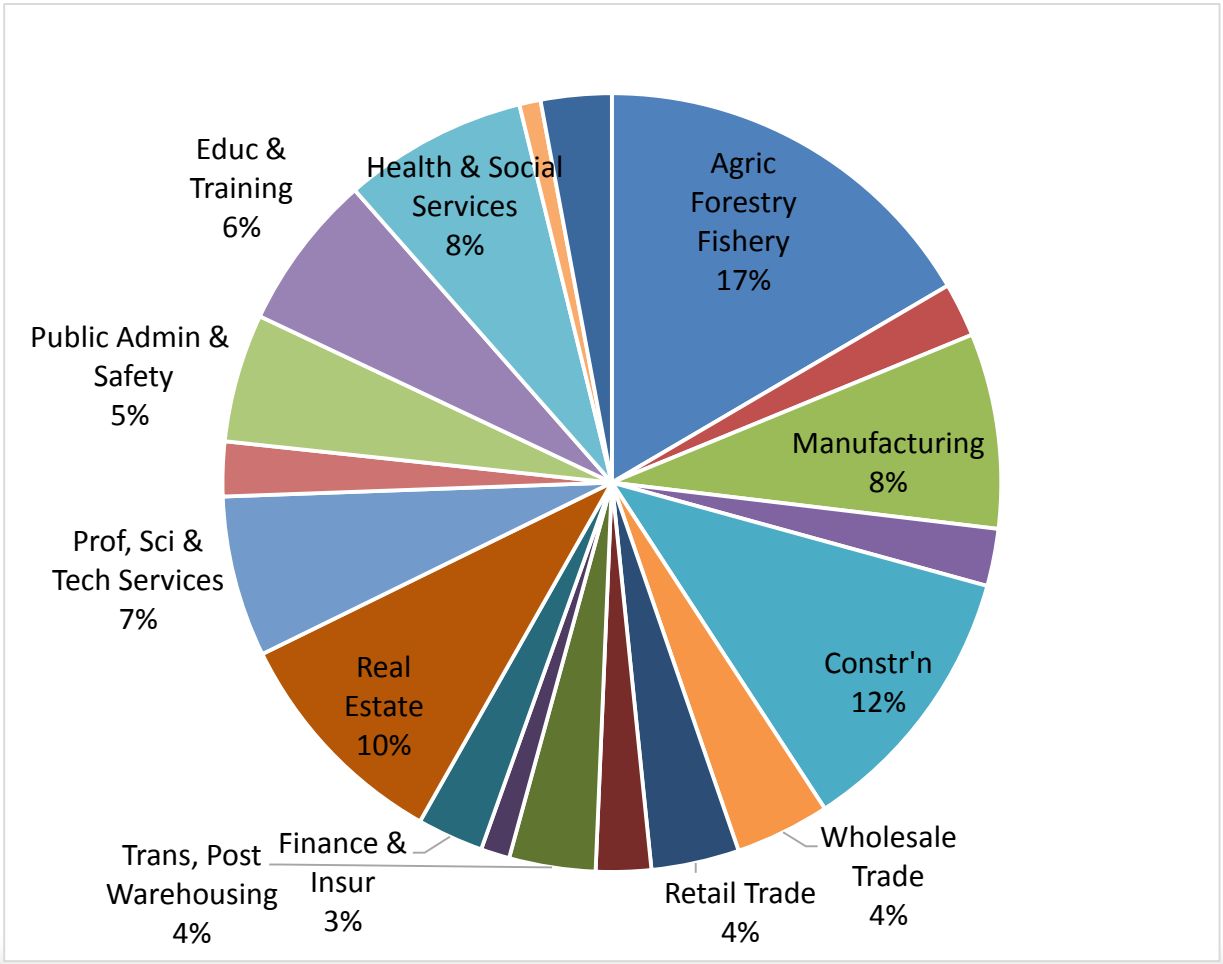
# SLA ECONOMIC DIVERSITY
# LODDON NORTH

Econ Div: 0.07



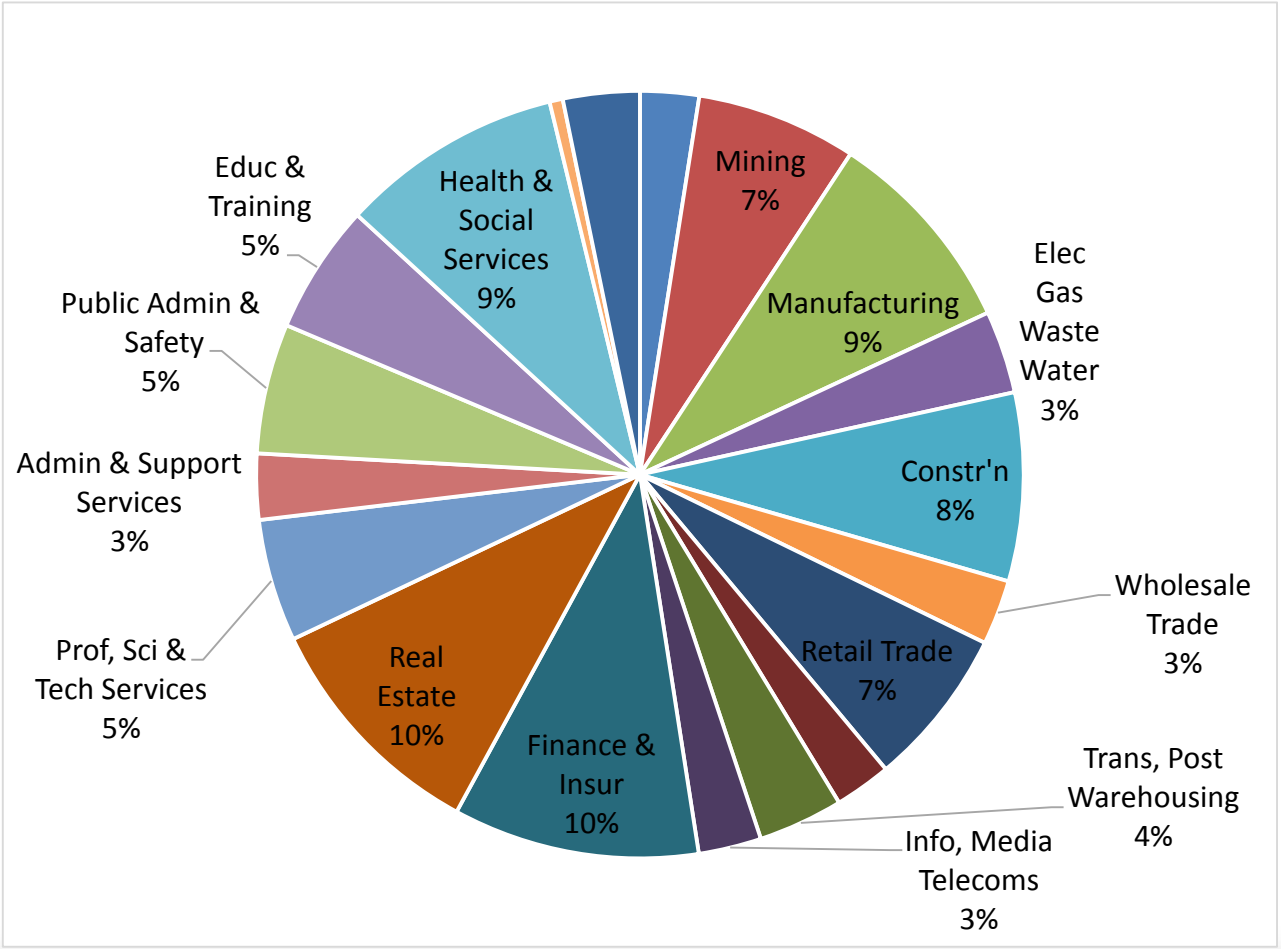
# SLA ECONOMIC DIVERSITY MURRINDINDI WEST

Econ Div: 0.50

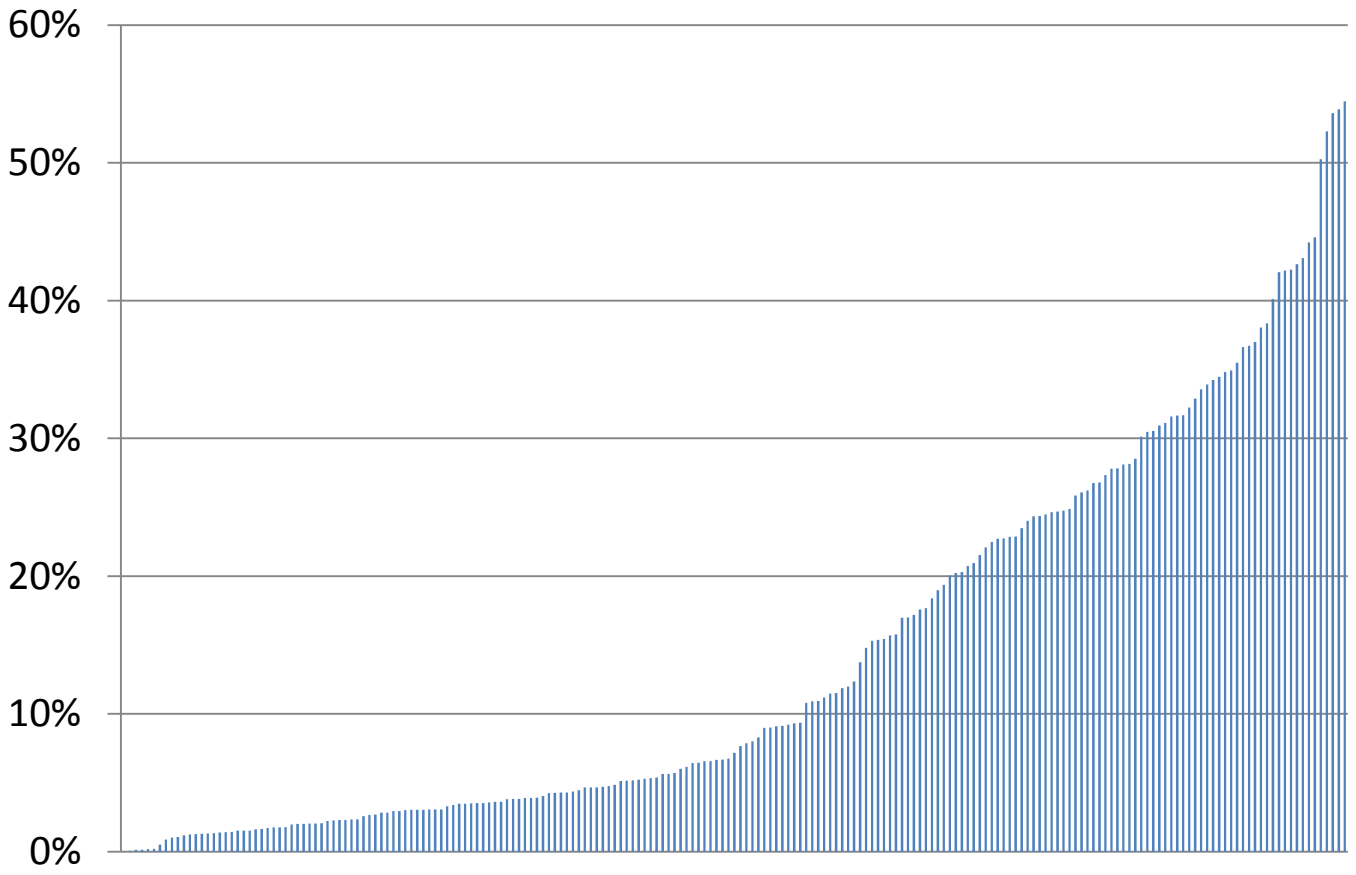


# SLA ECONOMIC DIVERSITY GR BENDIGO, INNER WEST

Econ Div:0.93



# SLA ECONOMIC INCOME, % OF MAX INCOME

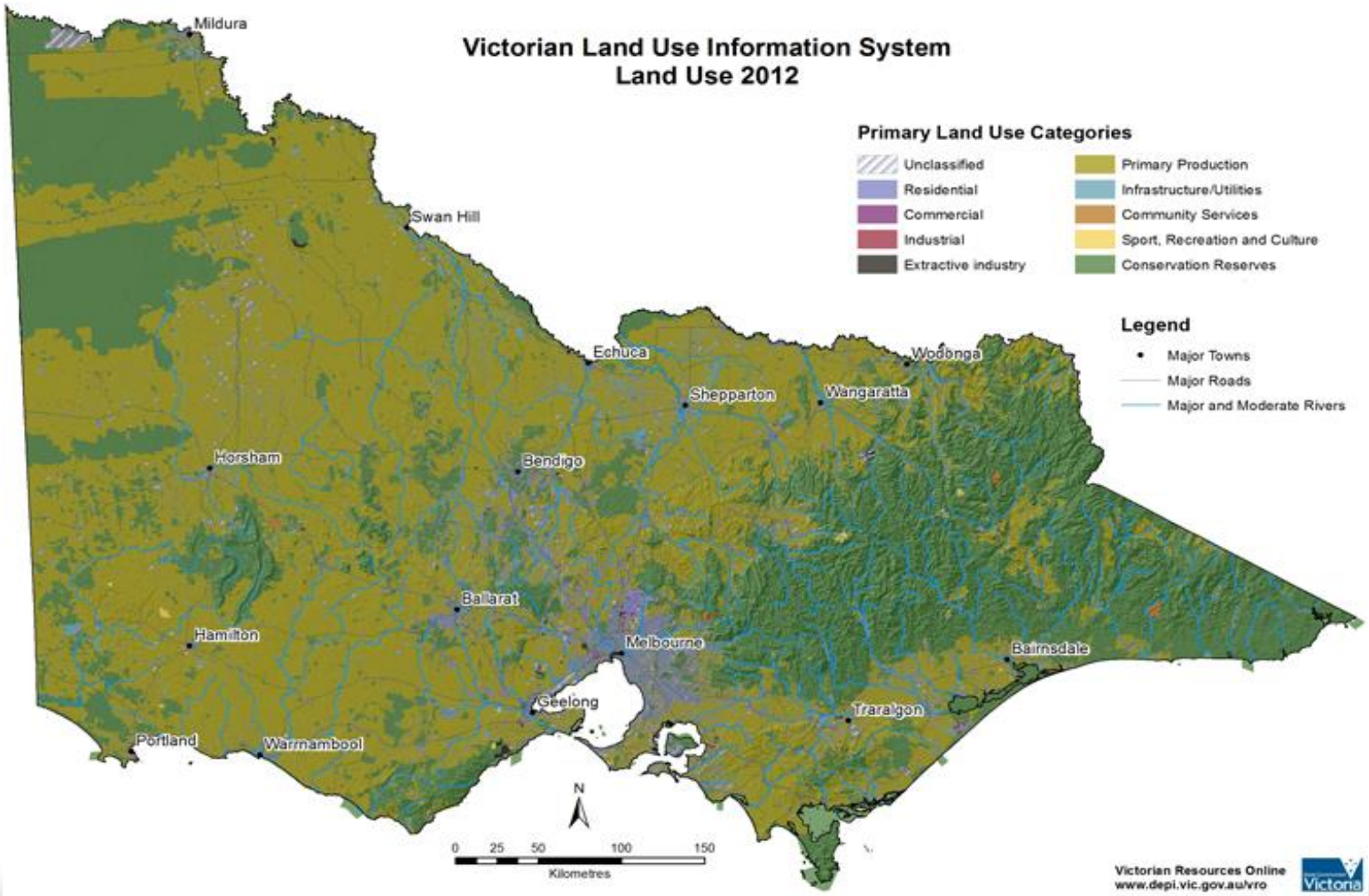


# ECONOMIC GEOGRAPHY OF NATURAL HAZARDS: VICTORIA CASE STUDY

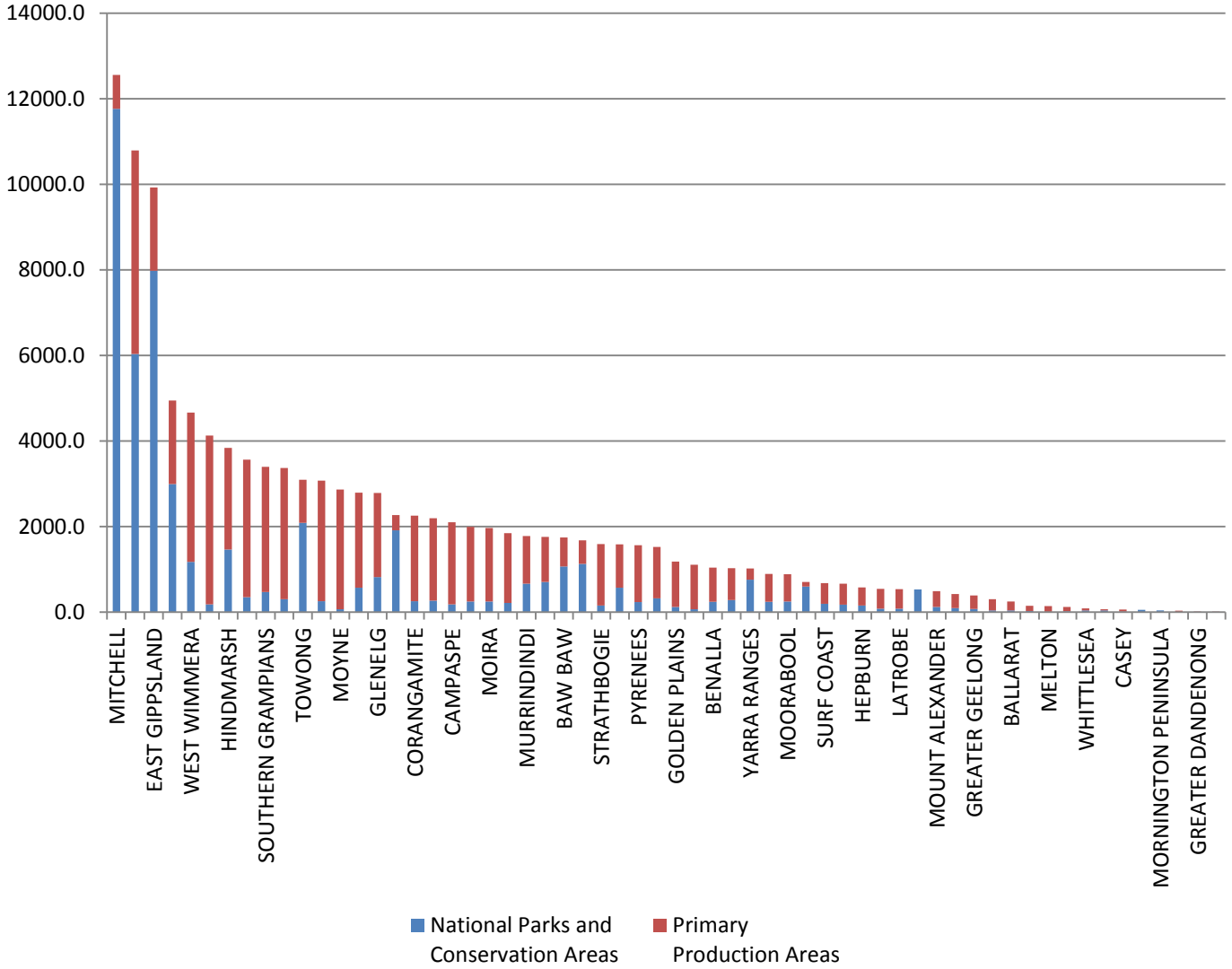
## Ecosystem Services Value

- Ecosystems provide a range of services that are of fundamental importance to human well-being, health, livelihoods, and survival
- The value of ecosystem services was not included in the ABS figures.
- Unit values used by Costanza et al. (2014) have been applied in the Victoria setting through the use of the Victorian Land Use Information System which allocates each land parcel into one of 10 categories
- The value allocated to agricultural land is based on the work of Wratten et al. (2013) who assign an ecosystem value to this land use separate to that of the market value of products grown on this land

