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BARRIERS AND ENABLERS IN THE LONG TERM RECOVERY OF COMMUNITIES AFFECTED BY NATURAL HAZARDS: A REVIEW OF THE LITERATURE

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EXECUTIVE SUMMARY

This report for the Bushfire and Natural Hazards CRC reviews Australian and international literature on the long term recovery of communities that have been impacted by natural hazards. Previous reviews have considered the immediate, short and medium term recovery and to a lesser extent long term recovery. However, none have focused upon the barriers and the enablers of effective long term recovery. This is the focus of this literature review.

The review addressed three key areas:

1) what does the literature say is 'long-term' in disaster recovery and how does that play out in disasters;
2) what has been done well in disaster recovery (i.e. What has been shown to have benefits for community recovery); and,
3) what are the key messages for successful long term disaster recovery?

The approach required a review of literature that documented and discussed the problems that can arise within a recovery phase that can determine the barriers and enablers for effective long term recovery. This necessarily includes consideration of the short term recovery efforts as decisions made in the short term inevitably impact upon future outcomes.

The key findings were:

- Research into disaster recovery has been dominated by research on disaster planning, prevention and response, and there has been a dearth of research on long term recovery. Thus research needs to focus on long term recovery as the costs, both financial and social, are significant.
- Recovery in the long term is a complex process with no clear end point. The process is not linear from short term to long term recovery, and nor are the same actors involved in short term and long term recovery. Rather there is a transition period between the purpose of long-term disaster recovery and actual implementation because recovery needs and progression changes over time.
- Local communities and their associated capitals are the core of successful recovery and thus community engagement needs to be central to immediate, short, medium and long term recovery policy and practice.
- There is a need for a greater focus on restoration of environment and the community in line with the traditional response to restoration of the built environment.
- Importantly there is a need to develop national monitoring and evaluation framework for long term recovery as most evaluations focus on the immediate response and short term response and lack consistency. The framework needs to evaluate the process as well as the outcomes to assess the effectiveness, efficiency and appropriateness of post-disaster responses.

INTRODUCTION

This report for the Bushfire and Natural Hazards CRC reviews Australian and international literature on the barriers and enablers which prevail in the long term recovery of communities that have been impacted by natural hazards. The impact of natural disasters such as earthquakes, floods, tsunamis, hurricanes, cyclones, bushfires, drought, and heat waves is gaining increasing attention worldwide. Specifically, concern has focused upon the severity of such events, and the increasing impacts upon life, the environment, infrastructure, and economic activity. It appears that the majority of the literature focuses upon the conceptual understanding of disaster, the phases of preparation and planning, or crisis and emergency response. There is little research on how communities achieve long-term recovery following a disaster (Moreton 2018). Yet the devastation of natural hazards upon communities can last for years, even decades, and incur significant financial and social costs. Thus, attention and planning must focus upon the long term recovery of communities that suffer a natural disaster. The long term outcomes must be front of mind in any planning for emergency response, and in the immediate and short term response to a disaster as actions and planning taken at those stages will impact upon long term recovery. This is the focus of this report.

The literature review covers Australian and international literature on disaster impacts and long term recovery. The aim of the review was to:

- provide a comprehensive coverage of the literature drawn from academic databases, government reports, agency reports, and other grey literature;
- identify areas where there is strong evidence in relation to the review questions; where there is equivocal or conflicting evidence; and where there are gaps in the evidence.
- Identify and document the barriers and enablers of long term recovery.

A systematic search was conducted in the literature using the terms "emergency management", "disaster recovery", "recovery management", "resilience", "social and economic impacts of disasters", and "long term disaster recovery".

This literature review forms part of the first stage of the Bushfire and Natural Hazards CRC project on disaster recovery which is designed to examine barriers and enablers in the long term recovery of communities affected by natural hazards through a lens of community capitals.

THE RECOVERY PROJECT

The aim of the recovery project is to address two complimentary areas of research relating to the long term recovery of communities following a disaster. First, the project aims to investigate how a person's history of residential mobility influences the likelihood of their willingness to dissolve social ties. This will be addressed by considering the following questions:

1) Why do people move?
2) How does their history of mobility play out in a disaster situation?
3) How does it affect the social capital of the community that is left behind?
4) How does it impact on the social capital of the community that is moved into?
5) What can we learn from this in order to increase the social capital in these communities?

The second area seeks to examine the enablers and barriers to successful recovery using a framework of community capitals (Figure 1). This exercise will examine natural, cultural, human, social, political, built and financial resources, their interconnectedness and interactions in disaster recovery. Examination of these assets through case studies and working with end users will identify both potential areas for improvements as well as recognise what has worked well in communities recovering from disasters. This process will provide feedback and a guide for the planning of recovery activities in a range of communities.

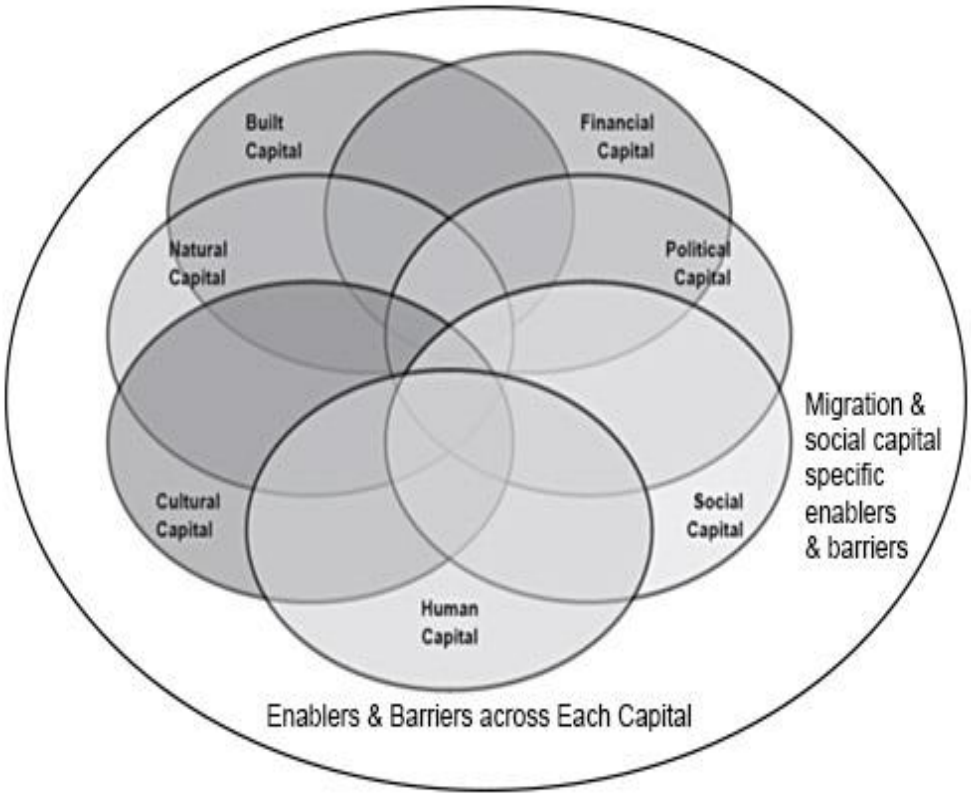

Figure 1. The capitals framework.

The first step in the recovery project is therefore to examine the literature to identify if and how these questions have been addressed elsewhere in the world and gather information which will inform the next stages of the study.

AIM OF THE LITERATURE REVIEW

The questions examined in this literature review are:

1) what does the literature say is 'long-term' in disaster recovery and how does that play out in disasters;
2) what has been done well in disaster recovery (i.e. what has been shown to have benefits for community recovery); and
3) what are the key messages for successful long term disaster recovery?

The following sections first overview background information about the importance of disaster recovery and disaster management. Further sections then review the barriers to effective long term recovery that emerge through the immediate, short term. Lastly, the factors that enable successful recovery in the long term are described and discussed.

NATURAL DISASTERS AND DISASTER RECOVERY

NATURAL DISASTERS AND THEIR IMPACTS

Throughout the latter half of the 20th century, the number of disaster events has increased significantly with an increase in the number of bushfires, earthquakes, tsunamis, floods and severe storms (CRED 2015). Between 1994 and 2013, an average of 218 million people were affected by natural disasters every year (CRED 2015). Today, more people live in harm's way than 50 years ago, and building in flood plains, earthquakes zones and other high-risk areas has increased the likelihood that a routine natural hazard will become a major catastrophe (CRED 2015). Although hazards occur at varying frequencies, intensities, durations and spatial extents, they can be defined as a disaster when humans are adversely affected (Wisner et al. 2004; Crowley and Elliott 2012). This impact may result in loss of life, damage to property, loss of livelihoods and/or general devastation to an affected population (Pelling 2003; Wisner et al. 2004; Guha-Sapir et al. 2011).

There are significant long term economic and social costs of natural disasters. The Australian Business Roundtable for Disaster Resilience and Safer Communities report of 2016 estimated that the direct and indirect costs of natural disasters in Australia is expected to increase from $9 billion to $33 billion by 2050 (Deloitte Access Economics 2016). Further, the intangible social costs following natural disasters (those that are difficult to quantify such as mental health, domestic violence, crime) may cause current estimations of the economic costs of natural disasters to be underestimated by 50% (Deloitte Access Economics 2016).

The global population is rapidly growing, estimated to be 7.6 billion according to United Nations estimates and 9.8 billion by 2050 (United Nations 2017). In many places, settlement patterns and urbanization have exacerbated the potential impact of disaster events upon the population (CRED 2015). As the frequency of disasters is increasing, populations are increasing, and the number of individuals living in vulnerable locations is also increasing. The frequency of climate related hazards such as droughts, heatwaves, storms and floods is also expected to increase with climate change (IPCC 2007). The culmination of these factors has resulted in greater risk to communities and their economies, environment and infrastructure, as well as risks to the wellbeing of individuals.

Historically, risk reduction has taken a hazard-based approach (Pelling 2003; Wisner et al. 2004), where policy has tended to separate the human from the natural environment (Quarantelli 1998). This creates the situation where events are examined in isolation of the social implications that magnify or attenuate the severity of impact, placing importance on the event rather than on human consequence (Cutter 2005).

There are two prominent schools of thought about the impact of natural hazards in human societies. One school of thought derives from a vulnerability perspective where distributional inequalities in physical, social, economic and environmental factors influence the susceptibility of people to harm and the ability of people to respond to hazards factors (Cutter et al. 2003; Birkmann 2006). The second derives from a resilience perspective where people learn to live with

a changing, unpredictable and uncertain environment. Human societies interact with their environment and the environment influences human societies within a social-ecological system, of which natural hazards are a part (Parsons and Thoms 2018). Under a resilience view, people have agency to adapt and transform in the face of change and to direct suitable outcomes (Berkes 2007). However, resilience has been criticized for ignoring issues of power, and for incorrectly assuming a homogenous distribution of power across different countries and sectors of society (Olsson et al. 2015).

Although the theorization of disaster resilience is academically contested (Adger 2000; Klein et al. 2003; Norris et al. 2008; Kuhlicke 2013), the concept of resilience has been operationalized widely in the field of natural hazards and disaster management, because hazards and disasters are external shocks to systems, and cause change and disruption. This operationalization is often led by governments through policy and program development (Cutter et al. 2010), using ideas of shared responsibility for building safer, and more resilient communities able to adjust to an increasingly uncertain and unpredictable world (COAG 2011). The academic community is often left to catch up and study the characteristics of disaster resilient individuals, communities and societies (Cutter et al. 2010). Nonetheless, definitions of disaster resilience generally involve one or more elements of: the presence of an external or internal stressor; the ability to absorb and recover from the stressor; the ability to return to a functioning state following an event; the ability to learn from the experience; and, the capacity to adapt/transform/develop/adjust as a result of the event or circumstances (Klein et al. 2003; Birkmann 2006; Boon et al. 2012a).

