Submission to Senate Inquiry into recent trends in and preparedness for extreme weather events

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Copied below are the executive summary and recommendations from each of three research projects that we have just completed. These were funded and driven by climate change adaptation priorities, but the extreme events form the basis of the studies and prompt immediate mitigation and adaptation strategies. Themes that emerged in these studies concerned: communication, insurance, evacuation, relocation, community resilience and government intervention through legislation and policy.

Some references are cited in these summaries, but a reference list has been omitted here. Full details and references may be located in the published reports.

1. Planning, building and insuring: Adaptation of built environment to climate change induced increased intensity of natural hazards

Executive Summary

The complexity and social and economic importance of the built environment requires focussed governance to develop adaptation and hazard mitigation for community resilience to climate change and to predicted extreme events. Where issues of adaptation and hazard mitigation impact public safety, they are best tackled through legislation, codes and policy.

Planning

Planning research focussed on a scenario of greater numbers and intensities of floods as a consequence of climate change, such that the research plan was strongly influenced by the flood events of 2011.

Recommendations of the Queensland Floods Commission of Inquiry (2012) that relate to land use planning responses to increased flooding were analysed. Many recommendations of the Inquiry propose sensible improvements that will mitigate the impact of natural hazards, but research highlighted responses that may be difficult to implement or that may be contested.

There was strong support from planners in four key areas of Inquiry recommendations: whole of catchment flood mapping; climate change adaptation as a component of hazard mitigation; creation of zones of limited or constrained development; and planning for flash flooding.

There no consensus among planners on the desirability of some recommendations; especially on land swaps, retreat, levees, and defined flood levels.

The Queensland State planning Policy ‘Mitigating the Adverse Impacts of Flood, Bushfire and Landslide’ has not been effective. Hazard mitigation and adaptation through land use and development planning must be incorporated into primary planning legislation.

Building

The resilience of houses to natural hazards such as windstorms, floods and bushfires can be improved by revising regulations (BCA) and design standards. Revisions to design and construction standards have resulted in post-80s houses being more resilient to windstorms compared to pre-80s houses built in cyclonic regions of Australia.
Structural upgrading is effective in reducing the vulnerability of non-engineered pre-80s houses. Structural upgrading and the provision of building envelope protection against windborne debris (preventing the formation of a dominant opening that generates large internal pressure) are two strategies that will also reduce the vulnerability of houses, including post-80s houses built in non-cyclonic regions. This is an adaptation strategy that would also be effective for any shift in cyclone boundaries or increases in wind loads that may result from climate change.
Education to improve the house-building process (regulation, design, construction, certification and maintenance) aimed at all parties (designer, builder, certifier, and owner) will enhance community resilience.

Insuring

Having insurance is not always a priority, or even an option, for all. In addition to significant rates of non-insurance and underinsurance, there is expectation of declining insurance availability and affordability in a changing climate. This will especially impact low-income earners. Insurance has little role at present in encouraging climate change adaptation measures, including risk mitigation. The role for insurance here is currently understood in terms of recovery not preparedness, and there is limited interest in using insurance to initiate innovation in climate change adaptation despite some engagement by insurers with the issues. The capacity of insurance to have a key role in climate change adaptation and associated risk mitigation is constrained by limitations in governance. Tensions over the roles and responsibilities for managing risks exist between the community and individuals, and between the public and private sectors, with inconsistencies amongst agencies and different levels of government exacerbated by a lack of leadership.

Recommendations

The following recommendations include the key findings that are summarised in the executive summary. These recommendations are intended as areas that may be developed as policy.

Planning

1. The recommendations about land use planning contained in the report of the Queensland Floods Commission of Inquiry are sound and sensible contributions to many of the changes that are necessary in order to enhance the capacity of planners and councils to mitigate natural hazard impacts and adapt to extreme weather events and to the greater impacts that may result from climate change. Some recommendations are straightforward and will not be contested or controversial, but this research has indicated several areas where change will be much more complex.
2. The first step to an overhaul of land use planning in hazard vulnerable areas is detailed knowledge and mapping of all hazard zones, within which it is essential to model changes that may be expected from extreme events and climate change. All

hazard zones – flood, bushfire, storm surge, flash flood, landslide – must be mapped in sufficient detail to inform planning development assessments and decisions. We note that this process has been ongoing for at least the last decade and that much work remains to be completed. The FCI recommended the completion of comprehensive flood studies, ideally in whole catchments, but at least in all urban areas. "Along with detailed mapping, flood studies typically have two main components: a) a hydrologic study aimed at determining rainfall and associated stream flows in a range of scenarios; b) a hydraulic analysis that estimates the behaviour of flood flow (that is, flow rate, velocity, depth and extent of inundation) as it passes through the floodplain." (QFCI 2012) This definition implies that fine detail and accurate information must be available down to the property level – i.e. LiDAR type information rather than large scale contour intervals.

3. The Queensland State Planning Policy 1/03 has not been effective in guiding land use planning in vulnerable locations. It is currently under review, but clearly must be made much stronger in its scope, its requirements and its reporting/referral procedures. It must be shown to be compulsory not optional. Ideally the primary planning legislation should directly identify hazard mitigation planning under the act, so that it is central to planning rather than an add-on through a state planning policy. This will require a significant rewriting of the *Sustainable Planning Act* (or a new act) in Queensland, and most probably in other states as well. Issues of public safety have to be compulsory, not an option of best practice. Planning legislation that recognises hazard mitigation as an integral part of the planning process will not need to be overridden or supplemented by temporary policies or emergency legislation.