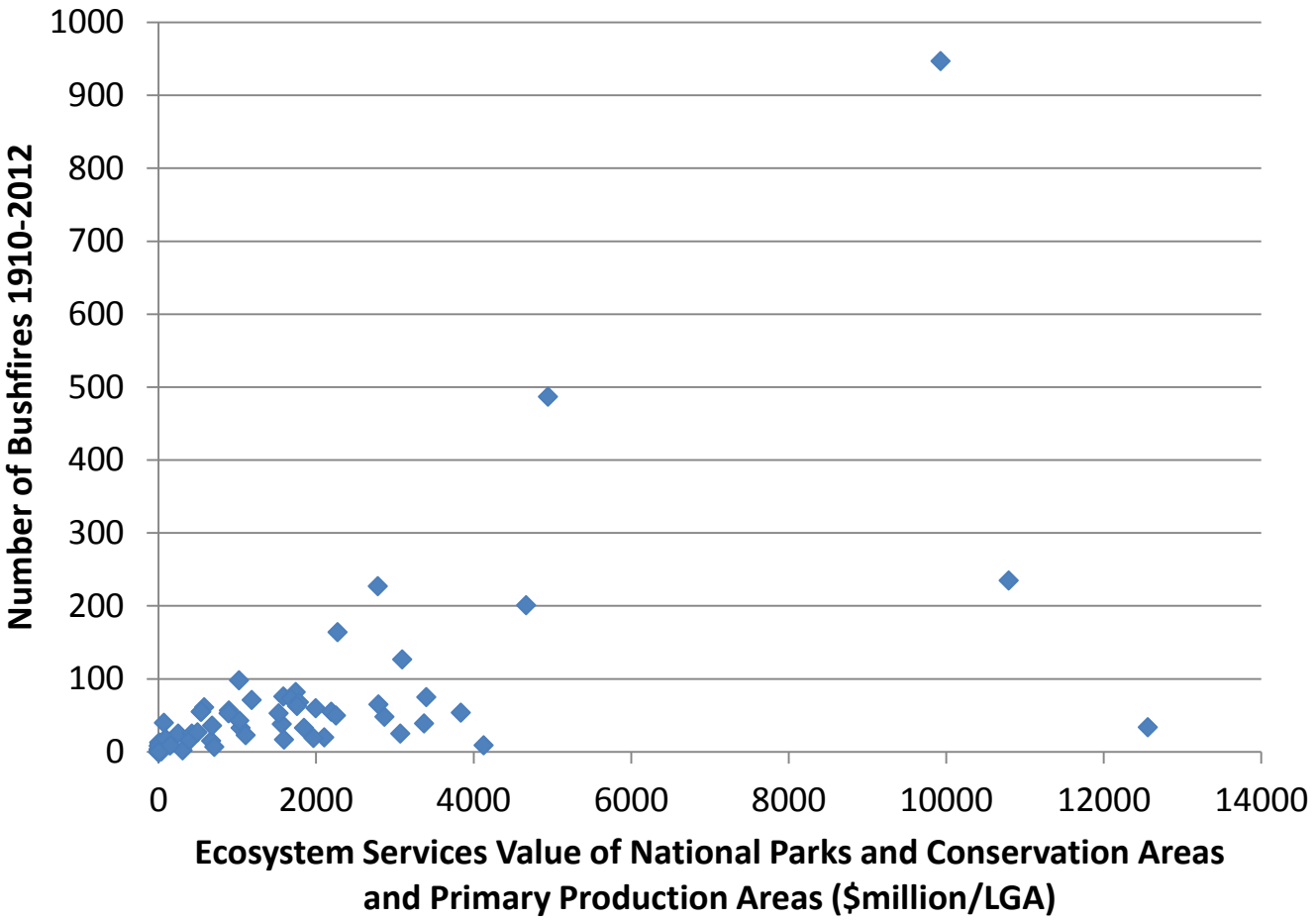
# ECOSYSTEM SERVICES VALUE



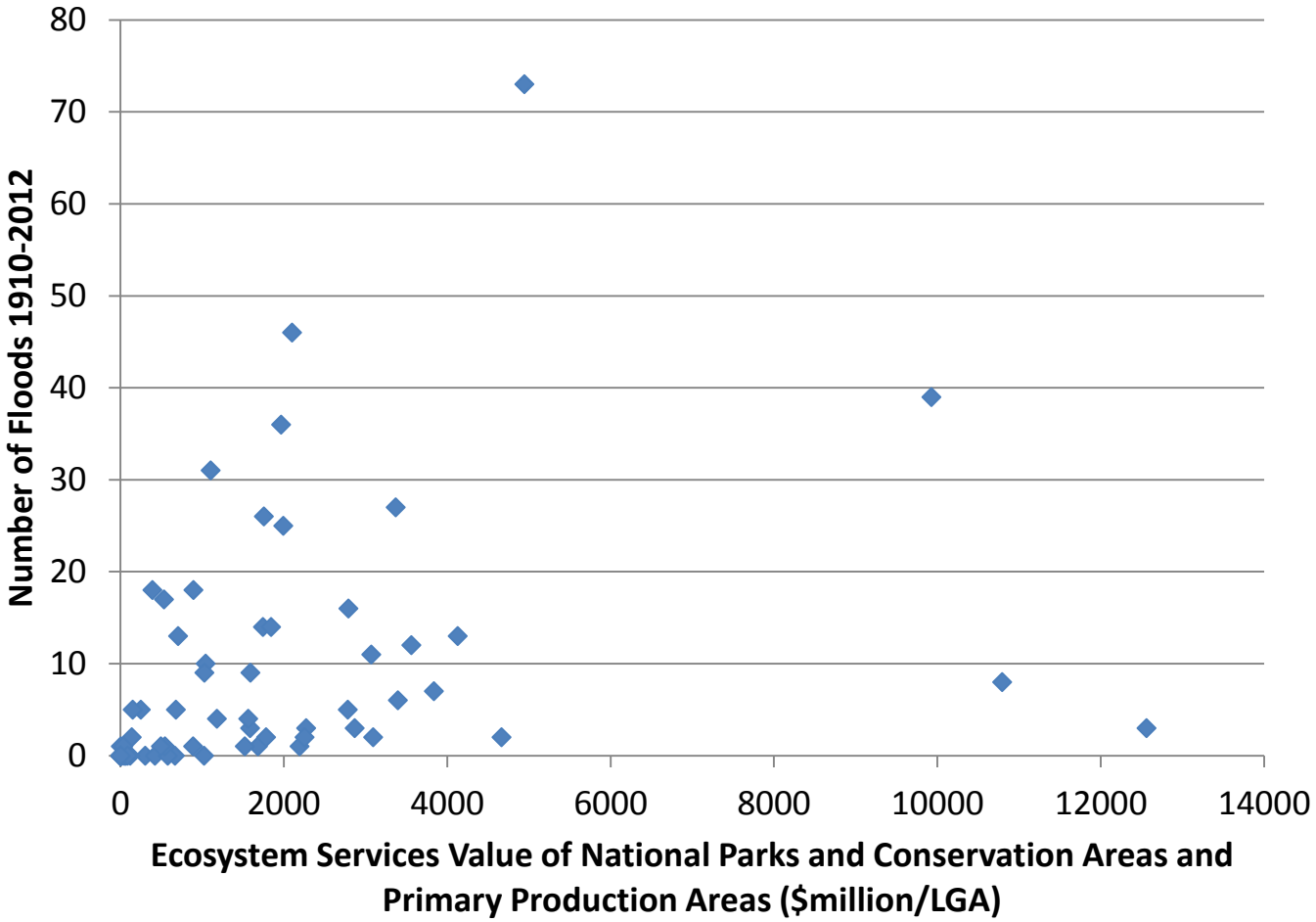
# ECOSYSTEM SERVICES VALUE



# ECOSYSTEM VALUE AND BUSHFIRE VULNERABILITY



# ECOSYSTEM VALUE AND FLOOD VULNERABILITY



# ECONOMIC GEOGRAPHY OF NATURAL HAZARDS: VICTORIA CASE STUDY

- At present, we can provide a picture as to which sectors are considered to be the most vulnerable and indicate the relative vulnerabilities between sectors.
- Data and scale limitations do not allow "drilling down" or aggregration from "bottom up" but this can be developed through state agencies
- Natural hazard data availability is a serious limitation