DISASTER RECOVERY AND COMMUNITIES

Since the advent of the Hyogo Framework for Action (HFA) which emerged from the United Nations General Assembly's World Conference on Disaster Reduction held in Kobe, Hyogo, Japan in 2005, nations have invested in targeted preparedness, relief and mitigation policies in a desire to reduce the financial and human cost of disasters. However, it is only after the media spotlight fades on a major disaster that the real recovery process commences. Irrespective of the level of interest and the effectiveness of the response during the disaster event, recovery is ongoing, passing through stages of short, medium and long term recovery. However, rarely is a concerted long-term dimension of recovery planned, particularly from the perspective of enabling disaster impacted communities to effect full recovery.

Most post-disaster recovery actions focus upon the social, built, economic and environmental domains (Ryan et al. 2016). These include:

- Social: physical and psychosocial support, such as healthcare, counselling and programs to sustain community welfare and wellbeing;
- Economic: financial support to safeguard and improve the local economy, such as assistance for primary industries, tourism, employment opportunities, or business development;
- Built: rebuilding physical infrastructure such as housing, roads, bridges, including re-zoning or relocating residents; and,

- Environment: restoring environments through revegetation, stabilising coastal zones, clearing waterways and monitoring ecosystems (Ryan et al. 2016).

However, reconstruction often focuses on the restoration of the built environment with less attention to the restoration of social and community networks. Yet disaster recovery is more than simply rebuilding infrastructure and assets or providing welfare and environmental rehabilitation. It is not about a return to normality but a process that is described by the US Federal Emergency Management Agency as "a sequence of interdependent and often concurrent activities that progressively advance a community toward a successful recovery" (FEMA 2011).

Successful recovery is about rebuilding better and smarter, and providing opportunities to enhance social and economic systems as well as the natural and built environments. To do this though, there is a need to recognise that communities and individuals have complex and interrelated needs which have to be understood and addressed. It is important that individuals, communities, organisations and government agencies play complementary roles in the response and recovery process and understand that the interrelations between the social, community, cultural, political, economic and built environments can determine the success or failure of goals. The manner in which recovery activities are planned and undertaken is critical and can require appropriate enablers to be present to optimise the effectiveness of any recovery intervention. Conversely some activities fail to reach their potential due to the presence of various barriers. There is a need to identify, assess and understand the enablers and barriers present within a recovering community to ensure that the right actions are taken at the right time.

The concept and term 'community' has various meanings and applications. It is invariably used to refer to collectives of people joined by shared geography, interests and concerns, or identity. Common definitions of community highlight existence within a geographical boundary, engagement in ongoing social interaction and psychological connections to both the surrounding people and place as key components. Community is also a form of social organisation that influences the way people think and behave. The *ideal* community is a place where neighbours know each other and can be relied upon to come to each other's aid (Barclay and Donnermeyer 2007).

Social psychologists and sociologists have endeavoured to define the 'ideal' community. Toennies's (1957) "*gemeinschaft*", Granovetter's (1973) "strong and weak ties", McMillan and Chavis's (1986) "sense of community", Sampson, Raudenbush and Earls' (1997) "collective efficacy", Granovetter's (1973) concept of "strong and weak ties between residents that define the degree cohesiveness of communities", McMillan and Chavis's (1986) concept of a "sense of community", and Putnam's (2000) "social capital" theories all seek to define those unique, often esoteric characteristics that unite residents to become stronger and work together towards achieving common goals. Putnam's social capital in particular is recognised as being integral in preparing for, responding to, and recovering from disasters (Winkworth et al. 2009; Aldrich 2012; Australian Red Cross 2012; Akama et al. 2013; Deloitte Access Economics 2016). Social capital is generated and supported through formal and informal networks and connections in communities. These connections, if active, can

result in generalised reciprocity in which individuals are prepared to act for the collective good (Putnam 2000; Howard et al. 2017).

There are three types of social capital. Bonding capital refers to reciprocity and solidarity among homogenous populations (peers, family, close friends); bridging capital connects heterogeneous individuals and groups (e.g. across religious or ethnic divides) and linking capital connects individuals across vertical divides such as socio-economic status and political power (Hawkins and Maurer 2010; Lalone 2012; Blackman et al. 2017).

A study of survivors following the 2003 Canberra bushfires (Camilleri et al. 2007; Camilleri et al. 2010) analysed the ways different types of social capital operated in recovery. Bonding networks of family and close friends were central for sustaining survivors immediately following the fires. Bridging social capital was important for aiding recovery. Intra-community bridging was evident in building networks within communities which supported vulnerable residents who were unable to call upon close family or friends. Events organised by local streets and neighbourhoods, as well as commemorative events built bridging social capital. Linking social capital, the development of networks with access to powerful institutions and agencies was also important in the recovery phase. In particular, the formation of residents associations promoted a sense of connectedness between community members (Winkworth et al. 2009; Howard et al. 2018). Similarly, Gibbs et al. (2016) examined responses to the 2009 Black Saturday bushfires in Victoria and showed that social ties and being connected to many people was a protective factor against psychological morbidity.

Overseas, a study of disaster recovery following the Tokyo 1923 and Kobe 1995 earthquakes, the 2004 Indian Ocean tsunami and Hurricane Katrina in 2005, concluded that high levels of social capital is the core of successful recovery, more than other commonly referenced factors as socioeconomic conditions, population density, amount of damage or aid (Aldrich 2012). In another study, Nakagawa and Shaw (2004) examined the levels of bonding, bridging and linking social capital in two neighbourhoods in Kobe, Japan and Gujarat, India. The authors found that in both cases social capital contributed to both the quality and speed of recovery. In Kobe, pre-existing community groups used different forms of social capital which contributed to effective response and reconstruction activities. Pre-disaster local organisations were able to leverage relationships to secure relief and recovery resources for the community. In Gujarat, of the four communities in the region, one, Soni recovered the fastest, despite having a lower income level. The authors attributed this to strong collective decision making, trust in community leaders, and networks with government agencies.

The Australian Red Cross (2012) concluded that a linking and bridging social capital framework enables community-driven recovery, as local agencies have faith in the community to know who is affected and what is needed and resources could best be allocated by local communities. Capital can be improved by facilitating points of gathering, information sharing and cooperation, the opportunity to share stories and create common narratives might enable communities to strengthen social capital networks and hence build internal resilience and capacity for recovery. Although it was recognised that social capital is a trait particular to and built within communities, it was

simultaneously recognised that actions taken by policy makers and recovery drivers could indeed help to foster and strengthen these resources.

Long term recovery within a specific community encapsulates that community's ability to absorb the shock and return to a pre-disaster level of function. While the degree to which a community can recover from an event is recognised as a key component of a community's resilience, measuring the potential, capacity or ability to recover is something of an elusive concept (Dwyer et al. 2004; Abuodha and Woodroffe 2006; Rubin 2010). However, it is important to note that no two communities are the same. They are defined by their size, social structure, geographic location and economic base. Even places closely matched in these factors still differ according to the types of individuals or groups of people that inhabit them and the social norms and mores to which they adhere. Thus, the way a community responds to and recovers from a disaster depends upon the nature of the disaster and the degree of social capital within the community. Stayner and Barclay (2002) in a study of the effectiveness of support services during drought in rural New South Wales found that in one small village people came together to support each other physically and emotionally. A neighbouring place of 10,000 people desiring a similar outcome for their own drought-affected residents asked the smaller town to show them how they operated as a group. This they were happy to do but despite all efforts, the new group failed. It proved impossible to transfer those idiosyncratic group dynamics between the two localities (Barclay and Donnermeyer 2007).

Sampson et al. (1997) described this willingness of community residents to come together for the common good as "collective efficacy". This ability depends upon the degree of mutual trust and shared values among residents. The principles of collective efficacy take into account the inequities that exist between communities, as well as geographic isolation or social disadvantage within a community (Ledogar and Fleming 2008). In fact, Sampson et al (1997) reject the notion that all communities are necessarily socially cohesive. Rather, collective efficacy can be a *mechanism* that makes social control possible despite a lack of cohesion. Even communities with weak personal and social ties can be effective if a working trust and shared expectations for the common good are present (Morenoff et al. 2001:521). As Sampson (2004:108) explains:

> *Some density of social networks is essential, to be sure, especially networks rooted in social trust. But the key theoretical point is that networks have to be activated to be ultimately meaningful.*

Therefore community networks of social trust can be activated even in communities that lack social capital if there is consensus within a community about the need to come together for the recovery of the community long term. As Blackman et al. (2017) found in their review of the earthquakes that occurred in Christchurch and Japan, once social capital grows, it leads the community to seek greater involvement in the recovery process. In one example, loosely connected communities overcame the problem of waiting for others to begin recovery by starting the process themselves after Hurricane Katrina (Storr and Haeffele-Balch 2012). Interviews with residents, evacuees, and community leaders revealed that a local organisation played a critical role in post-disaster recovery and redevelopment of the neighbourhood through its ability to identify and leverage local knowledge and resources, provide strong leadership,

organisation, and communication. Employing local resources, such as local churches as operational centres in the aftermath of the disaster, collecting local data and holding public discussions on community redevelopment enabled the organisation to secure funding and influence local recovery (Storr and Haeffele-Balch 2012).

RECOVERY AND THE DISASTER MANAGEMENT CYCLE

Whilst there are a number of factors influencing the level of impact of a hazard, the capacity and responsibility of planning for, responding to and recovering from disasters lies with an assortment of organisations and actors (Tierney and Oliver-Smith 2011). These include: national, state and local governments, non-governmental organisations (NGOs), local community organisations, households and individuals (Ronan and Johnston 2005; Birkmann 2006; Rubin 2010).

In Australia, Emergency Management Australia (EMA) is the main federal body that coordinates and provides advice on disaster management issues. The national government's role in emergency management is a strategic one and involves managing information, coordinating disaster research efforts, implementing mitigation policy and best practice, reducing the risk associated with disasters, limiting financial costs to the nation and making funds available to state and territory emergency response organisations. States are responsible for the provision of emergency services. State authorities each have their own state emergency frameworks which include planning for the response to disasters and other emergencies and generally include local governments as a critical part of disaster management arrangements. Although the states and territories each have unique setups and procedures, the disaster management cycle (DMC) is their guiding principle (Australian Government 2014).

The DMC provides a sequence through which individuals, communities and private or government organisations prepare for, respond to and recover from disaster events (Ronan and Johnston 2005). The DMC comprises four overlapping phases: Prevention, Preparedness, Response and Recovery (PPRR). The community is involved in one or more of the phases at any point in time and begins to mitigate against future disasters during the prevention phase. This can take place in the form of building codes and land-use planning as well as pre-planning for post-disaster recovery. Next, a community enters into the preparation phase (often when a hazard is imminent), where early warning systems are activated, plans and preparations in the form of household emergency kits are developed, and evacuation plans are deployed. Once a hazard event impacts a community, the response phase begins when search and rescue occurs and medical attention and temporary housing is provided. During a large scale event, where local capacity is overwhelmed, these tasks may be carried out by the state and/or federal government emergency management agencies as well as international aid agencies/NGOs such as the Red Cross (Smith and Petley 2009; FEMA 2011; Australian Government 2014). The recovery phase involves individuals, government agencies, NGOS and community organisations working to rebuild a community to some semblance of its former self.