4. There is a lack of agreement or consensus amongst planners in response to FCI recommendations concerning:

a) Land swaps and buybacks of properties in highly hazard vulnerable locations;
b) Retreat or relocation strategies;
c) The use and usefulness of defined flood levels such as the Q100;
d) Regulation and construction of hazard protection measures such as levees;
e) The level of government responsibility and funding for hazard mitigation and related activities.

5. Four groups of significant issues found consensus amongst planners:

a) Whole of catchment flood mapping,
b) Climate change adaptation as part of hazard mitigation,
c) Zones of limited or constrained development, and
d) Flash flooding.

6. These consensual recommendations, derived from the Flood Inquiry recommendations, reinforce earlier conclusions and were stated as follows.

a) Local government councils should be responsible for the development of a floodplain management plan.
b) Floodplain management plans should adhere to best practice guidelines.
c) Comprehensive flood studies should be carried out in all local government areas in Queensland.
d) Comprehensive flood studies must take into account the likely impacts of climate change on future floods.
e) Comprehensive flood studies should be carried out within the context of the whole catchment.
f) Planning schemes should be amended immediately as better flood information becomes available, or if development results in a change to flood risk hazard zones.

g) All areas of future urban growth should be mapped for three or more levels of flood risk.
h) All local government area flood mapping should be accessible to members of the public on a web site or as printed maps.
i) The flood risk to all individual properties and parcels of lands should be made available to the public.
j) Queensland Planning Provisions should define a zone of limited development, or constrained land, areas subject to high risk of flooding, in order to impose severe restrictions on urban development in high risk areas.
k) Detailed flood advice affects property values, but if property values are affected by detailed flood advice, councils should not be responsible for compensating property owners for any loss of value.
l) Councils are not liable for flood impact damage as long as the council has carried out reasonable mitigation and provided the most up to date information to the general public and property owners.
m) State Development areas must take account of flood risk and should be constrained in the same manner as any other development application.
n) Construction works and fill in low lying flood prone areas should not be permitted if they increase local flooding or reduce flood storage capacity.
o) Community infrastructure must be able to function effectively immediately after a flood or any other kind of natural disaster.
p) Planning schemes should contain flood and stormwater policy that sets out information to be provided in development assessments.
q) Because overland flow paths are primarily conduits for flash floods these must be mapped as part of overall flood risk assessment.

Building

7. The resilience of houses to natural hazards such as windstorms, floods and bushfires can be improved by revising regulations (BCA) and design standards. Revisions to design and construction standards have resulted in post-80s houses being more resilient to windstorms compared to pre-80s houses.
8. Structural upgrading is effective in reducing the vulnerability of pre-80s houses throughout Australia.
9. The provision of building envelope protection against windborne debris will also reduce the vulnerability of post-80s houses, especially in non-cyclonic regions. This is an adaptation strategy that would also be effective for shift in cyclone boundaries or increases in wind loads that result from climate change.
10. Education to improve the house building-process (regulation, design, construction, certification and maintenance) and for all parties (designer, builder, certifier, and owner) will also enhance community resilience.

Insuring

11. That further research be conducted into the contexts and processes informing people's prioritisation in the purchase and maintenance of insurance policies, including their awareness of, and interest in what these policies do and do not cover.

12. That public expectations in relation to insurance be more closely aligned with the insurance reality through clearer insurance industry communications with customers and through government-driven education initiatives.
13. That research to ascertain the likely changes in the costs and availabilities of insurance coverage and subsequent impacts on the built environment be undertaken in light of climate change with direct reference to bushfires and other natural hazards.
14. That mechanisms for providing affordable insurance to low-income earners be further investigated and implemented.
15. That insurance be recognised, explored and implemented as a mechanism for promoting disaster-preparedness as well as recovery with regard to climate change adaptation.
16. That insurance be recognised and implemented as acting in concert with other mechanisms such as building codes and land use planning regulation.
17. That a review be undertaken into the factors that impact on insurer activity in encouraging and incentivising climate change adaptation and associated risk mitigation measures.
18. That further research be conducted into public prioritisations regarding climate change adaptation and risk mitigation and related mechanisms
19. That government in collaboration with insurers investigate and implement appropriate climate change adaptation mechanisms such as the development of long-term insurance contracts.
20. That research be undertaken to identify, develop and implement instances of innovation regarding the role of insurance in climate change adaptation and risk mitigation.
21. That research assess how insurance best operates as a climate change adaptation mechanism across individual, household, business and community levels.
22. That government interventions into the insurance industry and insurance markets reconcile existing tensions between government and individual responsibility for risk.
23. That non-regulatory and regulatory approaches to the use of insurance in climate change adaptation and risk mitigation be investigated and implemented.
24. That more effective linkages be fostered between the various, relevant agencies and organisations across public and private sectors, including those in the insurance and reinsurance industries.
25. That state and federal governments demonstrate greater leadership on the investigation and implementation of the role of insurance in climate change adaptation.
26. That comprehensive hazard data sets and risk maps be made available to all stakeholders and compliance implemented.