# SUMMARY OF UNDERSTANDING VALUES AT RISK AND RISK OWNERSHIP WORKSHOP SYNTHESIS REPORT

# THE WORKSHOPS

**Four workshops in Victoria, New South Wales, Tasmania and South Australia, their purpose was:**

To explore how values and risk ownership currently inform decision making through a series of structured exercises.

To test aspects of the newly developed draft values-at-risk map to ascertain gaps in the values currently represented and explore its potential use.

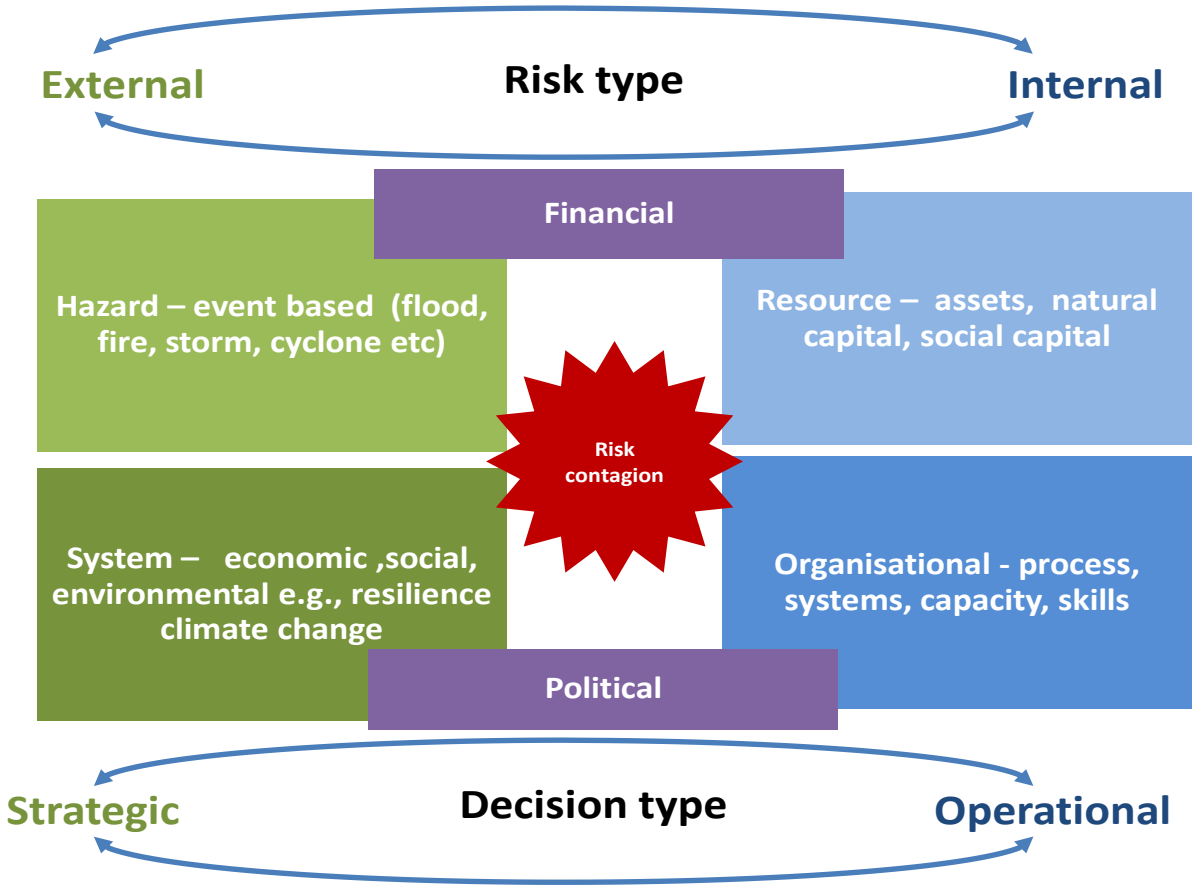
To understand better, current decision making preferences in relation to risk ownership.