Rubin (2010) defines recovery as "the differential process of restoring, rebuilding, and reshaping the physical, social, economic, and natural environment through pre-event planning and post-event actions" and early stages of recovery is often undertaken concurrently with the response effort (Twigg 2004; Smith and Petley 2009). Smith and Wenger (2006:238) define recovery as the differential process whereby the restoration, reconstruction and "reshaping [of the] physical, social, economic, and natural environment" takes place through mitigation planning and post-event actions. Tierney and Oliver-Smith (2011) highlight that individuals, communities, organisations and governments are each affected differently by disasters and that recovery is not so much driven by physical mitigation strategies but rather by the social factors that constitute the affected area and community. Assessments of social and community resilience are needed to provide a better picture and understanding of the recovery process. As no two communities are the same, this invariably means that there will be differential rates of recovery across space and time (Cottrell and King 2010; Rubin 2010; Boon et al. 2012b). Understanding how disaster recovery occurs for multiple communities and events over a variety of timeframes could help develop strategies to harness the resources communities may need in the face of adversity. It can also help frame a community's specific strengths and weaknesses and provide a guide for the level of support a communities may need during the recovery process.

Kates and Pijawka (1977) developed a model of the disaster recovery phase over a 500 week timeframe. The four stages in this model are: (i) emergency; (ii) restoration; (iii) replacement and reconstruction; and, (iv) commemorative, betterment and developmental reconstruction (Figure 2). Each phase takes longer than the previous phase and is often overlapping and it is suggested that each stage in the proposed framework runs sequentially and can take around ten times longer than the previous stage. Kates and Pijawka's (1977) model provides a macro analysis of what occurs during each stage of disaster recovery, however provides little analysis of the roles and inter-relations between various actors during the recovery process or the recovery process itself (Edgington 2010; Rubin 2010).

Initially there is an 'emergency' stage which lasts for a few weeks, during which time the normal activities of the community have ceased as a result of the event (Kates and Pijawka,1977; Sullivan 2003). The main objectives of this stage revolve around immediate assistance and relief, hazard mitigation and the return of essential services. The first responders provide a supportive role, performing initial assessments of damage and identifying the number of affected households (Kates and Pijawka 1977; Coppola 2011; Australian Government 2014). The second stage, 'restoration', occurs over a 4-6 month period and focuses on the restoration of community services and utilities. This aims to bring displaced households and populations back into the disaster area and restore some semblance of normality to the community (Kates and Pijawka 1977). Sullivan (2003:9) describes restoration during this phase as being "patchy".

The third stage, 'replacement construction' occurs over an longer period of time with the view of returning a community to either a pre- disaster state or to a level exceeding pre-event levels (Sullivan 2003). The fourth stage of 'developmental reconstruction' was later modified to the 'commemorative, betterment and developmental reconstruction period' by Sullivan (2003). During this phase, projects are built to memorialise the effects of the hazard and used to symbolise

how well the community has overcome various recovery challenges. This can take up to 500 weeks to achieve (Sullivan 2003). Full recovery is achieved when the affected population has returned to pre-disaster levels and when job losses, services and housing crises have been resolved (Kates and Pijawka 1977).

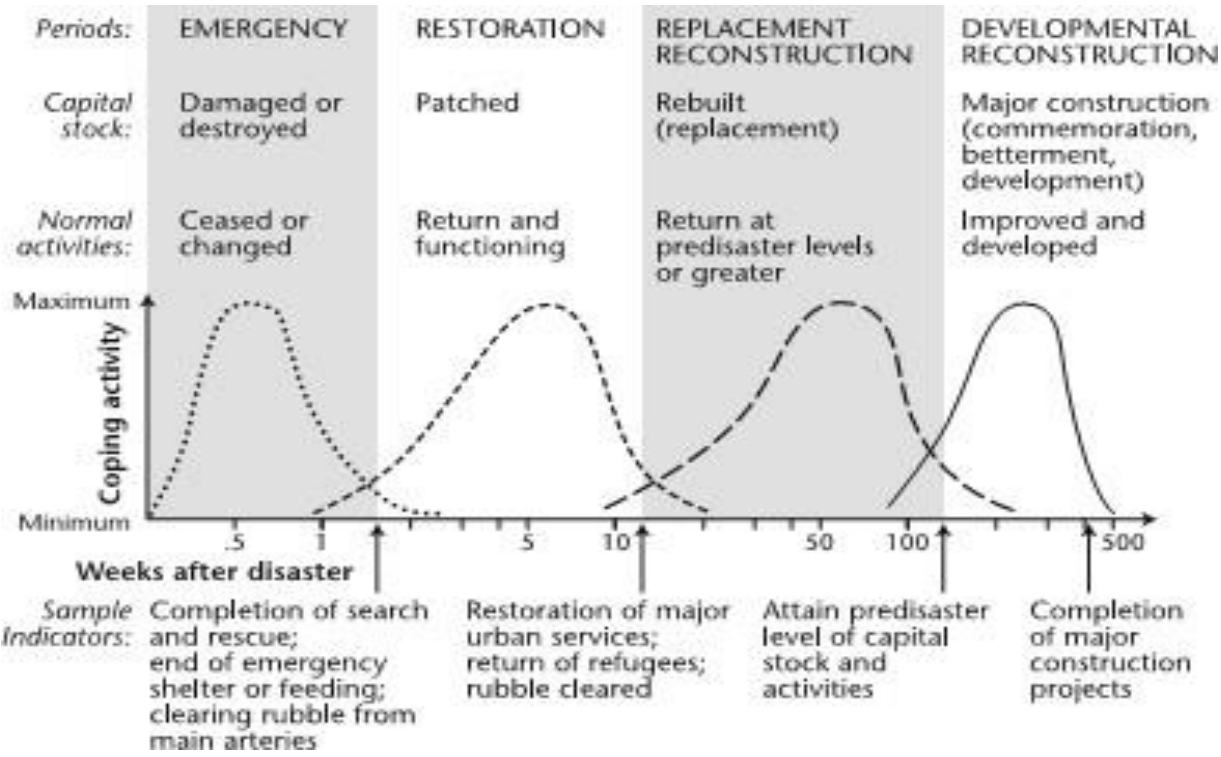

Figure 2. The Kates and Pijawka (1977) model of disaster recovery.

Although frameworks and policies regarding the best approach for disaster management differ from country to country, similarities do exist. Many governments have developed emergency management agencies due to public outcry over the mismanagement of disaster events. Coppola (2011) cites examples of this in Peru (1970), Nicaragua (1972) and Guatemala (1976) following devastating earthquakes in each of these countries. These governments failed to formulate emergency structures despite a history of frequent devastating natural disasters (Coppola 2011). In this context, the United Nations General Assembly declared an 'International Decade for Natural Disaster Reduction (IDNDR UN) in 1990 (IDNDR UN 1989). This was instituted in order to develop the capacity of each of the UN member countries, especially developing nation states, to decrease the infrastructural, economic and human destruction caused by disaster events (IDNDR UN 1989; Coppola 2011). Implementation of this strategy was assessed during the World Conference on Natural Disaster Reduction in Yokohama, Japan in 1994. This prompted the use of the four stages that make up the disaster management cycle, a procedural framework in which disaster response agencies could operate (Coppola 2011).

Academic discourse generally agrees with the stages identified in the Kates and Pijawka model (Sullivan 2003; Edgington 2010; Rubin 2010), although there are

doubts and questions about the linear and chronological sequence. It is contended by some that each stage of recovery can often occur in unison or out of sequence depending on various aspects of the disaster, the community impacted and the organisations involved in the recovery process (Sullivan 2003; Edgington 2010). Edgington (2010:20) argues that it and other studies fail "to adequately grasp the complexities and conflicts inherent in the recovery process", specifically mentioning that the framework focuses on the physical aspects of recovery and does not consider the political, cultural and social aspects in enough detail (Quarantelli 1998; Sullivan 2003; Hayashi 2007; Edgington 2010).

TEMPORAL DIMENSIONS OF DISASTER RECOVERY

In the short term, recovery focuses on providing a coordinated process of supporting affected communities in reconstructing the built environment and the restoration of emotional, social, economic wellbeing as well as the natural environment (Australian Government 2018). However it generally takes many years for a community to recover from a major hazard event (Ritchie and Gill 2011) and recovery may not be fully achieved before the next major event. There are relatively few studies that focus on the long-term recovery process following natural disasters. Historically, assessments of the recovery process have been conducted using an external top-down approach and last for a few months. Whilst these methods can provide useful, broad and provide general data, they fail to capture many aspects of a community slowly recovering over time. The recovery phase often overlaps with the response phase, and in some cases, runs parallel to the response phase. As the 'official' recovery process starts in the affected community, many of the agencies transition from response into recovery where maintaining funding streams and supporting repairs to infrastructural damage are a priority (Committee on Disaster Research in the Social Sciences 2006; Smith and Petley 2009; Australian Government 2014). Ultimately, once the various external organisations withdraw from the 'official' recovery process, the responsibility of long-term recovery it is in the hands of the affected community.

Blackman et al. (2017) agrees that recovery is not a linear progression from short term to long term recovery with the same actors and management. Rather they propose that there is a transition period between the purpose of long-term disaster recovery and actual implementation because the recovery process changes over time (Figure 3). It evolves from being a complicated set of interrelated, urgent but essentially predictable problems in the short-term response phase, into a complex system problem in the long term recovery phase. Each disaster response can lead to unexpected consequences. The study of the earthquakes in Japan and Christchurch found four traditional groups of actors took the lead in immediate recovery (Figure 3); they being national, regional and local governments, non-government organisations, residents, and local businesses (Blackman et al. 2017). However as time progressed and relief turned to rehabilitation, new local groups emerged led by local leaders. As rehabilitation moved towards recovery, the influence of government declined and was replaced by strong cohesive volunteer groups and new leadership including social entrepreneurs that were instrumental in determining how the community should be rebuilt.

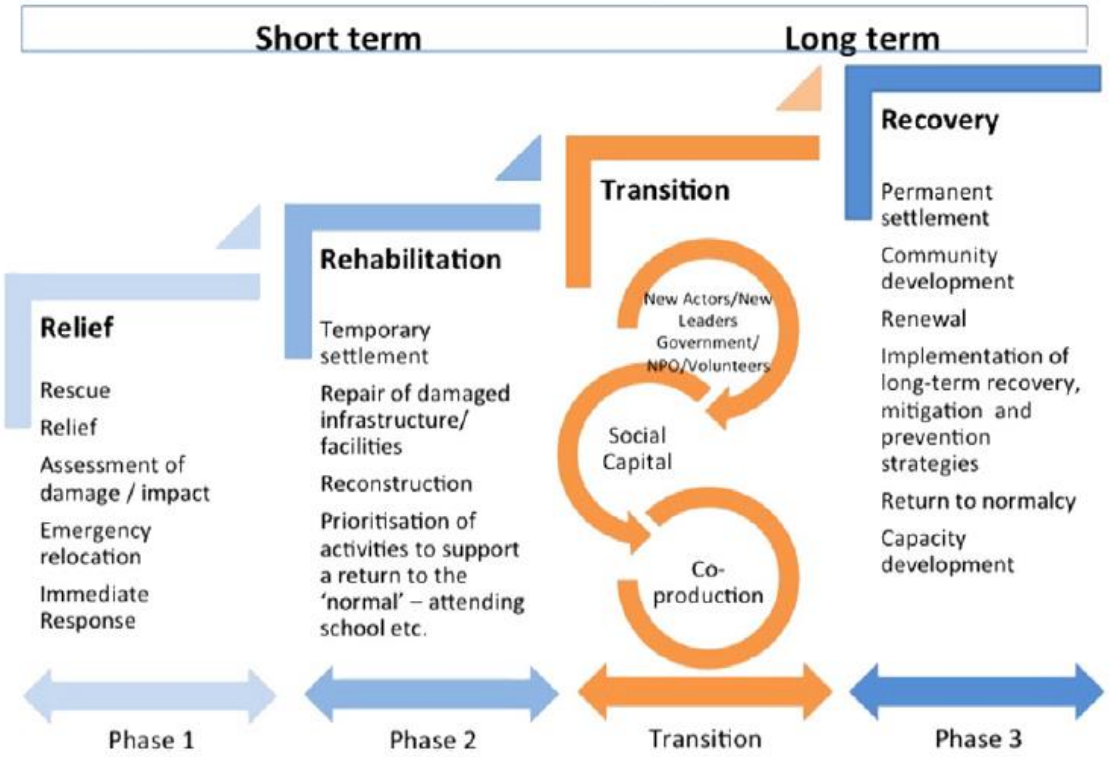

Figure 3. Elements of disaster transition (after Blackman et al. 2017).

