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The Australian Natural Disaster Resilience Index

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Society has always been susceptible to natural hazards. While the occurrence of these events generally cannot be prevented, the risks can often be minimised and the impacts on people and property reduced.

Natural hazard management policy throughout the world is increasingly being aligned to ideas of resilience. The *National Strategy for Disaster Resilience*[1] outlines how Australia should aim to improve social and community resilience with the view that resilient communities are in a much better position to withstand adversity and to recover more quickly from extreme events. However, there is a distinct need to assess resilience to identify areas of strength, areas for improvement, plan future actions and have a baseline condition from which to measure progress.

To address this, researchers from the Bushfire and Natural Hazards CRC teamed with various emergency service agencies around Australia to develop an index of disaster resilience and, for the first time, assess the state of disaster resilience Australia-wide. The Australian Natural Disaster Resilience Index[2] will produce a consistent spatial assessment of the current state of disaster resilience across Australia and report results as a State of Disaster Resilience report. The Index will also provide input to macro-level policy, strategic planning and community engagement activities at national, state and local government levels.

Disaster resilience

Three aspects of disaster resilience are common across the many definitions of disaster resilience:

- the ability to absorb or accommodate the effects of an external disturbance or stressor event
- the ability to recover and return to a functioning state or to persist following an event
- the capacity to learn, adapt or transform.

For the Australian Natural Disaster Resilience Index, disaster resilience is defined as the capacity of communities to prepare for, absorb and recover from natural hazard events, and the capacities of communities to learn, adapt and transform towards resilience. Importantly, this definition highlights not the actual realisation of resilience but the capacities for resilience.

> **Disaster Resilience:** the capacity of communities to prepare for, absorb and recover from natural hazard events, and the capacities of communities to learn, adapt and transform towards resilience.

There are two approaches to assessing disaster resilience. Bottom-up approaches are locally based and survey individuals or localised communities using a scorecard of indicators such as preparation, exposure, resources and communication. An example of a bottom-up approach to assessing disaster resilience is the scorecard approach developed in Australia by Paul Arbon and colleagues at the Torrens Resilience Institute[3]. In contrast, top-down approaches are often intended for use at broad scales and use secondary spatial sources such as census data to quantitatively describe the characteristics of a community that contribute to disaster resilience. Because it is difficult to survey individuals or local communities at a national scale, the Australian Natural Disaster Resilience Index uses a top-down approach. The Index assesses resilience based on two sets of capacities—coping capacity and adaptive capacity.

Coping capacity enables people and organisations to use their available resources and abilities to face adverse consequences. These are the factors influencing the capacity of a community to prepare for, absorb and recover from a natural hazard event.

Adaptive capacity is the ability of a system to modify or change its characteristics and behaviours to cope with actual or anticipated stresses. These factors enable the adjustment of responses and behaviours through learning, adaptation and transformation.

1 Attorney-General's Department 2011, *National Strategy for Disaster Resilience*. At: **www.ag.gov.au/EmergencyManagement/Documents/NationalStrategyforDisasterResilience.PDF**.

2 Australian Natural Disaster Resilience Index project. At: **www.bnhcrc.com.au/research/resilient-people-infrastructure-and-institutions/251**.

3 Assessing community disaster resilience using a balanced scorecard: lessons learnt from three Australian communities. At: **https://ajem.infoservices.com.au/items/AJEM-31-02-09**.

The Australian Natural Disaster Resilience Index will, for the first time, assess disaster resilience at a national scale in Australia using a standardised approach.

The Index assesses resilience based on two sets of capacities: coping capacity (availability of resources and abilities to face adverse consequences) and adaptive capacity (adjustment of responses and behaviours through learning, adaptation and transformation).

Results of the Index will be reported as a State of Disaster Resilience report and corresponding maps.

Researchers and emergency service agency staff from around Australia have teamed up to design the Index and to use the results in various policy and program settings.

Together, coping capacity and adaptive capacity help to answer the question: 'How able is a community to prepare for, absorb and recover from a natural hazard event and to learn, adapt and transform to build disaster resilience?'

Index structure and indicators

Figure 1 shows the hierarchical design of the Australian Natural Disaster Resilience Index. The first level of the hierarchy comprises the coping and adaptive capacity dimensions. Nested within these are eight themes expressing the main elements of coping and adaptive capacity. The lowest level is the indicator sets that measure the status of a theme.