# DECISION MAKING AREA

| Type of decision | Simple | Complicated | Complex |
|---|---|---|---|
| Characteristics | Linear, actionable, can be solved with one solution. Often static risks with known treatments and outcomes. | Systemic, 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 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. |
| Actionees | Individual to organisational – person or persons 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. |

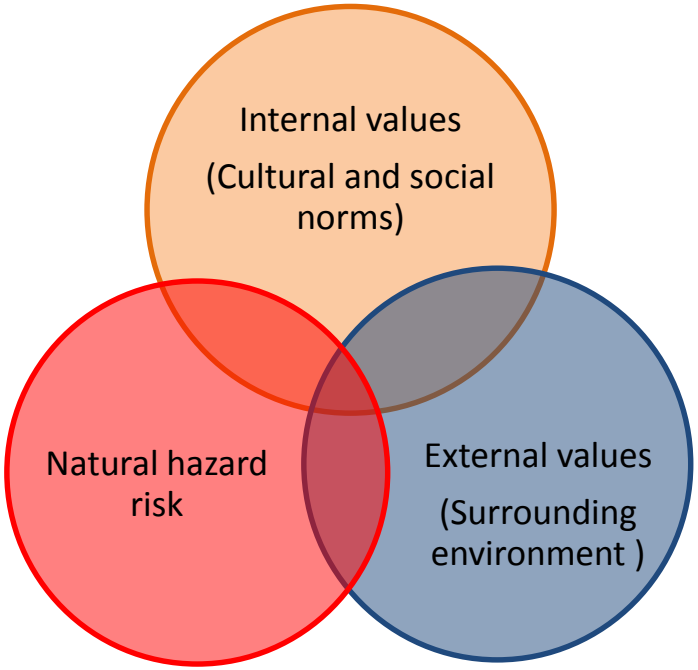
**Types of decisions for natural hazards management. Young et al 2016 Forthcoming**

# RISK AREAS




Risk System With Internal And External Components, (Young et al 2016 forthcoming)

# VALUES AREAS




**Key components of decision making for natural hazards (Young et.al 2016 forthcoming)**

# KEY FOCUS OF WORKSHOPS

**Institutions:**

Federal, state/territory and local government, business and industry and community.

**Values**

Built, social and environmental, assets and infrastructure.

**Hazards:**

Fire, Flood, Severe storm (includes wind and hail, Heatwave.

# KEY FINDINGS REGARDING THE PROCESS

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.
- That the process of allocating specific risk ownership needed to be supported by clear process structures, skilled facilitation and allocated sufficient time for effective outcomes to be achieved.
- Ascertaining community values requires stakeholders with diverse expertise and experiences to fully represent the different agendas and values that make up the community.

# KEY FINDINGS RELATED TO DATA

Data availability and quality was highlighted as a key area where support and capacity building is needed. Particular needs related to:

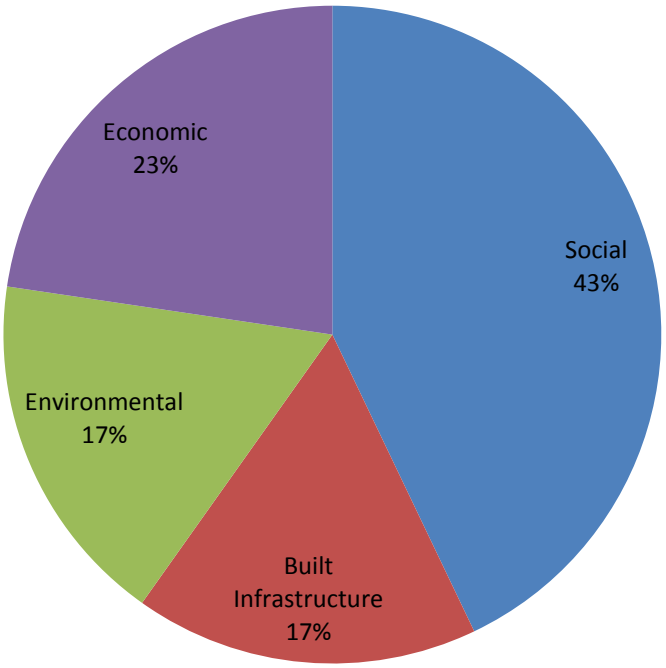
- Selection of data
- Lack of specific data
- How to maintain and ensure quality of data
- Integration of data and data use
- Sense making of data

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

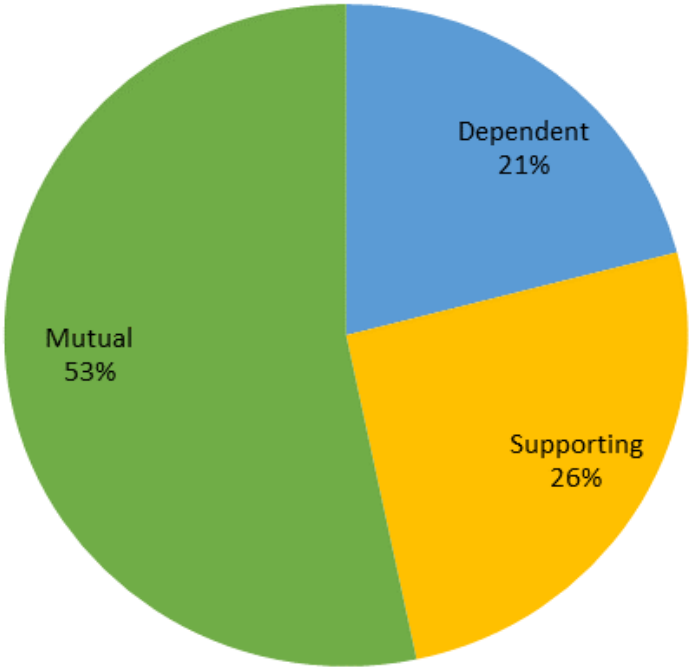
# KEY FINDINGS RISK OWNERSHIP

1) The Social values category had the highest level of allocation and built infrastructure the lowest.
2) 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.
3) The Social values category had the highest allocation of unowned risks and values.
4) The risk and consequence area had highest allocation of unowned risks, in contrast to the ownership of actions.