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2. Recovery from Disaster: Resilience, Adaptability and Perceptions of Climate Change

Executive Summary

Disasters disrupt multiple levels of socio-cultural systems in which lives are embedded. In this study, we used Bronfenbrenner's bioecological systems theory to analyse individual and, by proxy, community resilience. Bronfenbrenner's theory provided a comprehensive framework to evaluate the interacting factors that support resilience across different disaster sites and communities. While Bronfenbrenner's theory has been used extensively, we believe that this is the first time it has been used to model disaster resilience.

Our study focused on four disaster-impacted communities: Beechworth and Bendigo in Victoria and Ingham and Innisfail in Queensland. Each site had experienced a different disaster, namely bushfire, drought, flood and cyclone respectively, 1 year, 8 years, 1 year and 5 years previously.

The aims of the project were to:

1) Identify private and public sector groups' beliefs, behaviours and policies that have supported community resilience to a disaster event;

2) Examine the commonalities of the experience for the four types of disaster and the possible impact of their respective intensities, duration and perceived frequency, as well as how well communities cope with the unexpected;

3) Assess the degree of community resilience in each of four study sites in disaster affected areas; and

4) Construct a model with findings to help implement appropriate and equitable emergency management policies and mitigation strategies for climate change events.

A key hypothesis underpinning our research was that individuals remaining in the disaster impacted communities were likely to be resilient to disaster. A step-wise mixed-methods research design was adopted. Demographic data were used to profile communities for comparisons, determine representativeness of samples and to compare communities, pre and post disaster, for disaster impacts. Individual and group interviews were conducted with 186 people from the four communities to identify factors that helped individuals prepare, respond and recover from the natural disaster and to identify what supported disaster resilience. In addition, we explored attitudes to the notion of climate change. Surveys, informed by the interview data and the literature were then constructed and used on a sample of 1,008 people from the four sites in order to generalize results from the interviews. Rasch analyses were used to quantify the factors identified; these were then used in a structural equation model (SEM) to assess Bronfenbrenner's theory of influences upon disaster resilience.

Structural equation modelling provided identification of the links between the various factors shown to support resilience. Our analyses were used to assess levels of individual resilience to, and preparedness for, disaster events by site and across all four sites.

Results of our SEMs showed that disaster resilience across all sites was both an individual trait and a process facilitated by adaptability and community factors. By far the strongest direct pathways to resilience arose from a sense of place and adaptability. Indirect influences upon resilience, mediated by adaptability, were financial capacity, family and friends' support, communications about the natural hazard and climate change knowledge and trust in climate change communication

sources. The sources of support for individual and community resilience are distributed across Bronfenbrenner's ecosystem levels with a varying degree of importance.

Across all research sites generic factors that enhance disaster resilience are microsystem support; a sense of place; financial capacity and climate change knowledge; and trust for climate change communications.

We also demonstrated that communications, council disaster preparedness and response to the disaster, and local community group responses to the disaster supported community resilience, as indicated by individual's endorsement of community recovery and council function. These were most positive for Beechworth and Ingham, least positive for Bendigo.

Household preparedness is highly predicted by financial capacity, and by adaptability and resilience. As a result, lack of financial capacity renders individuals and households vulnerable to disasters. Financial support available to individuals from state and federal agencies and charity groups were not directly linked to individual resilience, but rather linked to potentially leaving the community. Therefore, we surmise that these factors were both individual and community resilience supports since without them individuals would have left the community, leaving it depleted in numbers and, in line with our hypothesis, rendering the community less resilient. Individual safety and wellbeing is likely to be a strong contributor to community resilience and recovery. More research needs to be conducted to clarify this.

The demographic profiles of each of the four communities comparing pre disaster community data with post-disaster community data supported our hypothesis that individuals remaining in the community were likely to be resilient and that these communities were resilient to disaster since they had a stable population despite the impact of disasters. However, for the individuals who endorsed leaving the community, whose resilience was not supported by the other community factors, the financial support from state and federal bodies sustained them, helped them stay in the community, thus possibly increasing their disaster resilience.

It is important to note that the relationship between climate change views and disaster experience is very complex and needs further exploration, particularly in rural and regional areas of Australia.

Based on our findings, we make the following recommendations to emergency managers and policy makers:

• Unique community characteristics make every community different in the levels of individuals' resilience to disasters and the factors supporting resilience. Policies must be tailored to the needs of each community. These must identify and provided targeted assistance to the most vulnerable. Our research identified that those who were economically marginalised, older in age (over 55) and less well educated were at risk.

• Accurate and timely communications in advance are critical to preparedness and must be a core component of emergency management. One important and related finding from our research was that prior experience sometimes resulted in an unhelpful "wait and see" attitude which was detrimental to preparedness. Positive role models for disaster preparedness can increase individuals' disaster resilience through powerful social learning so their promotion should be a component of disaster policies and initiatives.

