

# Characteristics of a disaster resilient Victoria: consensus from those involved in emergency management activities

Dr Natassia Goode, University of the Sunshine Coast, Dr Caroline Spencer and Dudley McArdle, Monash University, Professor Paul M. Salmon, University of the Sunshine Coast and Emeritus Professor Frank Archer, Monash University. 

## ABSTRACT

The aim of this study was to reach a consensus among stakeholders on the characteristics that they consider relevant for developing a disaster-resilient Victoria. Key stakeholders were defined as members of organisations involved in emergency management activities in Victoria (i.e. federal, state and local government, emergency services organisations, businesses, non-government organisations, community groups and researchers). A literature review was conducted to identify an initial set of characteristics. Using the Delphi technique, three surveys were conducted to identify any additional characteristics stakeholders considered relevant. This was used to achieve consensus on which of the characteristics from the literature and additional characteristics are relevant for the Victorian context. The findings indicate that stakeholders perceive that a systemic approach, which encompasses both formal structures and grass roots efforts, is required to develop a disaster resilient Victoria. This paper reports those findings to reach a consensus among key stakeholders on the characteristics they consider relevant for developing disaster resilience in Victoria.

## Introduction

The *National Strategy for Disaster Resilience* (NSDR) has guided the direction of the Australian emergency management sector since its release in February 2011 (Council of Australian Governments 2011). This is reflected by the numerous policies and projects designed to increase disaster resilience initiated at a national, jurisdictional and community level (e.g. Victorian Government 2011, 2012). Three key philosophies from the NSDR appear to underpin these:

1. a focus on 'preparation and mitigation', rather than 'response and recovery'
2. a model of emergency management based on shared responsibility between governments, business, communities and individuals, rather than the traditional top-down, chain-of-command
3. a risk management approach.

Despite this common focus, a clear articulation of the characteristics that determine whether a society is resilient in the face of an extreme event is missing in the NSDR. The NSDR identified four characteristics of disaster resilient communities, individuals and organisations:

- functioning well while under stress
- successful adaptation
- self-reliance
- social capacity (Council of Australian Governments 2011, p. 4).

The NSDR does not expand on what these characteristics imply or offer guidance on how they link to areas for action. These concepts are also ill-defined and contentious within the literature. As a result, it is not entirely clear whether Victoria or indeed Australia is currently resilient, how initiatives can be designed to ensure that required characteristics are developed, and how progress could be measured. As a starting point, a conceptual framework is required to unify efforts towards enhancing disaster resilience.

Two Australian frameworks have been proposed that describe the characteristics of a disaster resilient community (Arbon *et al.* 2012, Dufty 2011). However, they are based on the literature rather than data collected within Australia, they consider a limited range of characteristics compared to international models (e.g. Twigg 2009), and they focus narrowly on the community context. Therefore, they may be missing some characteristics central to developing resilience in Australia.

Data were collected from members of organisations involved in emergency management activities in Victoria (i.e. federal, state and local government, emergency services organisations, businesses, non-government organisations, community groups and researchers). These participants were chosen for this study, as they

were deemed likely to have first-hand knowledge of the characteristics that determine whether a society is resilient in the face of an extreme event. Achieving consensus among participants was considered important because not all stakeholders were involved in the NSDR development and a consensus-based approach reflects the NSDR’s philosophy of shared responsibility. Ultimately, the research reported here will underpin a conceptual model for developing disaster resilience, particularly in Victoria.

## Method

Identifying the characteristics considered relevant for developing a disaster-resilient Victoria involved a two-stage process. The study involved:

1. Conducting a literature review to identify a set of characteristics thought to determine whether a society is resilient in the face of an extreme event.
2. Asking 113 stakeholders to contribute additional characteristics they consider important to developing disaster resilience.
3. Presenting all characteristics to the 113 stakeholders using a three-round modified Delphi technique to obtain consensus on the relevance for developing disaster resilience, particularly in Victoria.