Unfortunately research into disaster recovery has been overshadowed by research on disaster planning, prevention and response (Smith and Wenger 2006; Cutter et al. 2008; Rubin 2010). In some cases, the ongoing loss of livelihoods from major events throughout the world highlight the length of the impacts of disaster upon a community. Understanding the importance of institutions, actors and activities involved in the recovery phase of a disaster within a community is vital when facing inevitable future events and in understanding vulnerability to natural hazards (Rubin 2010). Research into disaster recovery has also primarily focused on the short term (Shaw et al. 2003; Apan et al. 2010; Edgington 2010; Olshansky et al. 2012). Short- term recovery research often focuses on the first and second years after a disaster event and on specific aspects of the post-disaster environment and its process (Rubin 2010; Edgington 2010). Short-term recovery research generates very little data on what mechanisms drive long-term recovery and resilience building for future events (Rubin 2010; Sullivan 2003) as it often looks at the initial failures and successes of the response phase and immediate recovery process and does not consider the time needed to reach full recovery. The current approaches used to research recovery generally fail to develop a comprehensive perspective of the recovery process, where issues like funding availability, latent damage, social precursors and the long-term psychological factors that might slow a community's recovery are ignored.

Long-term recovery research looks at the post-event environment over a longer timeframe and may employ two main methods: (i) retrospectivity, where the researcher looks back over the long-term recovery timeframe or (ii) the analysis of past or progressive research where the researcher is present from the start of the recovery process tracking its progression (Edgington 2010; Rubin 2010; Whittle et al. 2010). Long-term research analyses of disasters have been limited by the

fact that there are often difficulties finding communities in recovery that have not been disturbed by a subsequent event. There has also been a lack of funding to support long-term recovery research (Edgington 2010; Rubin 2010). The latter is in part due to the argument that each dollar spent in preparation saves an average of four dollars on disaster response and recovery, and is therefore seen as a more efficient use of resources (Zambello 2013). However there is a growing awareness that the social and economic costs of a disaster that persist over time demands greater consideration by researchers and policy makers of the long term recovery process.

BARRIERS TO EFFECTIVE LONG-TERM RECOVERY

The characteristics of a particular disaster, that is, the type of disaster, the scale, the time it occurs, its duration, and location are factors that determine the nature and extent of the response and recovery effort. These factors can also determine the effectiveness of long term community recovery. In particular, the associated harms to individuals, communities, the economy and the environment are interrelated and all impact on the capacity of individuals and the communities to recover in the long term (WInkworth et al. 2009). These factors are discussed in the following sections.

THE TYPE OF DISASTER

COAG (2002) defines a natural disaster as:

> *… a serious disruption to a community or region caused by the impact of a naturally occurring rapid onset event that threatens or causes death, injury or damage to property or the environment and which requires significant and coordinated multi-agency and community response. Such serious disruption can be caused by any one, or a combination, of the following natural hazards: bushfire; earthquake; flood; storm; cyclone; storm surge; landslide; tsunami; meteorite strike; or tornado (COAG 2002:4).*

Drought and heatwaves are not included in this definition, yet they are features of Australia's environment and are included in this project. The onset and end of drought is difficult to determine. It is a slow-onset natural hazard, a 'creeping phenomenon' with impacts that accumulate slowly over a long period of time (Wilhite et al. 2014). In Australia, flood, drought and bushfires are expected to increase in frequency with climate change, intensified by socioeconomic development and population growth, particularly in exposed coastal and riverine areas, and in densely populated urban centres (Worthington 2004). Using normalised data, van den Honert et al. (2015) demonstrated that no single natural hazard type dominates or is responsible for most insured building losses—hailstorms, cyclones, floods, earthquakes and bushfires are all considred to be the most damaging events in Australia. However, heatwaves are responsible for the greatest numbers of fatalities in Australia. Over 55% of natural hazard fatalities between 1900-2011 were attributed to heatwaves (van den Honert et al. 2015). Floods were responsible for 15% of fatalities over the same period, storms 16% and bushfires 10% (van den Honert et al. 2015).

THE SCALE OF A DISASTER

The magnitude of a disaster and/or its intensity, is vitally important to the response and recovery process. Whether a disaster event impacts a community, the state or a nation as a whole, resources can be stretched influencing how the post-disaster environment is handled (Cutter 2006; Olshansky et al. 2012). Vulnerabilities and the intensity and magnitude of an event can lead to varying levels of damage within the same community. This is often dependent on

infrastructure, where housing may pre-date building code legislation based on newer building techniques. This can lead to varying rates of recovery within the same community (Walia 2008; Edgington 2010).

THE LOCATION OF A DISASTER

The location of densely populated areas can determine the level of damage or impact. Should, for example, developed urban areas lie in a flood plain or be built on a fault line, recovery could take much longer to achieve with the extent of damage exacted on that infrastructure and the time needed to repair it (Lall and Deichmann 2009; Kates et al. 2006). Also, communities located within hazardous locations are not always aware of their exposure. This leads to a lack of preparation, both physically and psychologically (Apan et al. 2010; Ross and Carter 2011). Another concern is access to a disaster affected area. For example, settlements in a river-valley or on floodplains could potentially be cut off by flooding (Yu et al. 2010; QRA 2012). Access to various areas and facilities and evacuation planning is vital, not only to preserve life (i.e. possible deaths during and after an event), but also to lessen the effects of the event and therefore promote a more effective collective recovery.

THE BUILT ENVIRONMENT

The nature and extent of the built environment can also define the response and the recovery process. During a major earthquake in Kobe, Japan, in 1995 the elderly suffered the highest fatalities mainly due to their isolated post Second World War houses, which were unable to withstand ground tremors (Edgington 2010). Adams et al. (2011) found the same when interviewing the survivors in the aftermath of Hurricane Katrina which caused significant damage to the Gulf Coast of the United States in August 2005. Many people, mostly the elderly and low socio-economic population, were found to be struggling with recovery due to the level of damage they sustained to their homes and lack of assistance to evacuate timeously. The poor housing construction and lack of resources within an already vulnerable group, led to a very slow and difficult recovery (Edgington 2010; Adams et al. 2011). If the existing infrastructure is not built to withstand the disaster impact and if the placement of that infrastructure is within highly exposed and vulnerable areas, rapid recovery is almost impossible. Further, renters also have less ability to make preventative and recovery modifications to their homes (Morrow 1999; Rufat et al. 2015).

In some areas, resettlement is necessary for recovery and for future disaster risk reduction. For example, the extreme flash flooding that occurred in the Lockyer Valley in January 2011 resulted in the loss of 19 lives including 12 in the township of Grantham. The flood was due to torrential rainfall on already saturated ground and steep topography. The sudden onset of the flood meant there was little warning which exacerbated the impact. To reduce future risk, the Lockyer Valley Regional Council (LVRC) made a critical decision to act quickly to resettle the small community on nearby higher ground (Okada et al. 2014). Previous studies identified the main barriers to effective resettlement are inadequate community consultation, poor planning, and decisions made quickly, reactively and in a top-down fashion (Badri 2006). The Lockyer council bypassed many of the normal

land use planning procedures to expedite the resettlement process. There were regular community consultations, media reports and public meetings as Council believed that successful recovery should be responsive and adaptive, centring, engaging and empowering local communities to move forward (Okada et al. 2014). Some $18 million in federal and state government funding supported infrastructure construction and 160 homes were relocated. However, as participation was voluntary, some residents elected not to move. Some left the community, while others chose to stay and repair their existing home. Some could not afford to demolish their existing house in the original location or build a new home in the resettlement site after land-swapping. There can also be psychological and social factors influencing non-participation (Okada et al. 2014). Of concern is that social capital might be affected by relocating residents to new/repaired houses or if residents need to move outside of the disaster area for a time and this will impact on long term recovery of the community (Blackman et al. 2017).

THE ECONOMIC IMPACT

A lack of finance is a significant barrier to recovery. There may be a shortage of capital for reconstruction, a lack of government support or a complex application process for funding (Brown et al. 2008). A strong local economy aids the recovery process. A community's proximity to major trade routes and access to resources is also a factor (Alesch et al. 2009; Twigg 2004).

Edgington (2010) found that if local firms are invested in the community, the recovery is further supported through the drive of those businesses to survive (Edgington 2010). Companies fully connected in a community, are important in creating a strong, resilient economic base on which recovery can take place (Folke et al. 2002; Alesch et al. 2009; Cottrell and King 2010). If the economy is weak and struggling before the event, then a full recovery could well be impossible. Examples of this can be seen in the aftermath of Hurricane Katrina, where communities such as Biloxi recovered well, due to the number of people employed by local casinos in the thriving tourism trade. Escambia did not fare as well as its local economy is dependent on agriculture, which was badly damaged during Katrina. Without a diversified or resilient economy, recovery has been much more challenging (Alesch et al. 2009).

However, Alesch et al. (2001), in examining the impact of natural disasters on small businesses and non-profit organizations, found that most business owners have little to no understanding of how natural disasters cause small organizations to fail or suffer long recoveries. Yet, they have control over many of the variables that determine the success of the business or organization after the disaster. The authors describe management techniques to reduce both exposure and vulnerability through smart business practices. Similarly, Marshall et al. (2015) showed that larger businesses, businesses that had prior disaster experience and businesses with prior cash flow problems were also less likely to meet demise post-Katrina. This suggests that prior experiences with some type of adversity may provide knowledge and insight that aid small business owners during subsequent experiences (Marshall et al. 2015). Communities never return to what they were before the event, and small businesses need advice for preparing for disasters to enhance their chances of surviving and re-establishing financially viability after it (Alesch et al. 2001).

Pre-existing social and economic conditions in a community prior to a disaster event often determine how effectively a community will recover (Tobin and Whiteford 2002). If the community is strong, vibrant, equal, growing and connected, recovery can be realised as an opportunity and a chance to seek betterment. Communities that exhibit weakness prior to the shock can take that much longer to reach normality and often never fully regain their pre-disaster level (Paton and Johnston 2006; Alesch et al. 2009; Edgington 2010; Cottrell and King 2010). At an individual level, personal wealth plays an important role in defining vulnerability, and in turn the ability to recover from an extreme event (Kohler et al. 2004; Alesch et al. 2009; Cottrell and King 2010; Olshansky et al. 2012). Misomali and McEntire (2008:26) cite examples of indigent and poverty-stricken populations in the wake of both Hurricane Katrina and Hurricane Andrew where inadequate resources such as personal savings, prior to the event meant the communities never fully recovered (Paton and Johnston 2006; Misomali and McEntire 2008; Cutter 2006; Olshansky et al. 2012). López-Marrero and Yarnal (2010) further highlight that even individuals, who have the income to sustain their households might not have access to long-term economic resources to deal with recovery. This hampered recovery after flooding in Puerto Rico where affected residents did not possess the necessary additional financial resources to pay for reconstruction. Furthermore, Wenger et al. (2013) point out that the level and type of insurance a household is able to afford is vital to how the long-term recovery progresses. Non-insurance for both building and contents cover is closely correlated to indicators of financial position (Insurance Council of Australia 2005) and uninsured households are often slower to recover than insured households. Households who have insurance, but who are ill informed of the extent of their cover, might find themselves without cover. This hampers overall recovery and authorities need to be aware of this reality and plan for it (Handmer and Hillman 2004; Camilleri et al. 2007; Gordon 2009; Wenger et al. 2013).