• As preparedness was predicted by financial capacity, policies and programs need to provide specific assistance to those whose financial circumstances prevent them

from adequately preparing for disasters. This may take the form of subsidised insurance to diminish dependence upon charity assistance for disasters.
• Prompt restoration of infrastructure and essential services were critical to community and individual resilience. Planning to strengthen these services, by examining system weakness and vulnerabilities, should be a priority.
• Policies and initiatives must also recognise the importance of social connectedness in building community resilience, by fostering stronger connections between neighbours and increasing a community's sense of place though local community programs.
• Education needs to play a prominent role in promoting adaptation to climate change and, as a corollary, enhancing disaster resilience. Our results showed gaps in awareness and understanding of climate change in the community, which will prevent appropriate adaptation to climate change risks, as well as significant mistrust of sources of climate change information. We suggest that schools are the most appropriate forum for climate change information, with up to date evidence-based information about the risks and responses needed for climate change. There is a corresponding need to ensure that current and future teachers are aware of climate change science by developing appropriate training in this regard to correct gaps in their knowledge and understanding.

Recommendations for emergency management and local government policies

1. National policy of building resilient communities is shown by this research to contribute to adaptive capacity. Resilient communities will be able to adapt to the changes and stresses of climate change.
2. Establish and enhance local support networks, especially through voluntary organisations (e.g. check on your neighbour's scheme, neighbourhood action groups).
3. Local government and social welfare agencies must identify vulnerable groups that do not have microsystem support and put strategies into place to ensure they are given assistance during a disaster.
4. Ensure adequate local health services are available so people do not have to move.
5. Local government and social welfare agencies need to run health and wellbeing education classes in relation to disaster preparedness, as well as campaigns that are run by emergency managers.
6. Use all media, including social media, for education on preparedness and warnings.
7. Develop appropriate plans for low socioeconomic groups who are unable to insure their properties. Acknowledge individuals in the community with prior experience and use them as mentors, local educators and leaders. This responsibility falls on local government, community and cultural organisations and NGOs.
8. Ensure councils are highly involved in disaster preparedness, response and recovery processes, and engage the community in such processes.
9. Support community events that build sense of place and support social networks.
10. Undertake further research to examine better approaches to provide financial support in times of natural disasters for those who are vulnerable.

The influence of disaster experiences on perceptions of climate change is complex and needs further research

Our results show a range of climate change attitudes in relation to disaster resilience. People can be prepared for disasters and adaptable without believing that climate change is a concern. This was highlighted in the Ingham case study where residents were the least concerned about climate change (as found in our Rasch measures of the construct), but nevertheless showed a high level of resilience to floods. Other studies confirm this anomaly in relation to flooding in the UK where experiences heightened awareness of flood risks but did not change perceptions or actions regarding climate change (Whitmarsh 2008). Flood victims in that study were more likely to identify local causes such as lack of maintenance of water courses. The interviewees in Beechworth identified local issues such as loss of forestry staff and closer settlement as increasing fire risk rather than climate change. Qualitatively, our results revealed uncertainty amongst interviewees regarding any causal relationship between disasters and climate change. These findings also reflect reluctance on the part of interviewees to openly discuss matters which they consider to be of a political nature, something that survey respondents noted in their extended answers in the surveys. Such perceptions about climate change are noted elsewhere in the literature (Doherty and Clayton 2011).

Our quantitative results, however, showed that more than 50% of respondents across all sites were concerned about climate change and believed it was influenced by human activities. Moreover, about 40% of respondents felt they knew a lot about climate change and trusted climate change communications. This concurs with other recent studies conducted in Australia. Reser et al. (2012) found that for Australian respondents, the extent of prior direct experience with extreme weather events and natural disasters showed consistent but modest positive relationships with climate change-related variables such as belief, concern, psychological adaptation, psychological distress, and behavioural engagement. For example, 71% of Australian respondents thought that climate change was influencing the frequency and intensity of extreme weather events. They concluded that “public risk perceptions and understandings of the threat of climate change in Australia appear to be strongly influenced and informed by direct and indirect experience with both acute and chronic natural disasters in the Australian environment” (Reser et al. 2012, p.150).

A review of literature on Australian’s views of climate change by the CSIRO in 2011 reported that belief in climate change and its anthropogenic drivers has waned in recent years reflecting trends in other Western countries (Leviston et al. 2011), possibly due to the current political nature of climate action decisions, although Reser et al. (2012) pointed out that CSIRO survey instruments tended to polarise positions on causes of climate change. However, Reser et al. (2012) reported that belief and acceptance of climate change among respondents was very high; acceptance including acknowledgment of some level of human causality for the vast majority of respondents. Public concern levels with respect to the threat and perceived impacts of climate change were also very high.

As in our results, other studies also show that people from more closely settled areas with higher levels of education, women and younger generations are more likely to be concerned about climate change (Leviston et al. 2011; Reser et al. 2012) although the gap may be narrowing between rural and urban people (Reser et al. 2012). There was overwhelming evidence in our study that respondents did not trust the government or media with information about climate change but were more inclined to believe scientists. This result parallels the findings of Reser et al. (2012) on public trust in these sources.

In some cases (e.g. Innisfail and Bendigo) those that are more aware or concerned about climate change tend to be more inclined to leave the area. This may indicate that climate change knowledge can generate a certain level of fear and lack of confidence. Reser et al. (2012) also found that in addition to the 88% of respondents reporting some level of concern about climate change, 20% of Australian respondents reported feeling, at times, appreciable distress at the prospect and implications of climate change and its consequences. However Reser et al. (2012, p.15) concluded that "experienced psychological distress in response to the climate change threat was found to be the strongest predictor of psychological adaptation to climate change in the comprehensive structural equation modelling analyses undertaken."