### Stage 1: Literature review to identify an initial set of resilience characteristics

The aim of this stage was to identify an initial set of characteristics drawn from the literature to be important for achieving resilience. Table 1 describes the search strategy for the literature review. As there is extensive literature on disaster resilience, the review was limited to models or frameworks that describe the characteristics that contribute to disaster resilience. A thematic analysis of the models was undertaken to synthesise a common list of characteristics. This involved classifying the characteristics from each model according to themes.

### Stage 2: Identify and evaluate resilience characteristics by stakeholders

The aims of this stage were to:

- identify any additional characteristics that stakeholders consider relevant
- reach consensus on which of the characteristics from the literature and additional characteristics are relevant for the Victorian context.

Monash University Human Ethics Committee approved this study.

## Recruitment

Participants were recruited through the Monash University Disaster Resilience Initiative (MUDRI) Forum (July 2013), the MUDRI email list, and emails to organisations involved in emergency management activities in Victoria. Participants were asked to forward the invitation to relevant contacts.

**Table 1:** Criteria for literature review search strategy.

Criterion	Detail
Search terms	Disaster AND Resilience
Language	English only
Timeframe	2000 – October 2013
Databases	OVID, MEDLINE, Google Scholar, Web of Science
Inclusion criteria	Model or framework describing characteristics or factors contributing to disaster resilience.  Primarily related to resilience to extreme events (manmade or natural).

## Procedure

Three online surveys were conducted during July to September 2013. A modified Delphi technique (Linstone & Turoff 1975) was used to reach consensus without engaging participants in direct discussion. This involved providing feedback on the results so that participants could see whether their views aligned with others and change their opinions if desired. Consensus was said to exist when at least 75 per cent of participants agreed. Although conservative, this consensus criterion was selected to represent a close to unanimous view (e.g. Keeney, Hasson & McKenna 2006).

In Survey 1 participants rated whether the characteristics identified from the literature review were relevant to developing disaster resilience in Victoria on a five-point scale (1 = ‘Not relevant at all’, 5 = ‘Extremely relevant’), and asked to nominate additional characteristics they consider relevant.

In Survey 2 participants were presented with the results of Survey 1 and asked to re-evaluate the characteristics that did not reach consensus using two options (‘Relevant’ or ‘Not relevant’). They also rated the relevance of the additional characteristics identified from Survey 1 on a five-point scale (1 = ‘Not relevant at all’, 5 = ‘Extremely relevant’).

Participants who did not respond to Survey 2 were not invited to participate in Survey 3. In Survey 3, participants were presented with the results of Survey 2. They then re-evaluated the additional characteristics that did not reach consensus using two options (‘Relevant’ or ‘Not relevant’).

## Results

### Stage 1: Literature review

The search identified 766 articles. Based on the search criteria (see Table 1), 13 models of resilience were identified. The characteristics identified through the thematic analysis, and their sources are presented in Table 2.