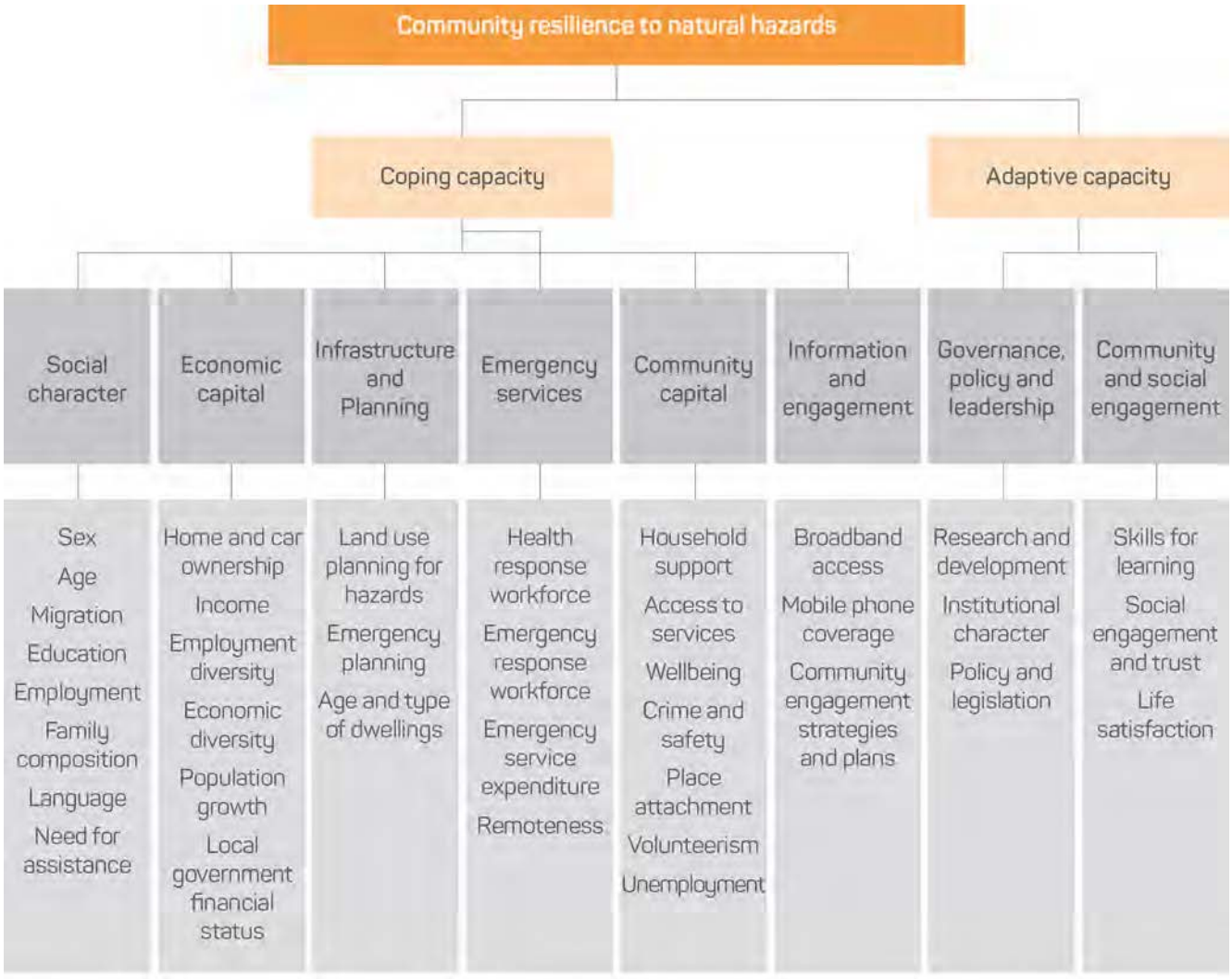


Figure 1: The structure of the Australian Natural Disaster Resilience Index. For brevity, indicators are listed as general areas.

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Table 1 explains the coping and adaptive capacity themes. The coping capacity themes encapsulate the factors influencing the resources and abilities that communities have to prepare for, absorb and recover from natural hazard events. The adaptive capacity themes encapsulate institutional and social learning, flexibility and problem solving.

The social, economic, government, infrastructure and community indicators used in the Australian Natural Disaster Resilience Index are consistent with those used in previous assessments of disaster resilience worldwide. The Australian Index innovates by including important elements of emergency management in Australia such as emergency services, emergency planning, land-use planning and community engagement. The Australian Index also advances the field of disaster resilience assessment by incorporating adaptive capacities related to learning, adaptation and transformation.

Computing the Index

The Index is computed from the indicators in each theme using various statistical techniques. Each theme can be reported separately and will be spatially represented as maps. For any location in Australia, users will be able to access a corresponding set of information about natural hazard resilience. The Index will provide a snapshot of the current state of resilience at a national scale and results will be released as a State of Disaster Resilience report. The Australian Disaster Resilience Index will provide a layer of information for use in policy development and planning as well as create a benchmark against which to assess future change in resilience to natural hazards. It can also be an overlay for risk maps to assess the intersections between resilience and risk.

The project is funded by the Bushfire and Natural Hazards CRC and has three distinct stages: conceptual development[4], data collection and analysis and the final stage of revision and reporting. It began in mid-2014 and will continue until June 2018 after which a fourth stage of agency implementation and utilisation activities will continue through to June 2020.

Table 1: Definition and description of coping and adaptive themes.

Theme	Definition	Description of theme
Coping capacity		
Social character	The social characteristics of the community.	Represents the social and demographic factors that influence the ability to prepare for and recover from a natural hazard event.
Economic capital	The economic characteristics of the community.	Represents the economic factors that influence the ability to prepare for and recover from a natural hazard event.
Infrastructure and planning	The presence of legislation, plans, structures or codes to protect infrastructure.	Represents preparation for natural hazard events using strategies of mitigation or planning or risk management.
Emergency services	The presence of emergency services and disaster response plans.	Represents the potential to respond to a natural hazard event.
Community capital	The cohesion and connectedness of the community.	Represents the features of a community that facilitate coordination and cooperation for mutual benefit.
Information and engagement	Availability and accessibility of natural hazard information and community engagement to encourage risk awareness.	Represents the relationship between communities and information, the uptake of information about risks and the knowledge required for preparation and self-reliance.
Adaptive capacity		
Governance, policy and leadership	The capacity within government agencies to learn, adapt and transform.	Represents the flexibility within organisations to adaptively learn, review and adjust policies and procedures, or to transform organisational practices.
Social and community engagement	The capacity within communities to learn, adapt and transform.	Represents the social enablers within communities for engagement, learning, adaptation and transformation.

4 Parsons M, Glavac S, Hastings P, Marshall G, McGregor J, McNeill J, Morley P, Reeve I & Stayner R 2016, Top-down assessment of disaster resilience: A conceptual framework using coping and adaptive capacities. International Journal of Disaster Risk Reduction, vol. 19, pp. 1–11.

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