Another consideration is the rate of population change in an area prior to an event and in some case local governments use the event to reinvent the town, provide development opportunities and endeavour to attract people or businesses back into the area with new, revitalised infrastructure (Smith and Boruff 2011; Wood et al. 2013). Knowing settlement conditions before a disaster event can help recovery managers target specific factors to promote rapid and effective recovery (Evans-Cowley and Gough 2007; Cottrell and King 2010; Edgington 2010). López-Marrero and Yarnal (2010) found that certain demographic trends like the make-up of households, individual well- being, access to resources and the institutional response provided a foundation on which recovery took place in Puerto Rico. People who came from a family background, with a solid income and their own home tended to absorb the shock more readily than those who were on their own and already struggling to survive from day to day. Furthermore, weak infrastructure, poor planning, improper land-use, lack of land tenure and access to existing settlement areas were, in some cases, seen to undermine an effective and efficient recovery for some individuals within the affected community (Alesch, et al. 2009; López-Marrero and Yarnal 2010; Edgington 2010;).

Finch et al. (2010) in their analysis of recovery in New Orleans following Hurricane Katrina found that private resources and government programmes helped those in the high and low groups but was lagging for neighbourhoods in the mid-range of vulnerability. They concluded that "the new residential landscape portends a

future where the geography of recovery is based on who can afford it", not necessarily those who are most affected.

Godschalk et al. (1999) found that after the devastation caused by Hurricane Andrew in Miami in 1992, much of the reconstruction was not in the city's best future interest. Local businessmen and politicians had seen the disaster as an opportunity, and through some quick business dealings, secured an advantage over their competitors swaying local redevelopment and reconstruction to suit their needs. This might have fostered economic growth and helped to drive local business, but could be at the cost of sustainable future development (Godschalk 1999). Phillips (2009) echoed this when highlighting the need for land-use planning and zoning. Private business can be vital to recovery, as was seen in the aftermath of Hurricane Katrina. However, pressure is often placed on authorities to allow development in unsuitable, vulnerable areas (Phillips 2009). Authorities need to be aware of vested interests and not lose sight of what is necessary to achieve a satisfactory recovery and ensure future resilience.

For long-term recovery Abramson et al. (2011) argue that the size and growth of recovery costs indicates an increasing disparity between covered and uncovered losses following disasters, and therefore government planning and policy needs to focus far more attention on long term recovery. Furthermore, many long term consequences cannot be costed in financial terms, for example, diminished physical and mental health among disaster victims, loss of a sense of community and attachment to place, or large scale social disruptions or population displacement (Abramson et al. 2011).

OUTMIGRATION

The choices people make in electing to stay or move away from a community in the aftermath of a natural disaster, and whether or not they return at a later date, has a major impact upon economic recovery as well as social recovery and the community capacity for social capital. For example, a study by Bengtsson et al. (2010) analysed the use of mobile phones before and after the January 2010 earthquake in Haiti. By the 18 June 2010, there were 6.6 percent fewer mobile phones in Port-au-Prince and an estimated 250,000 residents had not returned to the city.

In Christchurch New Zealand, following the 2011 earthquake, around 70,000 people left the city (Love 2011). They left because of damage to their homes and infrastructure (water and sewage), loss of social services such as schools, or a desire to avoid the subsequent aftershocks. However Love (2011) was concerned with the long term population impacts on Christchurch and compared the Christchurch experience with those in other cities that experienced similar impacts from natural disasters; the earthquake in Kobe, Japan (1995), and hurricanes Andrew in Florida (1992) and Katrina in New Orleans (2005). Smith and McCarty's (1996) analysis of outmigration from two areas with high and low levels of damage in Dade County Florida following Hurricane Andrew found population movement varied according to location and degree of damage to homes. Of those who returned, over 90% returned within six months in the less damaged North, while the return to the South where greater damage was recorded was much slower. Interestingly, in both regions, over 80% of those who left remained in Dade or the neighbouring Broward

County rather than moving further away. Two years on, only 0.2% of the population in the North had not returned while a much larger proportion (6.5%) of the South Dade population had moved permanently from the area. However, the disaster seems to exacerbate patterns in social inequality in housing as rented housing experienced a slower rate of recovery. The authors compared these findings against original population predictions for the area and concluded that overall population growth was unaffected by the hurricane (Smith and McCarty 1996; Love 2011). Likewise, in a study examining how migration varies among sets of counties that experience significantly different exposures to all environmental hazards in the United States, Shumway et al. (2014) showed that counties that experienced the greatest impacts from environmental hazards are losing income as a result of migration. In counties with the highest impacts, income is lost through both net out-migration and income loss through out-migrants having higher incomes than in-migrants.

Following the earthquake in Kobe Japan, more than 100,000 people left the city permanently, 2.5% of the population, and it was ten years before the city's population returned to its pre-earthquake levels (Horwich 2000; Love 2011). In a later study, Chang (2010) found that the earthquake had in fact accelerated the long term patterns in population; that is more decline in the inner city and growth in the outer suburbs. As for long term recovery, in Florida, there was a strong correlation between the degree of housing damage and population loss (Love 2011). The entire city of New Orleans was evacuated following Hurricane Katrina because of the widespread flooding that occurred, and people were not allowed to return for six weeks. One year on the overall population loss across the 18 parishes was 9.4% (Love 2011). A review of several studies of the impact concluded that population return was significantly related to the degree of damage to housing and that there were racial and socioeconomic in the return rate (Love 2011).

To compare these findings to the impact of the earthquake in Christchurch, 7.9% of people had sustained serious damage to their homes. Love (2011) analysed trends in school enrolments finding 12.5% of children had re-enrolled in other schools with 6.4% of these enrolling outside of the Canterbury district. Families with older children were less likely to move (Love 2011). The study of Love (2011) concludes that the impact is for natural disaster tends to be small in the context of overall population growth. Population changes prove to be relatively stable within two years following a disaster, and most displaced people only move small distances away from their home town. People are drawn back to their homes and family especially if assisted by effective reconstruction projects and support. Interestingly, disasters accelerate patterns of population change. Thus, effective reconstruction and planning for new residential areas will discourage permanent outmigration. However, lower socioeconomic groups and older people are more vulnerable to disasters and are more likely to be displaced (Love 2011).

THE SOCIAL IMPACT

While the impact of a disaster upon individuals, their families and communities often focus on the disaster itself, the distress experienced often reflects the difficulties encountered during the recovery phases more than during the event itself (Winkworth 2007). A report for the Australian Business Round table for Disaster Resilience and Safer Communities (Deloitte Access Economics 2016) found that social devastation can be the longest lasting and most significant consequence of natural disasters. Consequences such as mental health issues, family violence, disease and substance abuse have long term costs for individuals, families and communities. These costs are often higher than tangible costs such as the destruction of property (Deloitte Access Economics 2016). The report recommends that there is a need to embed resilience into planning decisions and do more to assist communities prepare for and recover from disasters. Specifically pre and post disaster funding should include the long-term nature of social impacts.

Corotis and Enarson (2004) maintain that there are significant differences in the way various groups within a community perceive, prepare for, respond to, and experience losses from natural disasters. In particular, there are gender differences in risk perception, disaster preparedness and response, impacts and losses, priorities for post-disaster recovery, and relative social power to make important decisions about risk and safety in households, organizations, and governments. Embedded social relations, organized around gender, ethnicity, age and socioeconomic status, place different social groups differently at risk (Morrow 1999).

AGE

Demographic factors such as age are often used as indicators of vulnerability but the role age plays in an individual's capacity to recover has not been adequately examined (Phillips 2009; Paton and Johnston 2006). Very young children have been found to be more resilient in the face of an event like September 11 and Hurricane Katrina when compared to school-age children. Older children within the school system tend to have exposure to the plight of other children who have lost parents or family members. Many experienced Post Traumatic Stress Disorder (PTSD) which required more support and resources than younger children who are more unaware of the surrounding devastation (Norris, et al. 2002; Cutter 2006). Le Brocque et al. (2017) add that teachers are in a unique and well-placed position to provide vital support to children in recovery following disasters. They can also help to identify children who may be experiencing ongoing psychosocial trauma.

Gibbs et al. (2014) propose seven core principles for a community-based approach to supporting disaster recovery for infants, children and young people up to the age of 24 years. These include the need to quickly restore safety and security for children which includes ensuring adults are advocating for the needs of children; participatory approaches that engage children and young people in community preparedness, response and recovery processes in a supported way to promote a sense of self efficacy and competence that can help offset the disabling effects of exposure to disasters; and taking a life course perspective

to this support to recognise that children vary in response according to their stage of development. There is a need to support parents, carers and families to provide support for children recognising that recovery from a disaster will manifest with different needs at different times. Infants, children and young people will require different services and supports at different stages of their recovery (Gibbs et al. 2014).

Older people can also be vulnerable in natural disasters due to their mental health, disability, social isolation, financial circumstances, lack of access to resources, communication difficulties and inability to use modern technologies (Zakour and Harrell 2003; Martin, 2010; Bennett et al. 2011; Peek 2013; Howard et al. 2017). In the 1995 Kobe earthquake, over 50 per cent of deaths involved individuals over the age of 60 years (Edgington 2010). Adams et al. (2011), during their empirical field work in New Orleans post Hurricane Katrina, found that a large proportion of the deaths were among the elderly population. This group were unable to evacuate from the poor and isolated areas where they lived (Adams et al. 2011).

Cornell et al. (2012) maintain that the vulnerabilities of older people are generally due to factors associated with advancing age, such as impaired physical mobility, diminished sensory awareness, pre-existing health conditions, and social and economic constraints. However older people often have lower psychological vulnerability which may be attributed to greater life experience, previous disaster exposure, or having fewer obligations and responsibilities. For example, the findings of a study of older people in regional Australia and disaster preparedness (Howard et al. 2017) challenge the framing of older people as purely vulnerable in relation to natural disaster preparedness. Focus groups with 111 participants revealed a high level of preparedness, neighbourhood knowledge, and capacity to develop and mobilise informal networks in preparation for and in response to natural disasters. Older people in the study had a strong interest in and awareness of their local community. Walking regularly around their neighbourhood was a common practice for many, so they were aware of their neighbours, especially those who were frail or needed support. Their historical knowledge enabled them to share their experience about environmental and social aspects of their community and past natural disasters that would assist disaster preparation, management and recovery. The authors concluded that despite older people have the willingness to participate, the time and organisation, the informal networks, reciprocity and experience; and as generators and enactors of neighbourhood social capital where resources are shared, trust and connections are established, they are an under-utilised resource in disaster preparedness, response and recovery (Howard et al. 2017).

It is clear that the age profile of a community does play an important role in the vulnerability of that community and its recovery process as different resources are needed for different age groups in post-disaster efforts (Edgington 2010; López-Marrero and Yarnal 2010; Adams et al. 2011).

GENDER

Gender plays a key role in social constructs and how people face and interact with the natural world (Aldrich 2011). Phillips (2009: 300) contends that "gender

influences the type of impacts experienced" as well as the resources or capacity a community might have to cope with a disaster event. Tierney et al. (2001) found that most research about gender issues and their impact on disaster recovery has been conducted in the developing world (Tierney et al. 2001; Phillips 2009). This was mainly in light of gender discrimination in the job market and hence the ensuing inequality of income resulting in a more vulnerable female population (Blaikie et al. 1994).