**Table 2:** Characteristics of disaster resilience identified from the literature.

Characteristic	Sources												
	Bruneau et al. 2003	Mayunga 2007	Twigg 2007, 2009	Norris et al. 2008	Stewart, Kolluru, & Smith 2009	Chen & Wang 2010	Longstaff et al. 2010	Renschler et al. 2010a	Duffy 2011	Ainuddin & Routray 2012	O'Sullivan et al. 2012	Arbon et al. 2012	International Federation of Red Cross and Red Crescent Societies 2012
Natural environment/ecosystem		Y	Y				Y	Y	Y				
Land use and management			Y						Y				Y
Built environment (e.g. buildings, roads)	Y	Y	Y					Y	Y	Y			Y
Critical infrastructure (e.g. water, power, public health, transport)	Y	Y	Y		Y		Y	Y	Y				Y
Supply chain (i.e. food and fuel supplies)					Y		Y						Y
Co-operation connectedness, co-operation and support systems (e.g. community-based volunteer organisations)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Community economy (i.e. financial capital, employment)	Y	Y	Y	Y	Y	Y		Y	Y	Y			Y
Knowledge and skills of the community		Y	Y	Y		Y		Y	Y		Y		Y
Community adaptation (i.e. the capacity of the community to improvise and response to event through social learning)							Y			Y	Y		
Population characteristics (e.g. health, wellbeing, age)			Y				Y			Y		Y	Y
Co-ordinated resources for emergency response	Y		Y			Y	Y	Y	Y	Y	Y	Y	
The rapidity of the initial response	Y		Y						Y				
Public warning systems for extreme events			Y	Y					Y				
Prevention and mitigation activities	Y		Y				Y		Y	Y		Y	
Emergency management planning and procedures			Y						Y	Y		Y	
Partnerships between sectors			Y	Y	Y								Y
Clear responsibilities			Y										
Ongoing research and learning systems			Y										Y
Hazard and risk assessments			Y							Y	Y	Y	Y
Availability of valid and appropriate risk assessment tools			Y										
Government policies, priorities and political commitment			Y										
Legal and regulatory systems			Y			Y	Y	Y					

**Stage 2: Identify and evaluate characteristics by stakeholders**

*Participants*

Table 3 provides background information on the participants in the three surveys. There was a 14 per cent attrition rate at Survey 2 and an 18 per cent attrition rate at Survey 3.

*Ratings of characteristics from the literature*

Table 2 presents the complete list of characteristics from the literature. In Survey 1 there was consensus (defined as ≥ 75 per cent agreement, n = 84) that partnerships

between sectors (82 per cent agreement), community connectedness, co-operation and support systems (81 per cent agreement), and critical infrastructure (80 per cent agreement) are 'extremely relevant'. No consensus was reached on the remaining characteristics. In Survey 2 there was consensus (defined as ≥ 75 per cent agreement, n = 76) that all characteristics except 'legal and regulatory systems' are 'Relevant'.

*Additional characteristics suggested by participants*

Table 4 presents the complete list of 27 additional characteristics participants suggested in Survey 1.

**Table 3:** Participant characteristics.

Characteristic		Survey 1 (n = 113)	Survey 2 (n = 97)	Survey 3 (n = 79)	
Roles	Federal government	6	2	2	
	State government	32	28	21	
	Local government	14	10	8	
	Emergency services	19	19	15	
	Business	7	6	5	
	Non-government organisation	17	15	13	
	Community group	9	9	8	
	Research group	9	8	7	
Demographics	Gender	Female	53*	51	41
		Male	59*	46	38
	Age (Mean years, SD)**		49.7, 9.7	49.3, 9.6	48.94, 11.1
	Experience (Mean years, SD)		13, 11.50	12.8, 10.7	13.9, 11.8

\* 1 missing. \*\*Standard Deviation.

**Ratings of additional characteristics**

No consensus was reached regarding any of the additional characteristics in Survey 2. In Survey 3 there was consensus (defined as ≥ 75 per cent agreement, n = 59) that 23 of the 27 characteristics are ‘Relevant’ (see Table 4).

**Discussion**

The aim of this study was to seek consensus from stakeholders regarding the characteristics they consider relevant for developing disaster resilience, particularly in Victoria. In order to identify a comprehensive set of characteristics, participants were asked to evaluate characteristics from the academic literature and suggest additional characteristics they felt were relevant to Victoria. In total, 46 characteristics were agreed as ‘Extremely relevant’ or ‘Relevant’ for the Victorian context.

The endorsement of so many characteristics reflects the complex nature of the question that participants were asked to consider: ‘What characteristics are relevant to developing a disaster resilient Victoria?’ The responses indicate that a systems approach is required. This recognises that enhancing resilience involves multiple stakeholders and activities across the socio-ecological system. While this view is prevalent and well established within the academic literature (e.g. Béné *et al.* 2012), this study provided a unique opportunity for practitioners to potentially have input into the direction of the approach in Victoria, and to inform future policy developments.