# OWNERSHIP OF VALUES AT RISK – ALL STATES

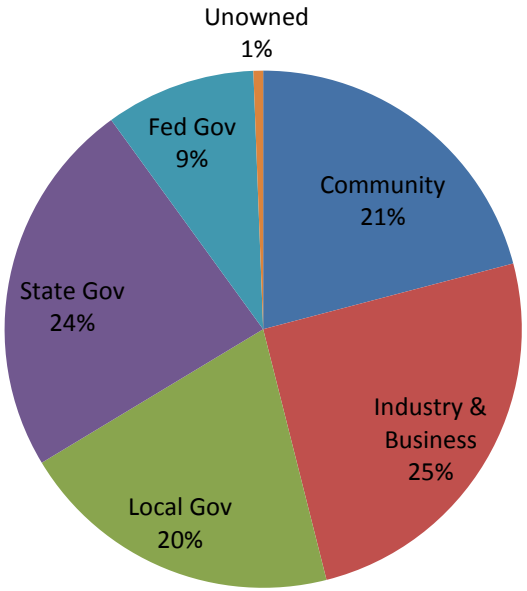


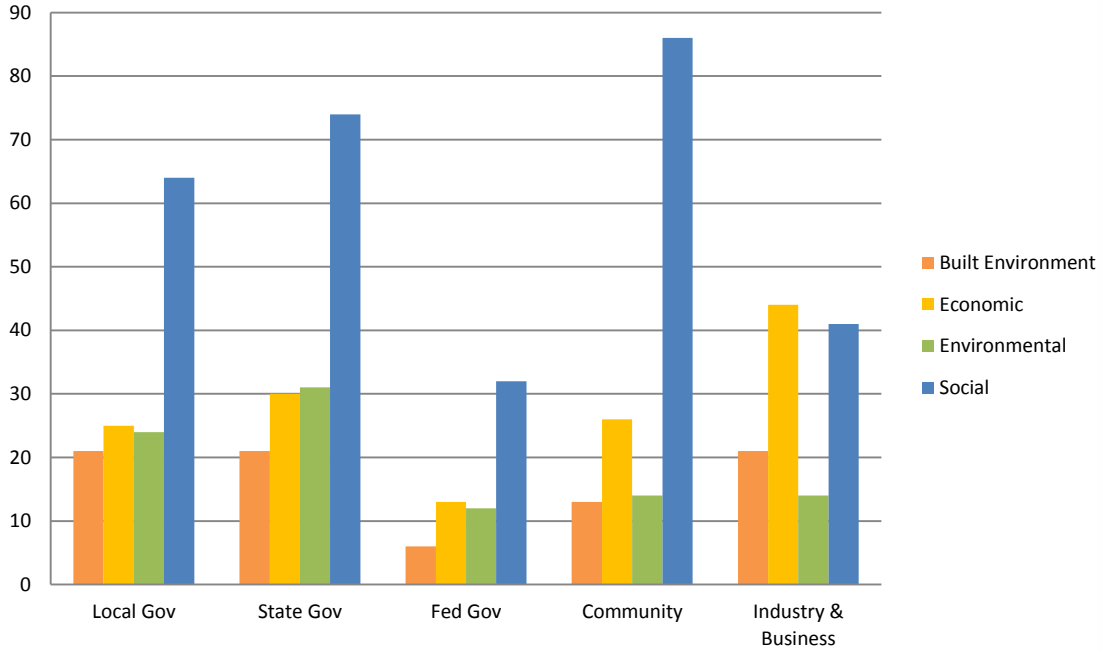

Value area



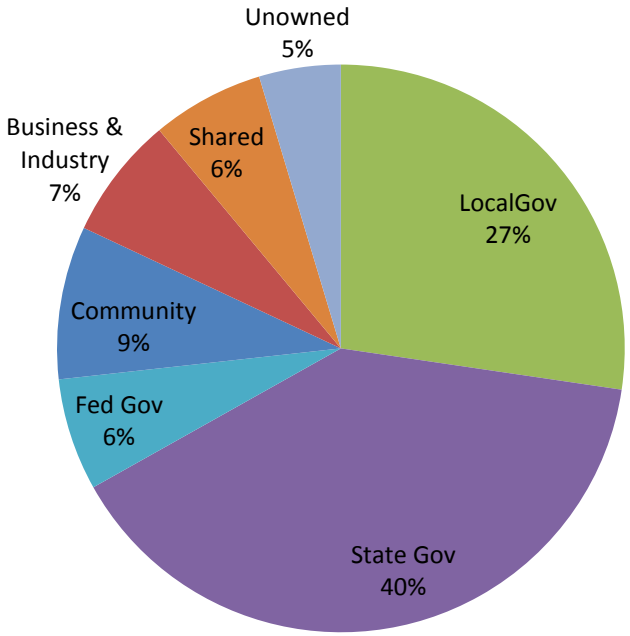

Connectivity

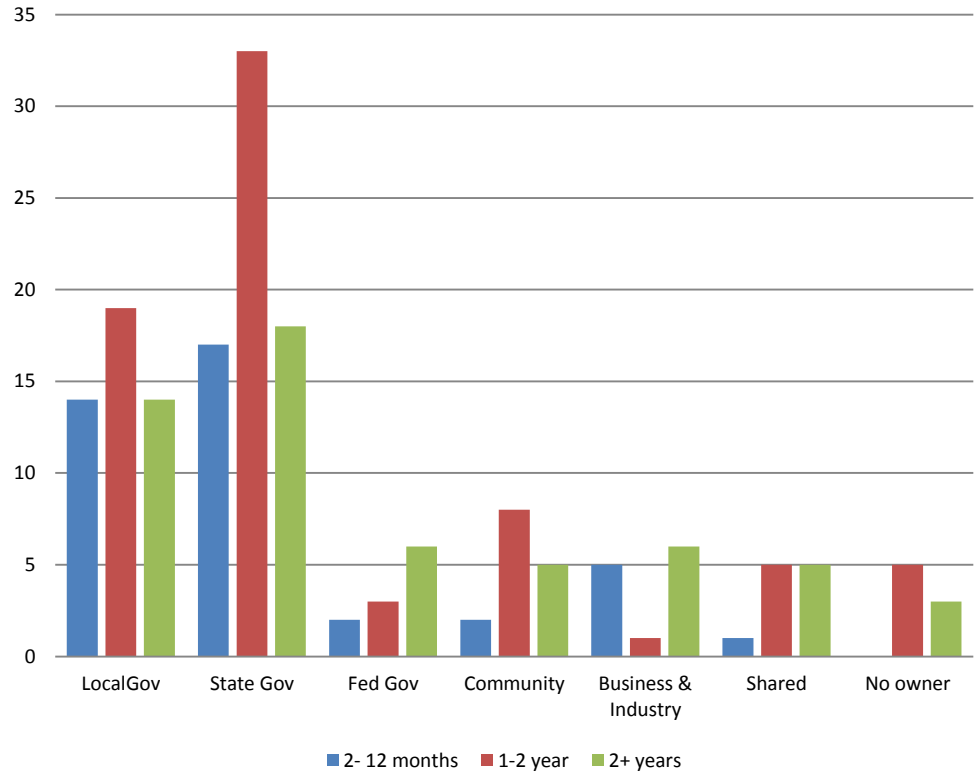
# OWNERSHIP OF VALUES AT RISK – ALL STATES