Gender is relevant for understanding human behaviour and hazard-related vulnerabilities on the potential impacts of a disaster which can influence the recovery process. During response and recovery, women, as caregivers, are believed to be more vulnerable to certain disaster events than men. The loss of housing or shelter hinders their ability to provide care to loved ones and increases stress levels. This in-turn leads to further complexity within their individual recovery and ultimately the household that they care for (Blaikie et al. 1994; Enarson and Morrow 1998; Phillips 2009). Men are usually associated with the strength and leadership of the family. They can take this role to extremes in disaster events where they do not heed warnings or are reckless in their attempts to retain their perceived 'hero' status (Phillips 2009). However, in a study of the 2009 Black Saturday bushfires, Whittaker et al. (2016) found no definitive trend in staying to defend as a masculine trait or to leave as a feminine trait. Significant proportions of women defended (42%) and men left (35%). Warning messages are heard and processed very differently by men as opposed to women (Drabek 2013; Tobin-Gurley and Enarson 2013). Women tend to give more attention to warnings and will be more likely to evacuate should the order be given. Females are more likely to believe a warning signal and respond than men (Drabek 2013). In a fire event, men are more likely to fight the fire, while women will more likely warn others (Tierney et al. 2001; Phillips 2009). In the 2009 Black Saturday bushfires, Whittaker et al. (2016) found that men stayed because they wanted to protect their homes while women stayed because they thought they thought it was unsafe to leave or their attempts to leave had been unsuccessful.

Depending on household structure, unforeseen consequences can hinder the recovery if gender is inadequately considered. If understood, gender can be harnessed to achieve a more appropriate and effective community response to preparedness strategies, through the correct assignment of roles during the recovery phase. For example, women, those on lower incomes and the young are less likely to have insurance and more likely to find it too expensive, imposing barriers to the potential for recovery (Box et al. 2016).

Phillips (2009) reported that relationship status also influences the resilience of individuals and households. This does not always extend to the larger family unit, where higher levels of stress might be felt by couples with children who could have lost their homes in the event and now feel that they are no longer able to provide shelter for their families (Phillips 2009). A community's social bonds, relationships and general family structure can either directly increase or decrease a household's vulnerability and thus establish what support or resources a disaster-stricken community might require (Phillips 2009; Cottrell and King 2010).

VULNERABLE POPULATIONS

People that are socially disadvantaged, such as those in poverty, migrants, refugees, children, older people, people with disabilities, people who are homeless or transient, and people living in poor quality housing, are more vulnerable at all stages of a disaster, and are particularly slow to recover (VCOSS 2014). With limited resources, social support, mobility and housing options they have less capacity to evacuate in time and recover in the long term from trauma and financial devastation (VCOSS 2014).

Hurricane Katrina highlighted one of the more recent cases of how socio-economic status influences the recovery process. In the aftermath of the hurricane, unequal access to resources, disparities in wealth and education and the racial divide in the New Orleans community manifested in the rate at which certain groups recovered. This was apparent in minorities, like the poor or homeless, who were left to fend for themselves (Cutter 2006; Olshansky et al. 2012; Wood et al. 2013). Hurricane Katrina showed not only a racial divide, but also a class divide where middle class black and white residents had the means to evacuate prior to the event. Cutter (2006) expands with the fact that New Orleans had little food, no assistance from the state or federal authorities and no welfare system which allowed the poor to evacuate. Cutter et al. (2006) concur and illustrates this class divide by contrasting Dauphin Island, Diamondhead and New Orleans' Garden District to that of Escambia, Bayou La Batre and New Orleans' Lower Ninth Ward. In the former, residents with higher socio-economic status had access to income and additional private funding streams and have therefore rebuilt and recovered more rapidly. In the Escambia, Bayou La Batre and New Orleans lower Ninth Ward, residents with low socio-economic status show slow, differential rates of recovery (Cutter et al. 2006). The racial and class characteristics of a community is one of the determinants for how that community responds to and recovers from an event and how support might be adequately rendered in the post-disaster environment (Sommers et al. 2006; Phillips 2009).

In particular, the homeless, people sleeping rough, living in their cars, couch surfing or staying in shelters are uniquely impacted by natural disasters particularly in the immediate response to the event but also in recovery. Using interviews with homeless service providers and clients, Every (2016) examined the homeless community's experience of 2016 storms and floods on Australia's East Coast. The findings highlighted that long-term wet weather had a significant impact on people's physical and mental health and also limited the ability of services to provide shelter and bedding. The main impacts of evacuation included the loss of temporary dwellings, bedding and possessions, anxiety and isolation, and ability to look after pets. Existing homeless services were under-resourced, so they were unable to meet the additional support needs of homeless people during and after the storms. Few of the services had a working relationship with emergency services. In some places, any possible collaboration was confounded by broader punitive policies and misperceptions about homelessness (Every 2016).

REMOTE INDIGENOUS COMMUNITIES

There is little research that has considered the recovery experiences of Indigenous people in remote Australia. Many communities are located in disaster prone areas, with limited resources and support services, and geographic isolation and restricted access can enhance their vulnerability in an emergency. These communities may have their own ways of managing disasters but they do require additional assistance to aid their recovery (Winkworth 2007). In a study of two remote Aboriginal communities in the Northern territory that are regularly isolated by flooding, Morley et al (2016) found that although both communities had access to communication television, radio, and telephone, residents reported a lack of communication and location-specific information, including local weather warnings in the lead-up to and during extreme events. Only half of all residents had motor vehicles and with overcrowded households, the capacity to evacuate would be less than half the community. While kinship networks provide a sound support system, small populations and poverty reduce the ability of these remote communities to recover (Morley et al. 2016).

CALD COMMUNITIES

Individuals from Culturally and Linguistically Diverse (CALD) backgrounds, are considerably less aware than others of emergency recovery communication, emergency preparedness or recovery activities. A language barrier can prevent an individual or household from understanding an evacuation order or vital information and people are more likely to hear and understand a message presented in a language they understand (Santos-Hernandez and Morrow 2013). Language barriers can also restrict community participation and limit the development of social capital often relied upon during the recovery process (Tierney et al. 2001; Kohler et al. 2004). During the 1987 Saragosa Texas tornado, warnings in English (with limited translation) were broadcast to the predominantly Spanish speaking community. This resulted in a lack of understanding of the level of danger associated with the approaching tornado which placed Saragosa residents at higher risk with devastating results. Many people were injured during the impact resulting in a more complex and longer recovery (Tierney et al. 2001).

Language can also influence an individual's ability to navigate the bureaucracy of recovery information channels. In the aftermath of Hurricane Katrina, Procopio and Procopio (2007) found that most recovery information was passed on through informal channels like local networks, neighbours and also the broader community (Procopio and Procopio 2007). Should an isolated community not possess the language to tap into these networks, the dissemination of what is often vital recovery information does not occur (Hoppner et al. 2012). Authorities need to be aware of the various language groups in an affected community to ensure that the appropriate communication channels exist to convey warning messages and recovery information. This issue is of vital importance to today's multi-cultural Australia.

Norris et al. (2008) examined whether immigrants, particularly those who were less acculturated, were more likely suffer higher levels of distress from an extreme event by examining post-traumatic stress disorder (PTSD) and depression. The authors found that ethnic differences in post-traumatic stress may point to effects

of various risk factors, such as low socioeconomic status, chronic adversities, and differential exposure to the event itself but have little to do with culture itself although culture can also shape the experience and consequences of disaster exposure. Other findings showed that immigrants are less likely to make use of existing resources during and after disasters such as public shelters due to previous negative experiences in their countries of origin (Norris et al. 2008).

MENTAL HEALTH

The psychological impact of a disaster for all victims at the individual, family and community level is a significant factor in long term recovery. Bereavement, injury to self, family or friends, the threat to life and panic during the disaster, property damage and financial loss and relocation are factors associated with poor mental health outcomes. In particular, the severity of the exposure to disaster and threat to life are important determinants (Winkworth 2007).

Such were the findings of studies conducted following the 2009 Black Saturday bushfires in Victoria which led to the loss of 173 lives and 3,500 buildings damaged or destroyed. Gibbs et al. (2016) surveyed 1056 residents of affected communities and interviewed another 35 participants, and found that while most residents were resilient, many were experiencing mental health problems some three to four years after the fires. The fear for one's life in the bushfires and the death of someone close was associated with severe psychological distress. Five years after the fires, rates of mental health problems had significantly reduced in high-impact communities but were still higher than national levels.

Some people had experienced delayed onset of mental health problems, such as posttraumatic stress disorder. Many were unable to adapt to major life events following the fires such as change of income levels, in accommodation or in personal relationships. Gibbs et al. (2016) note that these psychological impacts also had a ripple effect across communities.

However, people varied in their reaction. Depending on their experience of the event and aftermath, some people sought to reclaim their lives while others preferred to reinvent their lives (Gibbs et al. 2016). Involvement in community groups was protective. As an individual's number of group memberships increased, their mental health improved but there was a curvilinear relationship between group membership and concurrent mental health (PTSD and depression) so that at a certain point, membership to additional groups became detrimental to mental health. This was particularly true for men at Time 1 and applied to both men and women at Time 2 (Gibbs et al. 2016).

Living with someone else was protective, but the risks of living alone appeared to be offset by group involvement. This was particularly true for those who were retired. This suggests that a healthy community is characterised by having many groups with high levels of participation spread across the community, so that the majority of people participate in several groups (Gibbs et al. 2016).

Based upon observations of Australian disasters Gordon (2004) developed a model to explain the stages of the collective psychological response to a disaster event. This has provided a framework for recovery management for Emergency Management Services in Australia. The sudden onset of a disaster causes residents to 'debond' from the social structure of their community. This is followed

by a rebound, or 'fusion' phase, where the community unites to respond to immediate needs, but not to long-term recovery. Fusion is followed by the appearance of "cleavage planes" caused by tensions that arise between affected groups, government and recovery providers and this has a negative effect on morale and individual psychological health. However, as reconstruction continues, community stability and function returns, albeit with a modified network of social differentiation (Gordon, 2004). The stages in this process are not linear but rather interlinked initiated when a disaster threatens a social system that is unable to respond. Gordon (2004) provides a series of mitigation strategies to ensure a community achieves the final stage in the long term.

'WHAT WORKS' FOR ENABLING LONG TERM DISASTER RECOVERY?

COMMUNITY RESILIENCE

Areas that have a history of experiencing natural hazards can develop greater community resilience and recover more rapidly. A long standing disaster culture produces communities who adapt, who know what to expect, are more resilient and recover rapidly (Phillips 2009; Tierney et.al. 2001). For example, the residents of San Francisco, where earthquakes are a regular occurrence, have adapted and developed coping strategies. Many residents understand the risks and as such, take preventative action to curb death or injury and minimise property damage. This promotes recovery (de Boer and Sanders 2005). López-Marrero and Yarnal (2010) in their study of Puerto Rico where the experience of flooding formed part of the community's "social memory" found a shared disaster history enabled disaster-prone communities to develop strategies which enhanced the recovery process and, in turn, promoted a rapid and efficient recovery (López-Marrero and Yarnal 2010).

In Australia, Apan et al. (2010) found differing levels of vulnerability/resilience in the Queensland towns of Charleville and Mackay after they experienced severe flash flooding in February 2008. In Charleville, a town with a relatively stable population base and experience of 'regular' flooding, a greater level of resilience existed and recovery was thus more rapid. By contrast, Mackay, a town with no history of regular flooding and a relatively high migrant population, was found to be more vulnerable. In addition, Mackay lacked the community participation and sense of belonging that Charleville exhibited (Apan et al. 2010).

In a study of recovery in four Australian communities, residents frequently described their connection to 'place' as being core to their recovery (Moreton 2018). This included its natural beauty, the history or significance of the built environment or the families. Participants maintained that the crisis changed their lives forever and believed that community recovery was not about returning to 'normal' or even creating a 'new normal'. Rather, community recovery involved accepting and expressing loss and grief in their own ways, of finding ways to adapt and incorporate the disaster experience into their individual and collective identity. Thus long term recovery was an ongoing process.