From this perspective, all characteristics agreed as ‘Extremely relevant’ or ‘Relevant’ should be considered critical for developing disaster resilience

in Victoria. These characteristics can be interpreted as representing the ‘disaster resilience system’ in Victoria, encompassing the environmental context, individuals and communities, businesses, agencies and the all levels of government. The findings show that stakeholders perceived that to enhance resilience, all stakeholders within the system need to be engaged and connected. This view is exemplified by the three characteristics agreed as ‘Extremely relevant’:

- partnerships between sectors
- community connectedness, co-operation and support systems
- critical infrastructure.

Taken together, these characteristics reflect the need for co-ordinated and reliable top-down resources to support efforts at the community level. The characteristics identified as ‘Relevant’ further reinforce this view and provides further specification of the actions required to achieve this goal.

Many of the additional characteristics suggested by participants highlight the importance of interactions between stakeholders within the system. For example, the characteristics ‘flexible government systems that can accommodate community innovation and responsiveness’ and ‘ability of the emergency services to accommodate communities’ spontaneous response to extreme events’ require interactions between local communities, agencies and government. Surprisingly, this perspective was largely missing from the characteristics identified from the literature review. This highlights the unique contribution that practitioners bring to understanding resilience, which could benefit both academic and policy discourse.

The Emergency Management Victoria *Interim Emergency Management Strategic Action Plan* (2014/15) provides an opportunity to evaluate whether the characteristics participants identified as ‘Relevant’ are reflected in strategic policy in Victoria. The plan identifies specific actions that strengthen Victoria’s emergency management capability, including the need for:

- a common risk assessment tool and the conduct of state-wide risk assessments
- local emergency management plans
- increased capacity for communication to/from the community
- infrastructure that supports an all-hazards, all agencies approach to response and recovery that is sustained through volunteer recruitment and training.

These actions align with characteristics agreed as ‘Relevant’ by stakeholders. However, actions to enhance community engagement and development, both important components of many of the characteristics identified in this study, are clearly missing from the plan. Moreover, although the plan goes some way towards building a solid ‘top-down’ structure, no actions are specifically identified to support business,

**Table 4:** Additional characteristics suggested by participants in Survey 1, with ratings from Survey 3 (as a % of sample in Survey 3).

Characteristic	Not relevant	Relevant
Multiple modes for communicating relevant information to the community, not necessarily reliant on technology	2.6	97.4
Flexible government systems that can accommodate community innovation and responsiveness	2.6	97.4
Consideration and inclusion of local community groups during response and recovery efforts	2.6	97.4
Effective and inclusive community engagement (i.e. participatory decision making processes) incorporated into planning and prevention activities	5.1	94.9
Emergency planning at the household level (e.g. insurance, evacuation plans)	5.1	94.9
Community members that are empowered to make decisions and take action	6.4	93.6
Awareness of vulnerable community members	6.4	93.6
Adoption of an all-hazards, all-agencies approach	6.4	93.6
Psychological resources/support for community members post-disaster	6.4	93.6
Consideration of local infrastructure during response and recovery efforts	6.4	93.6
Positive and highly trained leaders at all levels of the emergency/disaster management system	9	91
Effective community education regarding preparation	9	91
Effective community education regarding prevention/mitigation	10.3	89.7
Effective communication about local resilience/disaster planning activities	10.4	89.6
Adoption of innovative approaches to emergency/disaster management	11.5	88.5
Financial funding for Emergency Services	12.8	87.2
Ability of the emergency services to accommodate communities spontaneous response to extreme events	12.8	87.2
Effective community education regarding response	14.1	85.9
Effective community education regarding recovery	14.1	85.9
Communities that build and maintain a collective memory of previous disaster impacts	14.1	85.9
Communities that are motivated and committed to the resilience approach	19.2	80.8
Adoption of new and relevant technologies	20.5	79.5
Education system	23.1	76.9
-----	----	----
Media	25.6	74.4
Community disaster resilience committees	26.9	73.1
Gender balanced decision making at all levels of the disaster/emergency management system	39.7	60.3
Single agency coordinating the resilience based approach	51.9	48.1