In conclusion, our results confirm the variable nature of links between climate change perceptions and disaster experiences reported by other authors (e.g. Spence et al. 2011; Doherty and Clayton 2011). While our results suggest that a lack of belief or knowledge about climate change does not prevent an individual from being prepared for or resilient to a natural disaster, the lack of belief or knowledge about climate change may present a more significant concern for climate change mitigation or adaptation behaviours. Clearly, natural disasters are more threatening on an immediate timeframe and are directly observable by individuals whereas the changes imposed by climate change are more gradual and not as easily perceived. As a result, those individuals who are prepared for or resilient to a natural disaster but display little belief or knowledge about climate change may not be so able to act for the more nuanced changes that climate change will entail. Further research is required to explore these issues.

On the whole, from our study we cannot conclude that experiencing disasters at present will necessarily change people's views on climate change, particularly in older generations (i.e. above 50 years) and those from more remote, rural areas. This may change in the future as younger generations who appear to be more concerned about climate change, experience future disasters and learn to adapt. Future longitudinal research is needed to establish the relationships between climate change attitudes and disasters and how they alter over time.

Recommendations for emergency managers, state and commonwealth policy and research priorities

1. Engage people in disaster preparedness strategies that do not focus on climate change messages that may induce further scepticism, apathy or fear (i.e. keep climate change and disaster messages separate).
2. Any messages regarding climate change need to be situated within the concept of future global sustainability and the individuals' areas of concern and interest (Lynam, Leitch, Ryan and Gouskos 2012); they must be positive and constructive (i.e. What can I do?) and preferably come from local sources or the scientific community, rather than the media or state/federal governments.
3. Focus on disaster education for younger generations, building on their receptivity and their need to be resilient to future scenarios of climate change. This will also necessitate that practicing teachers and pre-service teachers are given instruction and professional development to bridge identified knowledge gaps in climate change science (Boon 2010).
4. Use social networks and local community leaders and those who have recovered from disaster as positive role models to engage residents (particularly newcomers) in disaster mitigation strategies and climate change adaptation strategies. Social

modelling is a powerful learning tool that is known to promote behaviour change (Bandura 1977).
5. Monitor and evaluate longitudinal changes in attitudes to disaster risk and climate change.

Every disaster event is different in terms of individual and community response and recovery as shown through Bronfenbrenner's model

Rapid onset events such as bushfires and cyclones generate an immediate emergency management response, as well as mandated mitigation strategies to build individual and community resilience (Bushnell and Cottrell 2007; Erikson and Gill 2007; Stelling et al. 2010). Slow onset events such as drought and flooding may allow an individual or community the opportunity to more readily adapt to impacts as the event unfolds (Alston and Witney-Soanes 2008; McEachern 2009). Nelson et al. (2007) also maintain adaptive capacity is specific to (a) the length and frequency of perturbations, (b) the spatial scale at which perturbations occur, and (c) the organisational scale of focus.

Our results confirm that individuals perceived themselves to be less resilient in the face of Cyclone Larry at Innisfail and the Black Saturday Bushfires around Beechworth (both of which were catastrophic events) than the Ingham floods or Bendigo drought. These communities felt less prepared than those in Ingham, indicating a level of vulnerability which may take time to overcome. Communications were equally important with radio, TV and local volunteer organisations playing a key role in keeping people informed. However there were distinct differences between the cyclone and fire events in the level of physical impact sustained and macrosystem services offered. Innisfail residents were more heavily impacted and received greater assistance than Beechworth residents. Hence it is not only the type of disaster but the intensity and length of impact that determines resilience variables (Nelson et al. 2007; Field et al. 2012a).

Rapid onset disasters can sometimes galvanize communities and create community cohesion during and immediately after events (Carroll et al. 2011; Sharp et al. 2009). However, such events can also create social conflict and loss of trust arising from dissatisfaction with agency decisions and actions, some of which can persist several years after the event (Carroll et al. 2011). The interviews with key informants in our research revealed some community criticism of services and distribution of grants in the Beechworth and Ingham case studies. However, overall most respondents were appreciative of government efforts during and after the disasters. The level of confidence in community preparedness for future disasters was greater for neighbourhood preparedness than government preparedness in all cases but Innisfail (most likely due to the substantial Commonwealth support) indicating a general lack of trust in exosystem and macrosystem services regardless of the type of disaster.