THE ROLE OF GOVERNMENT

When a disaster strikes a city, town or region, three institutional stakeholders are the first to respond, albeit in varying ways and times, and assuming different responsibilities. They are: (i) government (national, state and local), (ii) non-governmental/non-profit organisations (NGO/NPOs), and (iii) emergency volunteers and local community organisations (Phillips 2009). Government, in particular, has a vital role in the rate of recovery. Waugh (2000) defines disaster management as the "quintessential governmental role" in society (p. 3).

The Australian Government works in partnership with state and territory governments to fund disaster resilience initiatives through the National Partnership Agreement on Natural Disaster Resilience. The Government contributes $26.1 million each year through this program, which is matched by state and territory governments. State and territory governments are in turn responsible for emergency management in their jurisdictions, while state support, both physical and financial is coordinated by Emergency Management Australia. At District and Local level, the Department of Family and Community Services (FACS) in partnership with non-government organisations (e.g., Anglicare, Adventist Development and Relief Agency, Australian Red Cross, the Salvation Army) and similar support organisations collaborate to deliver welfare services during emergencies and disasters (Australian Government 2018).

In developed countries like the USA and Australia, local governments are responsible for smaller scale disaster events but can draw upon support from the state and Federal governments in times of need (COAG 2002; FEMA 2011). Ultimately, it is the responsibility of local governments to make the hard decisions and best use of outside resources provided (Phillips 2009; Whittle et al. 2010). Once an event escalates, state authorities are activated and should the impact and damage overwhelm their resources, a state of disaster is declared and federal systems are deployed (COAG 2002; FEMA 2011). Edgington (2010) highlights that the most successful recoveries are those where governments allow for a degree of flexibility within the recovery and reconstruction planning process. Government bodies strongly influence the recovery effort through the availability of financial resources, managing programmes to ensure local business recovery, quality administration as well as handling rebuilding plans, land use zoning and amendments to building codes (Phillips 2009; Whittle et al. 2010).

Pre-disaster assessments and planning conducted by local governments, are also vital for effective and efficient post-disaster reconstruction. A lack of planning by local governments and a failure to recognise the increasing and widespread nature of disasters has hindered recovery in many instances. Ando (2008) undertook a post-disaster evaluation of reconstruction following the 1995 Kobe earthquake and found that the local and state authorities, prior to the earthquake, had failed to see the importance of planning for recovery and reconstruction. Immediately after the event, a lag occurred in the start of recovery as time was wasted assessing the situation and developing a recovery plan. The absence of adequate information meant that government resources could not initially be accessed to provide the affected community with a workable solution (Ando 2008; Edgington 2010). Having a recovery plan prior to an event, which incorporates the available local assets and resources, will accelerate the vital initial recovery process which then sets the tone for the longer-term recovery process.

NPO and community organisations are also vital in assisting in post-disaster environments. Organisations like the Red Cross, Lifeline and The Salvation Army help to provide food and volunteers. In addition, they provide essential ancillary services, such as post-disaster trauma counselling, disaster victim registrations and the facilitation of certain government inquiries (DOTARS 2004; Phillips 2009; Tierney et al. 2001). While the government concentrates on the actual reconstruction of important community buildings, houses, centres and

healthcare facilities, NPOs support the affected community by providing resources for their immediate needs.

Johnston et al. (2012) examined multi-agency community engagement during disaster recovery following two New Zealand earthquakes, in 1987 in Edgecumbe and in 2003 in Te Anau. They found that effective survival and recovery from disasters depended on how the societal environment complements and supports the complex and protracted processes of community recovery. Central to recovery was the way society organised, mobilised and coordinated the diverse range of organisational and professional resources that could be called upon to assist recovery.

Government culture also influences the recovery process. Edgington (2010) documents that Japan traditionally had a very complex, top-down, bureaucratic approach to reconstruction. As seen in the aftermath of Hurricane Katrina, the US Federal government saw the clean-up as its responsibility and totally sidelined the local authorities. These actions stalled the initial recovery effort, due to emphasis the national/federal governments placed on infrastructure, ignoring local community needs. If proper mitigation planning and strong relationships do not exist between the local and national governments, sustainable development and proper long-term recovery is threatened (Edgington 2010; Olshansky et al. 2012; Whittle et al. 2010). Local officials are best placed to understand specific community needs, prioritise vulnerable areas and mobilise resources (Edgington 2010; Phillips 2009; Coppola 2011; Whittle et al. 2010).

The relationships that the external authorities and organisations have with the local leadership is a factor that especially affects the initial recovery. Mulligan et al (2012) found that in Sri Lanka, many external aid agencies did not make contact with the local authorities or seek local knowledge. This led to, not only a misunderstanding of what various communities needed supply-wise, but also when supplies did arrive, no distribution channels into the community were available (Mulligan et al. 2012).

Reliance on the capacity of external authorities to deal with the response and initial recovery of any large scale event, for example Hurricane Katrina, inevitability exposes the weaknesses and inability of these institutions (Camilleri et al. 2007; Guha-Sapir et al. 2011). In Australia, inquiries after the Canberra bushfires echoed this sentiment and recommended that the involvement of 'local' agencies and communities directly affected by hazards was paramount at the outset of the recovery process (Camilleri et al. 2007). Allowing local stakeholders to play a more active role in the recovery and response effort promotes expertise and, more importantly, more effective long-term recovery outcomes. Therefore, risk assessments need to include aspects of and an understanding of social and community resilience (Dwyer et al. 2004; Brewster 2005; Abuodha and Woodroffe 2006; Cutter, et al. 2008; Boon et al. 2012b). Research into effective disaster recovery can provide the tools and information needed to assess weaknesses, support and methods to be addressed prior to an event.

ENGAGING COMMUNITIES

A number of studies have emphasised the role of community engagement in all stages of the recovery process. Edgington (2010) found that in the case of the Kobe Earthquake, the role communities played in reconstruction was pivotal. The government needed to include, inform and listen to the community in order to achieve success in the implementation of their plans (Edgington 2010). Commentators agree that one of the most effective vehicles in disseminating post-disaster information and gaining trust in the way forward is through strong local leadership (Phillips 2009; Edgington 2010; Ross and Carter 2011; Mulligan et al. 2012). A strong local government leader is important as the face of the initial recovery as they are trusted and known to the community (Okada et al. 2014). Without that local leadership, conflict may arise and the community may react to being told what to do by unknown external or state authorities (Edgington 2010; Phillips 2009).

In Australia, 'community-led recovery' is advocated at all levels of government and non-government sectors through disaster management policies and frameworks (e.g. National Strategy for Disaster Resilience (COAG 2011)). Leadbeater (2013) in an examination of the recovery following the 2009 Black Saturday fires highlighted the critical importance of how recovery begins. Taking time from the outset to re-establish community connections, to revisit local priorities and aspirations and to support inclusive processes that are valued by and make sense to local people is vital. Recovery that has a poor beginning is almost impossible to reclaim given its longer-term impacts on the structure, relationships and functioning of the community. Creating space and time for the community to come together and for the 'right' answers to emerge is an investment in meaningful, sustainable recovery. If the value of community leadership in recovery is to be fully realised, it is imperative that recovery agencies and government at all levels acknowledge that disasters do not happen in a vacuum. Prior to being impacted, every community has existing values, networks, projects, relationships, knowledge, and capacity that underpin its day to day operations and indeed, its very identity. But the imposition of externally constituted and 'templated' recovery models can seriously undermine inherent community resilience (Leadbeater 2013).

Moreton (2018) in a study of 112 residents of four regions in rural Australia affected by natural disasters also found that the response and actions of local individuals or groups that focused on the expressed needs of the local community were far more effective for long term recovery than were outside agencies imposing processes or solutions onto that community. Residents were frustrated and disempowered by consultation mechanisms and community reference groups where often the most suitable community representatives were excluded and meetings were chaired by government or non-government organisations. When asked to describe what contributes most to community recovery, all participants described extensive and detailed examples of community leadership and community-led action. As one participant explained:

> *We needed help, but we weren't helpless. We needed someone to come along and hold our hands, with the tools and support that we needed, but knowing when to take their hands away. We didn't want people to come in and take over. Part of*

> *going through the process was to feel that we had some strength. (Moreton 2018).*

In terms of the social fabric of a community, Tierney, Lindell and Perry (2001:174) advocated that "strong and extensive social bonds generally have a positive effect on emergency response-related behaviours". Feeling socially connected or disconnected contributes to how a community responds to and recovers from a disaster event (Woolcock 2001; Putnam 2000; Edgington 2010; Cottrell and King 2010; Ritchie and Gill 2011). The level of social bonding within the community, with other communities and with institutional actors can frame the level of resilience, access to resources and absorptive capacity to extreme events (Woolcock 2001; Nakagawa and Shaw 2004). There are various bonding, bridging and linking factors which help connect a community internally, as well as to the outside world. These connections help foster communication channels and information flow (Procopio and Procopio 2007), access to support networks (Ritchie and Gill 2011) and resources (Cutter et al. 2006) during disaster recovery. They can prove vital in how disaster-affected individuals, households and communities react to the shock of a disaster event and recover from it (Tierney et al. 2001; Nakagawa and Shaw 2004; Cutter et al. 2006; Phillips 2009; Ritchie and Gill 2011).

GREENING THE COMMUNITY FOR RECOVERY

Greening is a major aspect of resilience in communities that have suffered disaster and operates at multiple, interrelated levels; individual, social and ecosystems (Tidball and Kransy 2014). Greening involves the actions of individuals working alone or in groups to restore social- ecological systems by establishing community gardens, forests, and improving habitat for wildlife and aquatic biodiversity. The authors note that the act of planting trees vegetables or flowers has been critical for emotional survival and building hope for the future following the 2011 Canterbury earthquakes in New Zealand (Tidball and Kransy 2014).

The broader context of ecosystem rehabilitation is also important in long-term disaster recovery, because the notion of recovery also applies to ecosystems. While natural hazards play an important role in shaping ecosystems through disturbance, social and ecological values are often at odds post-disaster. Classic examples of this clash of values come from approaches to 'cleaning up' the landscape such as logging after bushfires and the removal of woody debris from river channels after floods (Lindenmayer 2013; Parsons 2018). Post disaster ecosystem recovery considerations include biodiversity conservation, landuse planning, ecosystem function, habitat rehabilitation, pollution control and the intensity of activites such as logging and fishing.

MONITORING THE RECOVERY PROCESS

Currently, there is no national framework for monitoring or evaluating post-disaster recovery in Australia or in New Zealand. This is a significant barrier to long term recovery because the lessons learned from previous post-disaster

experiences are lost (Ryan et al. 2016). Monitoring and evaluation of the recovery process following disasters would provide invaluable knowledge and understanding to inform and improve the effectiveness and efficiency of government policy and response at all levels of government, and provide sound logic for program design and government investment (Ryan et al. 2016).

Currently, there is no planning or consistency in the way post-event emergency management evaluations are conducted in Australia (Dufty 2013; Ryan et al. 2016). In a review of 84 disasters (Dufty 2013), evaluations were only conducted for 35 events. Current evaluations are usually government inquiries, independent evaluations or operational reviews but there is no consensus on a definition of long term recovery, what steps or interventions are required in this stage of recovery, or what successful recovery looks like (Ryan et al. 2016). There is no consistency among these evaluations, they are narrow in focus, limited to specific aspects of emergency management such as command and control which ignore the complex relationships between emergency agencies and communities necessary for assessing the overall impact of the event. There is also inconsistency in timing of evaluations with some conducted several months after the event without gathering the necessary baseline data established immediately after an event (Dufty 2013).

Despite the lack of a monitoring and evaluation framework, there are disaster recovery frameworks established in Australia and New Zealand, to guide the development of post-disaster recovery programs. The Australian Government Attorney General's Department 'Community Recovery Handbook' emphasises that community recovery should be coordinated across social, built, economic, and environment domains (Australian Government 2018). However, the reach of recovery programs may be hindered by the lack of a monitoring and evaluation framework. Such a framework is essential for ensuring the success of post-disaster recovery efforts and efficient use of resources for optimal outcomes. National standard evaluations would determine how well a government program or intervention has met its objectives, accountability, and the findings would inform future policy and practice, and effective use of resources. It would also allow comparison between post-disaster recovery interventions from similar disaster events (Ryan et al. 2016).