----- represents the cutoff point for consensus of 75 per cent

community or individual efforts. However, it is stated that ‘work will continue.... on building community resilience’ alongside the actions identified within the plan (Emergency Management Victoria 2014, p. 4). The findings from the current study could potentially be used as an overarching framework to direct this work.

Overall, the findings suggest that the scope of emergency management reform in Victoria needs to be extended. There is already recognition that a whole-of-government approach is required that encompasses mitigation, preparedness, response and recovery, and supports interactions between agencies (Emergency Management Victoria 2014). The findings suggest that reform also needs to specifically address the role of businesses, communities and individuals in enhancing resilience, as well as the interactions between actors at all levels in the system.

The findings also provide evidence that stakeholders broadly support the approach outlined in the NSDR. Most characteristics agreed as ‘Extremely relevant’ and ‘Relevant’ reflect themes within the NSDR including:

- the built and natural environment
- the responsibilities of the business sector
- the characteristics and capacity of the local community
- emergency response capabilities
- knowledge about potential hazards, risk factors and the local context
- community education about prevention, preparedness, response and recovery (PPRR)
- government systems
- financial resources.

While critical infrastructure is not specifically addressed in the NSDR, it is reflected in a companion federal government strategy, i.e. *Critical Infrastructure Resilience Strategy 2010*. Overall, these findings suggest that stakeholders accept the NSDR.

This study had some important limitations that should be acknowledged. Firstly, the results should not be generalised outside the Victorian context without further research. Secondly, a convenience sample was used, as they were all contacted through MUDRI



forums or other contacts within Victoria. However, this is balanced by the cross-section of ages, roles and levels of experience represented.

Finally, the study points to directions for future research. This study identified the characteristics that stakeholders agreed are relevant for developing a disaster resilient Victoria. Research is required to identify where each characteristic sits within the 'disaster resilience system' (e.g. at the community level, at the state or local government level), and which stakeholders are responsible for, or may influence, development of the characteristics. Following on from this, stakeholders will need to set priorities in terms of which characteristics require immediate action within Victoria. These activities will provide a clear action plan which details what characteristics are required to enhance resilience and which stakeholders should be working together to attain them.

## Conclusion

This study moves towards closing the longstanding theory, policy and practice gap in the discourse around disaster resilience. It demonstrates that stakeholders perceive that a systemic approach, which encompasses both formal structures and grass roots efforts, is required to develop a disaster resilient Victoria.

### Acknowledgements

This research was funded through the Natural Disaster Resilience Grants Scheme (NDRGS) – Victoria. The NDRGS is a grants program funded under the Natural Disaster Resilience Program by the Commonwealth Attorney-General's Department.