The Bendigo qualitative interviewees did not believe that residents had grown more resilient or adaptable as a result of the drought. In the SEM modelling, only 8% of adaptability in the Bendigo sample was explained by the model indicating that there were variables at play in predicting adaptability levels other than the microsystem, communications, climate change attitudes, prior experience or financial capacity. Notwithstanding this, 36% of their resilience was accounted for by the model and predicted by their sense of place and their adaptability, which shows the critical role that adaptability and a sense of connectedness to a community plays in supporting individual resilience. The qualitative interviewees believed prolonged mental health

issues and relationship breakdowns can worsen over time unless counselling services are provided. The data to support these assertions are conflicting, however and further research needs to conducted to confirm such beliefs. Bendigo respondents felt they were not prepared for drought (though they scored higher than Beechworth respondents on preparedness according to the Rasch measures) and were the least supported by friends/family, community services, communications and local government. Assistance from the State and Commonwealth Governments was also rated poorly. The drought was thought to severely test individual resilience over a long period of time but this did not appear to erode community resilience as evidenced by the demographic profile. It is possible that although slow onset disasters like drought allow more time for adaptation practices, people are less likely to seek help and join community networks due to fatigue and potential depression from the relentless conditions. This might also illustrate undesirable aspects of resilience, those that endure impact, rather than those that help to cope and adapt to change. Hence, efforts need to be made to build and maintain community networks during times of drought, and to focus on the wellbeing of town residents not just farmers. More attention needs to be paid to the effects of slow onset disasters on individuals and communities. Prior experience was a predictor of household preparedness in Beechworth, Innisfail and Ingham, a predictor of adaptability in Innisfail and Beechworth, and a direct predictor of resilience in Bendigo. The importance of prior experience was repeatedly endorsed in the qualitative interviews, illustrated through people's stories of past experiences and what they had learnt. Bihari and Ryan (2012) similarly found past experience was crucial in encouraging residents to undertake wildfire preparedness and hazard mitigation strategies in the USA. However, our quantitative results showed that prior experience does not necessarily lead to the same behaviours in all people.

Other researchers have claimed that repeated disaster experiences can lead to complacency (Cutter et al. 2008; Paton and Johnston 2001) and that in some communities there has been no influence of prior experience on hazard mitigation decisions (e.g. Paveglio et al. 2011). Our results show that prior experience is unpredictable in its influence upon disaster resilience, a finding that is very important for local governments and emergency managers to note when preparing communities for future natural hazards.

Recommendations for emergency managers and state and commonwealth agency policies

1. Response and recovery services need to be flexible to cater for different disaster events.
2. There is a need to encourage two levels of preparedness- one for catastrophic events and one for less severe events.
3. Government support services need to enhance services for rapid and for slow onset events.
4. There is a need to build and maintain community networks during times of drought for both town residents and farmers, newcomers and the more vulnerable groups of citizens.
5. Mental health and the physical wellbeing of those impacted needs to be monitored therefore ensure that there are sufficient health centres and affordable medical care for those at risk so that the rural health disadvantages do not persist (Hanna, Bell and Woodruff 2011).

6. State government agencies and NGOs need to provide ongoing counselling services during and for the longer term after the events.

Every community is different in its levels of individual resilience to disasters and influential variables supporting resilience as shown through Bronfenbrenner's model

This research has shown just how different communities can be in terms of how they respond to and recover from disasters (Adger 2000). The location, size and demographics of towns are key variables in determining resilience to disasters. Although the towns of Innisfail, Ingham and Beechworth were roughly similar in population size, residents were different in terms of ethnic background, level of education, income and types of businesses. These variables influenced their responses to the survey (e.g. preparedness items, microsystem support and negatives, sense of place and climate change perceptions). For example, the lower income level of Innisfail residents was linked to lower scores for financial preparedness and having insurance. The higher education levels of Beechworth corresponded to higher scores for climate change knowledge and concern. The agricultural industries of Innisfail (e.g. the banana industry) and Bendigo (livestock and crops) suffered to a greater extent than Beechworth or Ingham. As explained by Adger (2000) and Zhou et al. (2010), communities that are dependent on a narrow range of natural resources can decrease in terms of community resilience.

The social connectedness also differed between sites regardless of population size. Ingham residents had the strongest microsystem support and sense of place with high scores for evaluation of community preparedness for future events. Innisfail residents were less connected and more dependent on exosystem and macrosystem support. Beechworth residents had a strong sense of place and regard for community services, but were not well connected to microsystem or exosystem support. From the survey it appeared that Bendigo had little community connectedness in relation to drought and felt unsupported by State services but interviewees gave accounts of some state programs, social networks and counselling services. These results confirm the findings in the literature on the importance of social networks and social capital which can affect community resilience to disasters (e.g. Bhari and Ryan 2012; Beall 2001; Schafft and Brown 2000; Berkman 2000; Adams et al. 2002; Fowler and Christakis 2008). Clearly, climate change adaptation measures need to address social development for different community types and different contexts (Bardsley and Wiseman 2012; Bardsely and Rogers 2011).

There were also significant differences between the two States. It is interesting that the two Queensland communities felt more supported by State and local government services than Victorian people. They had stronger ratings for microsystem connections, communications and exosystem support as a result of suffering greater property damage and infrastructure loss. As a result, they expressed more confidence in being prepared for future disaster events.

Recommendations for emergency managers and policies at local and state government levels

1. Mitigation strategies for disaster risk reduction need to be tailored to each community at a local level. This requires local governments to adapt strategies to the needs and situations of their own communities.

2. The role of local government is CRITICAL in contributing to a sense of place. Local government councils have a primary responsibility to be heavily involved in disaster preparedness, response and recovery efforts, and their efforts will be effective, within resource constraints.
3. State government services should not dominate or overshadow local government or volunteer roles, but should support and guide local efforts and initiatives.
4. The role of state leadership is important in helping people feel that the state government acknowledges their trauma and needs.
5. In large towns like Bendigo, there is a need to create more support networks through local government, community and volunteer organisations.