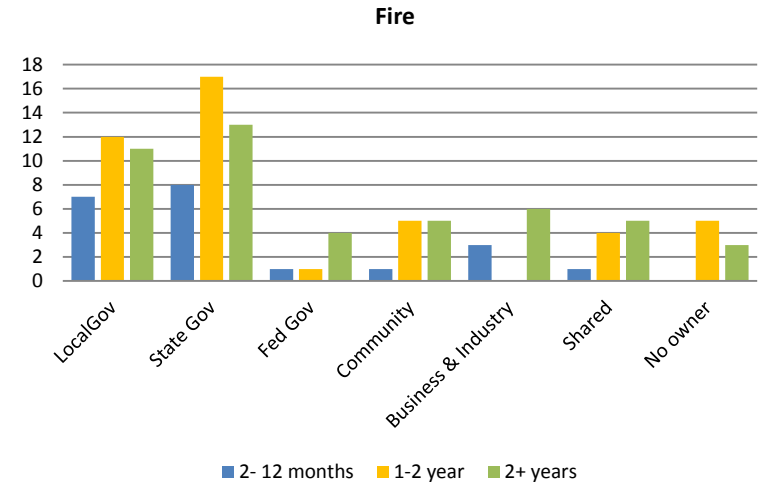



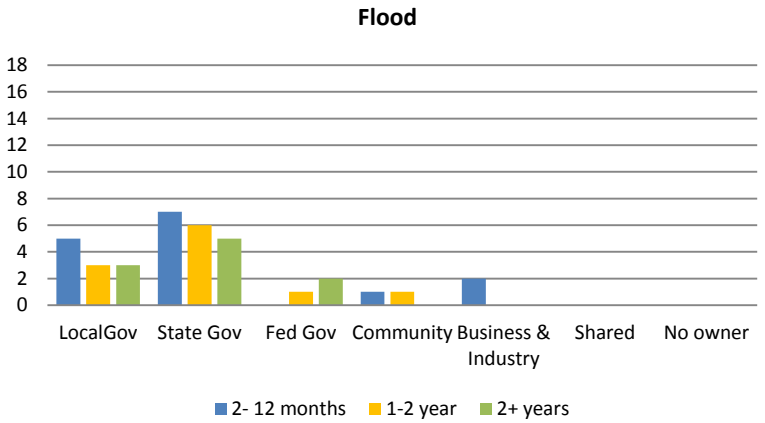
# ALLOCATION OF RISK AND CONSEQUENCE OWNERSHIP

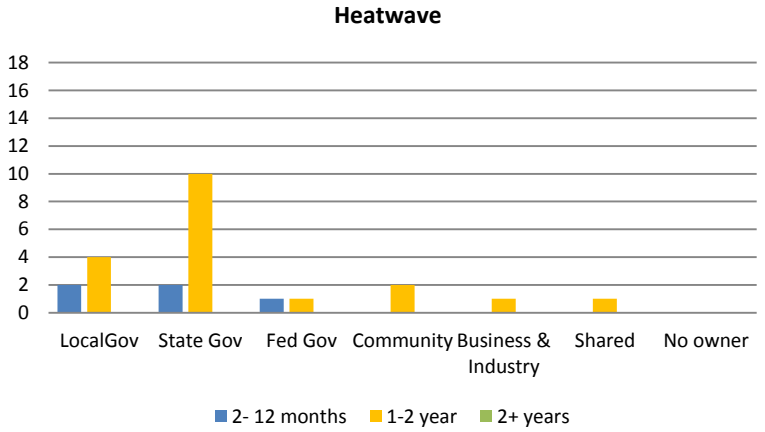


# RISK AND CONSEQUENCE ACROSS HAZARDS

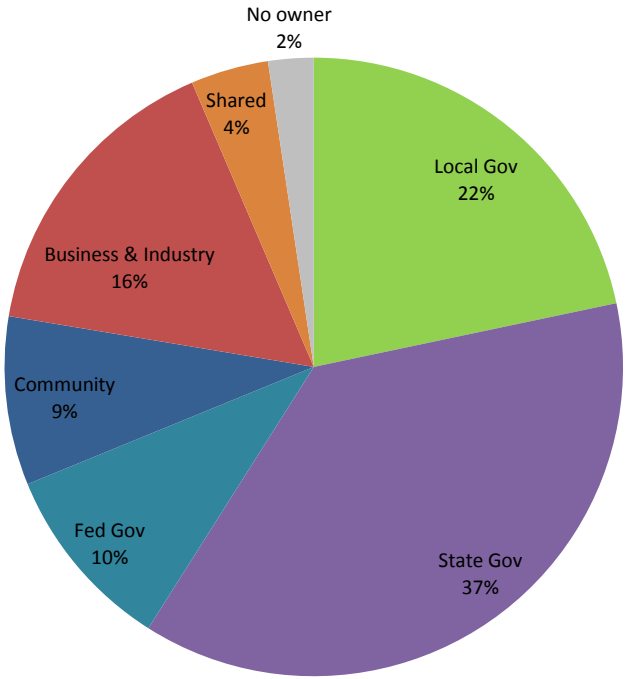


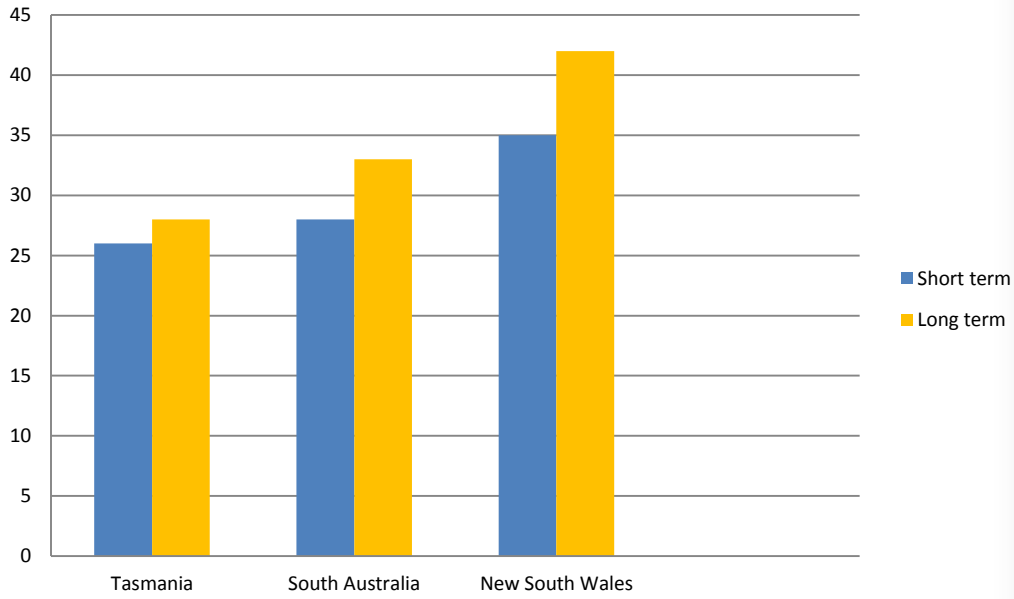



# OWNERSHIP OF ACTIONS – PREPARATION & RECOVERY

**People found it easier to allocate actions and risk ownership using activity-based exercises**



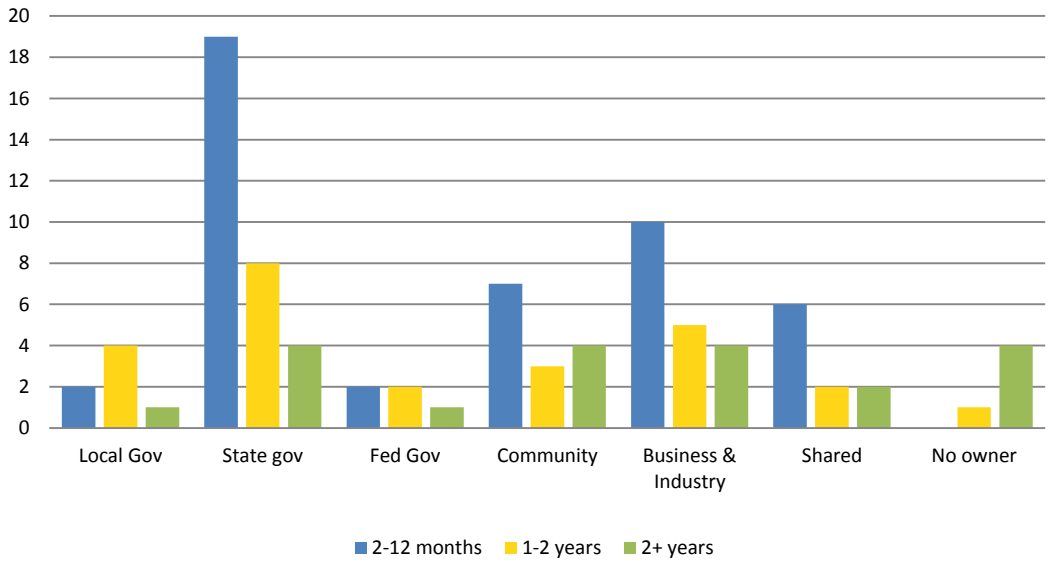

**Ownership of actions all states**




**Tasmania, South Australia and New South Wales actions**

# RAP CRITERIA - VICTORIA

**Specific allocation of accountability, responsibility and payment was found to be particularly difficult and, at times, contentious.**