## References

- Ainuddin S & Routray JK 2012, *Community resilience framework for an earthquake prone area in Baluchistan*. *International Journal of Disaster Risk Reduction*, vol. 2, pp. 25-36.
- Arbon P, Gebbie K, Cusack L, Perera S & Verdonk S 2012, *Developing a model and tool to measure community disaster resilience: Final report*. Australia: *Torrens Resilience Institute*.
- Béné C, Wood RG, Newsham A & Davies M 2012, *Resilience: New Utopia or New Tyranny? Reflection about the Potentials and Limits of the Concept of Resilience in Relation to Vulnerability Reduction Programmes* IDS WORKING PAPER, 2012 (405). At: [www.ids.ac.uk/files/dmfile/Wp405.pdf](http://www.ids.ac.uk/files/dmfile/Wp405.pdf) [17 March 2014].
- Bruneau M, Chang SE, Eguchi RT, Lee GC, O'Rourke TD, Reinhorn AM, von Winterfeldt D, 2003, *A framework to quantitatively assess and enhance the seismic resilience of communities*, *Earthquake Spectra*, vol. 19, pp. 733-752.
- Chen L & Wang Y 2010, *Building community capacity for disaster resilience in Taiwan*. *Journal of Disaster Research*, vol. 5, pp. 138-146.
- Council of Australian Governments 2011, *National Strategy for Disaster Resilience: Attorney General's Department*.
- Dufty N 2012, *Using social media for natural disaster resilience*. *Australian Journal of Emergency Management*, vol. 27, pp. 40-45.
- Goode N, Salmon P, Spencer C, McArdle D & Archer F (Accepted 30th October 2014). *How would you define disaster resilience? A comparison of definitions from key stakeholders involved in emergency management in Victoria*. *Disasters*.
- Keeney S, Hasson F & McKenna H 2006, *Consulting the oracle: ten lessons from using the Delphi technique in nursing research*. *Journal of Advanced Nursing*, vol. 53, pp. 205-212.
- Linstone AH & Turoff M 1975, *The Delphi Methods: Techniques and applications*. Reading, Massachusetts: Addison-Wesley.
- Longstaff PH, Armstrong NJ, Perrin K, Parker WM & Hidek MA 2010, *Building Resilient Communities: A Preliminary Framework for Assessment*. *Homeland Security Affairs*, vol. 6, no. 3.
- Mayunga JS 2007, *Understanding and Applying the Concept of Community Disaster Resilience: A Capital-Based Approach*, draft working paper prepared for the summer academy, *Megacities as Hotspots of Risk: Social Vulnerability and Resilience Building*, Munich, Germany, 22-28 July 2007.
- Norris FH, Stevens SP, Pfefferbaum B, Wyche KF & Pfefferbaum RL 2008, *Community Resilience as a Metaphor, Theory, Set of Capacities, and Strategy for Disaster Readiness*. *American Journal of Community Psychology*, vol. 41, pp. 127-150.
- O'Sullivan TL, Kuziemyk CE, Toal-Sullivan D & Corneil W 2012, *Unraveling the complexities of disaster management: A framework for critical social infrastructure to promote population health and resilience*. *Social Science and Medicine*, vol. 93, pp. 238-46.
- Renschler C, Frazier A, Arendt L, Cimellaro G, Reinhorn A & Bruneau M 2010, *A Framework for Defining and Measuring Resilience at the Community Scale: The PEOPLES Resilience Framework*. *National Institute for Standards Technology, Building and Fire Research Laboratory: University of Buffalo*.
- International Federation of Red Cross and Red Crescent Societies 2012, *Understanding community resilience and program factors that strengthen them: A comprehensive study of Red Cross Red Crescent Societies tsunami operation*. Geneva, Switzerland.
- Stewart GT, Kolluru R & Mark Smith 2009, *Leveraging public-private partnerships to improve community resilience in times of disaster*. *International Journal of Physical Distribution and Logistics Management*, vol. 39, pp. 343-364.
- Twigg J 2009, *Characteristics of a disaster resilient community: A guidance note*. *DFID Disaster Risk reduction Interagency Cooperation Group*.
- Victorian Government 2011a, *Towards a more disaster resilient and safer Victoria, Green paper: Options and Issues*. Melbourne, Australia.
- Victorian Government 2011b, *Victoria Prepared: An action plan*. Melbourne, Australia.
- Victorian Government 2012, *Victorian Emergency Management Reform*. Melbourne, Australia.

### About the authors

**Dr Caroline Spencer, Dudley McArdle** and **Emeritus Professor Frank Archer** work within the Monash University Disaster Resilience Initiative.

**Professor Paul Salmon** and **Dr Natassia Goode** work within the Centre for Human Factors and Sociotechnical Systems at the University of the Sunshine Coast.