Individual safety and wellbeing is likely to be a strong contributor to community resilience and recovery

While we were not able to extract demographic data from the 2011 census to confirm the health status of residents in each community after their disaster experience, our quantitative data show that health and wellbeing variables influence an individual's decision to stay or to leave their community. This finding holds for all locations except Beechworth, the community with the highest socioeconomic score in this research.

Indigo shire, where Beechworth is situated, is consistently the highest ranked of the four case study communities, which accords with its "tree change" social trend.

Our analyses revealed that health and wellbeing variables were linked to educational level and age, with those who had completed more years of study less likely to be impacted by heath issues, while those who were older were more likely to have negative health outcomes as a result of the disasters. These findings concur with other research which shows that individuals and communities are differentially exposed and vulnerable based on inequalities of wealth and education, disability, and health status, as well as gender, age, class, and other social and cultural characteristics (Field et al. 2012a).

It is not suggested that negative health outcomes of community members are necessarily linked to lowered community disaster resilience. However, the effect on community resilience is dependent upon mediating variables such as the extent of economic and infrastructure losses that might result from a natural hazard and the initial conditions and level of preparedness of each community. Larger communities might be better able to withstand the impact from natural hazards as they could have stronger and more extensive infrastructure. Community infrastructure which is extensive and well developed can absorb a greater number of individual casualties or health impacts without the need for outside support. It is an issue of scale; the ratio of numbers of individuals affected in relation to community capacity (Field et al. 2012a).

Of relevance are not only direct losses due to a disaster, i.e. the physical impacts of disasters on the lives and health of directly affected persons, on homes and on infrastructure (e.g. hospitals, schools), which are more easily measured (World Bank and UN 2010), but also the indirect impacts of such losses. These include the gradual deterioration of individuals' health and wellbeing, with the mental health impact from extreme events being substantial (Neria et al. 2008; Berry et al. 2010), long lasting and affecting a large portion of a population (Morrissey and Reser 2007). Long-term mental health impacts are not often adequately monitored but the body of research conducted after natural disasters in the past three decades suggests that the burden of PTSD among persons exposed to disasters is substantial (Neria et al.

2008). A range of other stress-related problems such as grief, depression, anxiety disorders, and drug and alcohol abuse, (Fritze et al. 2008) as were reported in the Ingham and Bendigo interviews have lasting effects, long after the causative event, and as such can have an impact upon community resilience through mediating variables such as economic losses (Rose 2004) and out- migration. Moreover, disasters can significantly disrupt social support networks, and these networks may continue to deteriorate if conditions and services are not restored promptly (Adeola 1999; Kaniasty and Norris 1995) leading to further individual distress and perhaps leaving one's community. These issues illustrate the importance of the ratio of individual health issues in relation to community capacity to absorb and respond to individual needs.

All our results, both quantitative and qualitative, strongly suggest that if either individuals or their family and friends are experiencing health issues or psychological distress then they are more likely to want to leave their communities and move on. If this occurs, unless there is an equivalent number of individuals in-migrating, community resilience to disaster is likely to be eroded. This has been experienced elsewhere in the world as a result of natural disasters (Field et al. 2012a). We propose then that while individual resilience is not a guarantee or direct measure of community resilience, it is supportive of community resilience. If as a result of a natural hazard there are large numbers of casualties in a community, this is likely to severely strain the capacity and infrastructure of the community and its ability to cope *without outside support.*

Therefore, we propose that individual safety and resilience is tantamount to community resilience. Our assertions are supported by the use of Bronfenbrenner's theory to model resilience pathways as discussed below.

Recommendations for support service and recovery policy

Counselling and health support services must be in place during and after a disaster for up to 5 years to assist individuals to rebuild their physical and mental health and thereby their resilience and capacity as community members. These services should be provided by state government agencies and NGOs.

Future directions

The first step towards enhancing community resilience requires an understanding of the community's strengths and vulnerabilities, its physical characteristics (e.g. local infrastructure), local governance (e.g. disaster policies and plans) and social characteristics (e.g. level of community cohesion). Communities reliant on a single economic sector for their livelihood (e.g. tourism, agriculture) are inherently more vulnerable than those with more diversified economies (Cutter et al. 2008). Economic vulnerability is also linked to social vulnerability. Social vulnerability arises from inequality, which in turn affects access to resources and information (Cutter et al. 2008). Indicators of increased vulnerability include: age (i.e. the elderly and the very young), gender (i.e. women are more likely to be vulnerable than men), socioeconomic status (i.e. the poorer members of the community are more vulnerable), populations with special needs (e.g. physically or intellectually disabled groups, homeless people), culturally and linguistically diverse populations, and Indigenous populations (Cutter et al. 2008; Tierney 2006).