Ryan et al. (2016) provides a program logic model for an evaluation of the recovery process the effectiveness, efficiency and/or appropriateness of a response to a disaster event (Figure 4). Questions to guide the evaluation would assess the ability of the program or activity to achieve the desired outcomes, the efficient use of resources, and whether the program or intervention was appropriate for the needs of the community (Figure 4). They emphasise that evaluations should be process as well as outcomes focused. A process evaluation examines the actual development and implementation of a program or intervention while an outcomes evaluation is a systematic assessment of the impacts, benefits, or changes that have occurred as a result (Ryan et al. 2016). As the lack of a clearly defined endpoint complicates evaluations of long term disaster recovery, they suggest monitoring recovery at regular intervals over a 10 year period (Ryan et al. 2016).

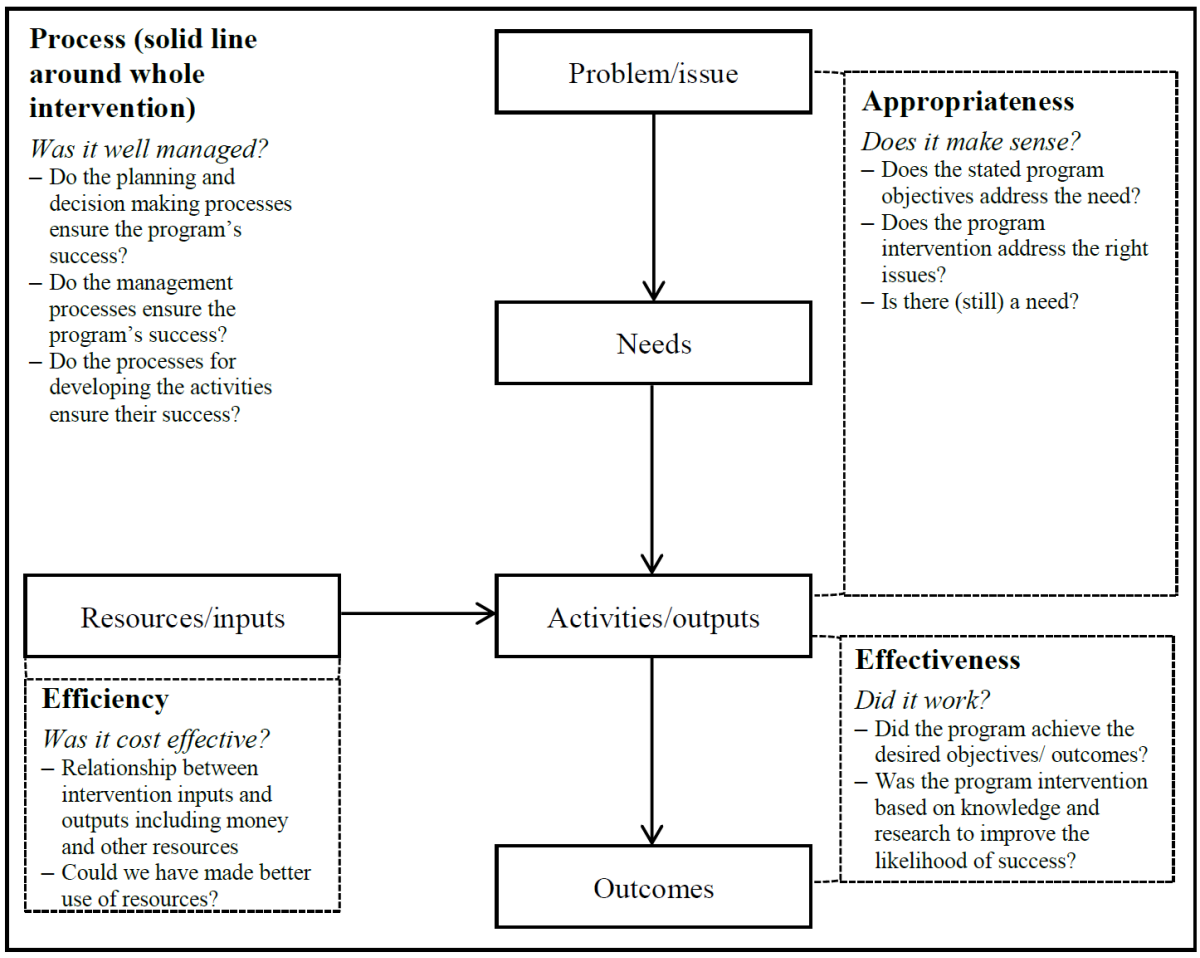

Figure 4. Program Logic model of key recovery program evaluation themes. After Ryan et al. 2016.

King (2007) argues for the need and value for longitudinal studies to provide a much deeper understanding of the long term impact of a disaster and behaviour of a community in recovery. Jordan and Javernick-Will (2012) identified key indicators that can be used to monitor community recovery and what causal factors are critical to successful recovery. The authors conducted an in-depth content analysis of 202 articles from four disaster-focused journals published between 2000 and 2010. The most frequently citied recovery indicators focused upon infrastructure, including housing recovery and restoration of public facilities and lifelines. Social science articles cited social indicators such as population and emotional recovery, while economic recovery indicators included employment rates, income levels, government revenue received and the number of businesses involved.

Bidwell (2011) also assessed approaches to measuring recovery from disasters, identifying the sources of routinely collected data to measure recovery indicators, and the need to ensure collected information is reliable, consistent, timely, frequently updated, and easily accessible. Routinely collected data that is disaggregated by social group or geographic area is the most useful source. Data such as school enrolments, postal addresses, and workforce information have been used following disasters to track recovery over time and space. The author states that one weakness of routinely collected data is often the inability to measure indicators of individual and community wellbeing, which can only be

assessed by surveying individuals directly. Many previous examples of such surveys of disaster victims tend to focus on psychosocial deficits rather than factors of functioning and wellness (Bidwell 2011). The author suggests that indicators need to be built on available information that is suitable for the context where possible (Bidwell 2011).

An example is the Canterbury Wellbeing Index which is used to track social recovery in Christchurch following earthquakes in the region in 2011 (CERA 2014). The index is updated annually to enable agencies to respond to issues, and provide community information about the social aspects of recovery after the Canterbury earthquakes. In addition to a wellbeing survey, the index uses secondary datasets across a range of organisations and is based on a hierarchy of indicators under 7 themes:

1) Knowledge and skills: Participation in education, Educational achievement
2) Employment wellbeing: Household , Individual income
3) Housing: Housing affordability and availability
4) Health and well being: Keeping well and having access to health services
5) Mental wellbeing, Risk factors
6) Safety: Offending patterns, Child abuse and neglect
7) Social connectedness: People participating in and attending the arts, sports events, sense of community, civil participation (CERA 2014).

Brown et al. (2008) adds that the recovery process of the built and ecological environment can be monitored using indicators of post-disaster recovery assessed through the use of satellite imagery and internet-based statistics. Their analysis of two case study sites, BanNam Khem in Thailand and Muzaffarabad in Pakistan identified the ways remote sensing can be effectively used to monitor some of these indicators.

CONCLUSIONS

Disasters have increased in frequency and the level of impact, devastating communities' world-wide and destroying infrastructure on a large scale. The conventional, blanket approach to disaster management is inadequate to deal with the substantial number of affected people and the varying timeframes of recovery (Camilleri et al. 2007; Rubin 2010; Cottrell and King 2010; Guha-Sapir et al. 2011). A more individualistic, area/country specific approach is needed, where plans need to be explicitly based on common, as well as specific strengths and weaknesses. Aldrich (2012) makes the point that empirical research into disaster "or more specifically disaster recovery, will provide policy makers and victims alike" with functional accurate knowledge on how to manage the recovery process. Understanding the factors that drive or hinder recovery will activate not only the necessary support but the right type of support to promote the most effective and rapid recovery process possible for that community (Iversen and Armstrong 2008; Aldrich 2012).

Recovery encompasses the compression of time in which certain services and infrastructure are re-established (Olshansky et al. 2012). These timeframes vary from community to community due to the various individual characteristics of each community. A successful long-term recovery involves understanding the pre-existing conditions within disaster-prone communities. Factors like physical location, the built environment, socio-economic conditions, political and environment issues, determine a community's specific vulnerability and resilience, and therefore the likely support needed in the aftermath of an event (Edgington 2010). Understanding pre-existing conditions in hazard prone areas, where high damage is likely (Kates et al. 2006) and the specific impact and characteristics a hazard event might exhibit (Cutter 2006; Kates et al. 2006; Lall and Deichmann 2009; Olshansky et al. 2012) helps establish the exposure a community has to the natural environment. The built environment could further expose a community, if infrastructural planning has not been undertaken prior to an event. A lack of zoning, building code enforcement and building sustainability could further worsen the impact and prolong recovery (Mason et al. 2010; Edgington 2010; Adams et al. 2011). A community that lives in a settlement which has insecure land tenure, poor land-use practices, inadequate land access and weak administration promotes specific vulnerability and hampers recovery (Phillips 2009; UN-HABITAT 2010; López- Marrero and Yarnal 2010).

The effectiveness of recovery is underpinned by what a community's existing social and economic conditions are, prior to a disaster event (Alesch et al. 2009; Cottrell and King 2010). If there are weaknesses in these areas, it further complicates the recovery and can prolong the timeframe of reconstruction (Paton and Johnston 2006; Alesch et al. 2009; Edgington 2010). Economic decline, population trends and the demographics of a community can pre-determine their specific vulnerability and point towards the types of support they might need in the aftermath of a disaster (Alesch et al. 2009; Edgington 2010; López- Marrero and Yarnal 2010). Age profiles can be used as indicators of vulnerability, where various groups might be more exposed in the disaster aftermath and take longer to recover (Norris et al. 2002; Cutter 2006; Edgington 2010; Adams et al. 2011). Gender, class and ethnicity play a role in response and recovery and can also have a profound effect on rebuilding a disaster-affected community (Tierney et al. 2001; Phillips 2009). Language and the lack of

understanding of warning messages as well as important recovery information may also hinder the recovery effort (Tierney et al. 2001; Kohler et al. 2004). Having a strong economic base, access to resources (financial and otherwise) and a strong local business community, helps create a foundation on which recovery takes place. Should this not exist, a protracted and difficult recovery might result (Folke et al. 2002; Twigg, 2004; Alesch et al. 2009; Edgington 2010;). Not only does the wealth of the community contribute to rapid recovery, but the economic wealth of households is also an indicator of the level of resilience (Kohler et al. 2004; Alesch et al. 2009; Olshansky et al. 2012). An individual's health, well-being and connectedness to the community also plays a role. Marginalised and socially-isolated minority groups and individuals can be used to establish the specific vulnerability of a community and therefore its inherent capacity to recover (Putnam 2000; Woolcock 2001; Cutter 2006; Cottrell and King, 2010; López-Marrero and Yarnal 2010; Ritchie and Gill 2011). Finally, a shared disaster history can help prepare and promote a more rapid recovery (Tierney et al. 2001; de Boer and Sanders 2005; Phillips 2009; Apan et al. 2010).

Government also plays a vital role in how effectively and efficiently communities recover after disaster (Waugh 2000; COAG 2002; FEMA 2011). The most successful recoveries have incorporated a degree of flexibility (Edgington 2010), good planning and pre-determined policies (Ando 2008; Phillips 2009). Funding can therefore be rapidly released and local governments are given the lead in the recovery efforts from the outset (Phillips 2009; Edgington 2010; Coppola 2011). Strong local leadership is paramount to a successful long-term recovery process.

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