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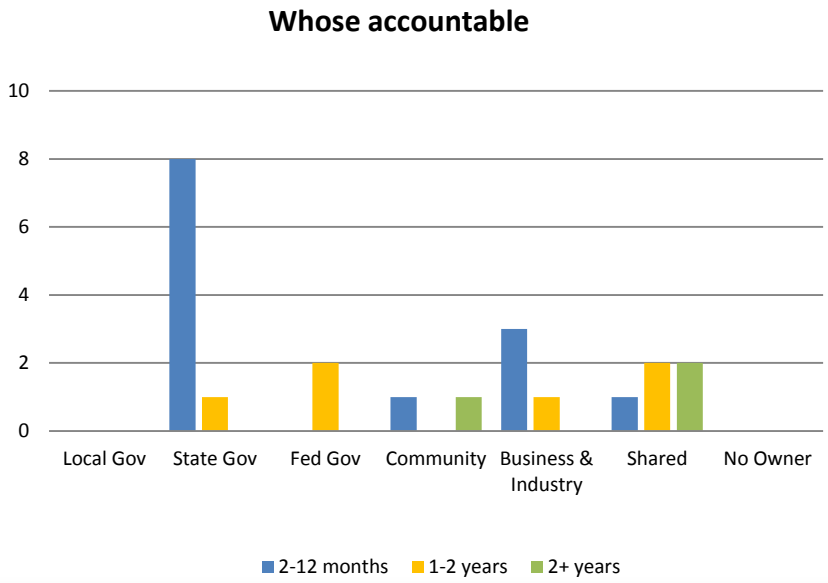
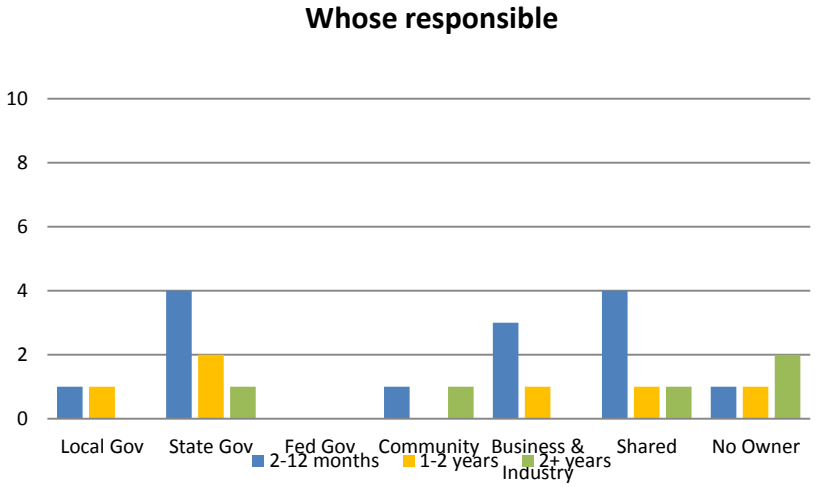
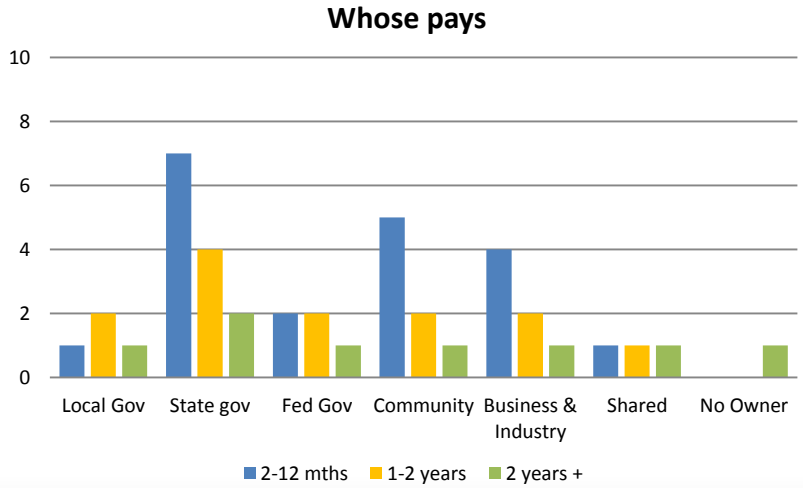


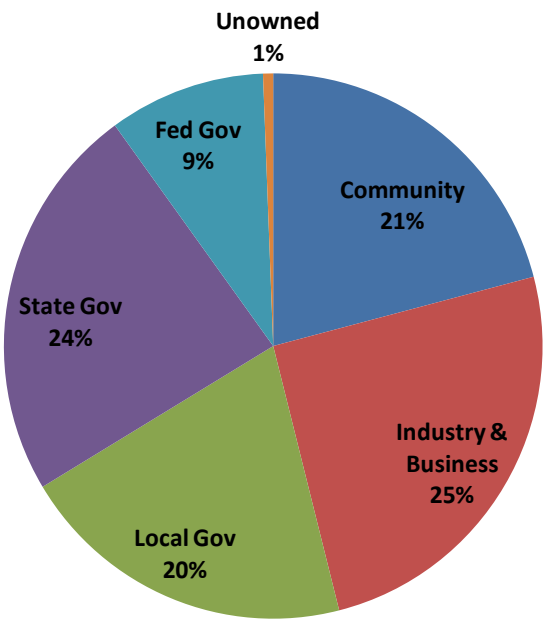



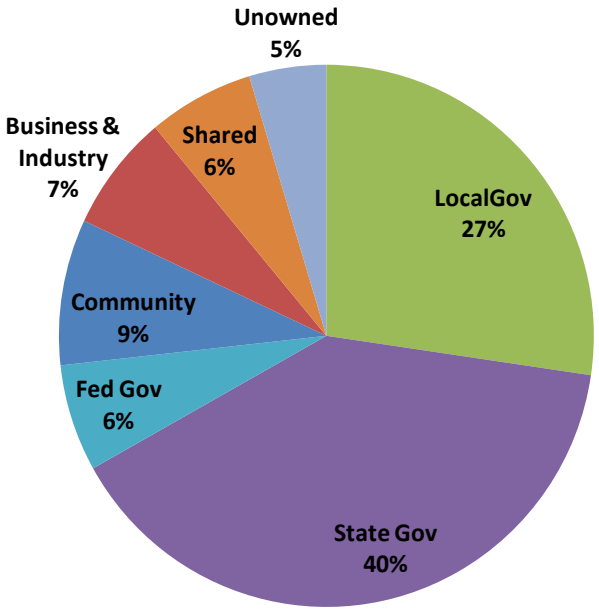
# SO WHO OWNS THE RISK?

**There are potential imbalances with current public, private sector arrangements between ownership of values and ownership of risk.**

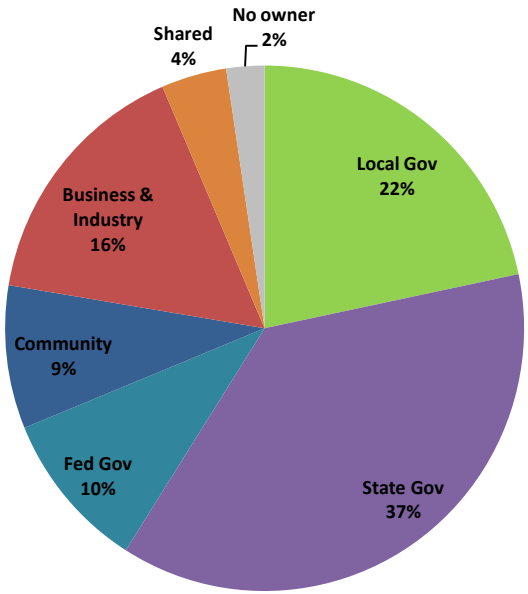
## Values at risk




## Risk and Consequence




## Risk Actions



# TOWARDS VALUE BASED DECISION MAKING FOR NATURAL HAZARDS

| 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?<br>• Is there a criteria to establish what is an acceptable level of risk 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?<br>• What values are dependent upon other values to sustain their function?<br>• What values support other values to maintain their function?<br>• 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?<br>• What is the benefit/s of this value e.g., social, environmental, economic?<br>• Who owns this value/s?<br>• If there are multiple owners of a value, who is the primary owner?<br>• What supporting or dependent values are associated with this value/s?<br>• Who owns these values?<br>• 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?<br>• What are the likely consequences/risks of these hazard scenarios?<br>• What area do these risks and consequences belong to; operational, system, hazard, financial,<br>• What is the level/degree of possible impact is being allocated to the hazard/s?<br>• Do these consequences/risks impact across (short, medium, long term) time scales?<br>• If they impact across different time scales, do they change or increase across (short, medium, long term) time scales? |

# AREAS FOR FURTHER DEVELOPMENT

1) **Integration of new knowledge, practice and everyday understanding of risk** into decision-making frameworks for strategic planning.

2) **Analysis of current sense making with data-based tools and methods** and their effectiveness in relation to strategic decision making.

3) **Developing a better understanding of risk ownership as a system,** clarifying areas such as shared ownership and unowned risks.

4) **Analysis of the current balance of public–private ownership** of values and risks.

# BUILDING CAPACITY FOR STRATEGIC DECISION MAKING

- Current institutional arrangements are fragmented and uncertain with key values at risk being partially owned or unowned, especially social and environmental values
- No clear vision as to what strategic decision making is or entails
- Further research development requires engagement with end users as to what the above points mean to them (and what they want to do about it)
- Risk ownership is a useful framework for decision making at the institutional scale

# QUESTIONS AND CONTACT

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