It is not surprising that economic support can assist individual and community resilience. What is perhaps more interesting is the role that microsystem support plays in supporting resilience to disaster. This is why initiatives designed to increase

a sense of place, for example, by building stronger connections between neighbours, are important and need to have as much emphasis as those that focus on rebuilding the physical and economic infrastructure of a community.
Rose (2004) advocates looking to post-disaster conditions and responses which are aimed to reduce potential losses through mitigation activities. This view is in line with The National Strategy for Disaster Resilience (COAG 2009) which was adopted by COAG on 13 February 2011 and which also proposes a sustained drive to increase community resilience. Recent consensus among many disaster researchers lead to the conclusion that the most effective adaptation and disaster risk reduction actions are those that offer development benefits in the relatively near term, as well as reductions in vulnerability over the longer term (Field et al. 2012a).
We have observed such initiatives in Ingham and Beechworth: the restructuring of the council processes and personnel in Ingham to streamline, strengthen and make more efficient the response for future weather related hazards and the building of strategic infrastructure in Beechworth, such as water tanks on private land accessible to CFA trucks and the new Stanley communications tower for better emergency communications. The challenge is to address issues of social welfare, quality of life, infrastructure, and livelihoods, by incorporating a multi-hazards approach into planning and action for disasters in the short term, while using the opportunity of post-disaster recovery and reconstruction to reduce weather and climate-related disaster risks to improve adaptation to climate change in the longer term (Field et al. 2012b).

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3. **Impact of the 2010/11 floods and the factors that inhibit and enable household adaptation strategies**

Executive Summary
The main objective of this research was to identify the factors that inhibit and enable adaptation strategies within flood affected communities. To achieve this, a mixed methods survey was carried out in three case study locations: Brisbane and Emerald, Queensland, and Donald, Victoria. In order to understand the broader story from a local perspective, however, we also investigated people's experience of the flood in terms of response and recovery.
A scoping analysis was undertaken in Brisbane and Emerald in January 2011, immediately following flooding in both these areas, with follow-up field work conducted in Donald and Emerald in August 2011 and four suburbs of Brisbane in September 2011. The suburbs of Chelmer, Graceville, Tennyson, and Rocklea were selected for analysis in Brisbane following discussion with officials at the Queensland Government Department of Communities - Communities, Child Safety, Youth and Families. During these discussions it was suggested that residents within each of these communities represent a variety of demographic groups impacted by the floods.
The two primary levels of information gathering were from: 1) households in flood affected areas and 2) local and state government institutions and authorities that

provide services to the community. Qualitative and quantitative data were collected via face-to-face interviews and questionnaires distributed door-to-door and online.
The survey results provide a great deal of valuable information on the various barriers and opportunities people face in making changes to reduce their vulnerability to flood prior to, during and after an event. The main factors that were identified as either enabling or inhibiting response, recovery and / or adaptation are:
Direct experience - many people stated that the history of flood events, the inconvenience and stress associated with being flooded and the pain and heartache that the floods caused were significant factors driving their desire to reduce their vulnerability.

Outcome expectancy – some respondents revealed desired outcomes such as the need to protect family members, belongings and assets and, a desire to have peace of mind, were positive drivers in changing their behaviour to reduce flood risk. In contrast, others could not comprehend how changes will prevent a disaster occurring from a natural event.

Communication and information - the most widespread series of responses called for more communication and more information prior to and during the flood, which suggests that residents are more willing to adopt reactive strategies rather than proactive measures. Nevertheless, people in Brisbane and Donald felt the warnings were inadequate and they were not sure what to do when they received flood warnings.

Governance and physical protection – respondents perceive that more dams, better control and management of dams and the construction of levees will help to reduce their flood risk. Other governance issues related to planning and development, building regulations and information.

Insurance - in all communities respondents cited the slowness of obtaining insurance payouts as a barrier to recovery. There is a great deal of anger directed towards the attitudes of insurance companies, the quality of the assessment process, and a lack of clarity in relation to what was covered. Many people referred to ‘being held hostage’ by insurance companies with little idea of their personal rights. Moreover, there was little or no immediate support coming from the insurance industry to assist people to make changes to reduce their risk.

Financial restraint and relief assistance - those people who were not covered by insurance are very limited in their capacity to make changes to their homes due to a lack of funds. Compounding the insurance issue was the fact that many people were not eligible to receive financial assistance from sources such as the Premiers Flood Appeal.

Housing: including design / construction, rental properties, builders and guidance - residents felt they had no options to make changes to reduce their future risk due to the structural design of their home and / or the fact that they resided in a rental property. Respondents cited ‘slab-on-ground’ constructions as the main reason for not being able to make changes because raising their home was simply not an option.

Health and wellbeing - health impacts, both physical and mental, were identified, leading to problems in recovery. Interestingly, those respondents from Brisbane and Emerald who were mid-high household income earners ($100,000-$150,000) indicated more negative impacts in terms of wellbeing compared to those in the low and low-mid income brackets.

Relocation – while some respondents in Brisbane and Emerald suggested that they would consider relocating to a safe location, the dominant response is that people do not consider that it is likely they will move, especially in Donald. This is as one would expect, or hypothesise. It reflects resilience and community strengths.

Volunteers and community initiatives - positive and negative aspects of volunteerism were cited. It was recognised that people felt a need to volunteer, in order to do something, but there were problems of a lack of control and some inappropriate assistance. A strong impression from the case study responses was the willingness of residents to get on with their own recovery and to make improvements to reduce the flood risk in the future. This was particularly evident in Donald where local residents established the Donald Community Flood Recovery Group.

A dominant finding from the study is that a greater number of constraints inhibit adaptation than factors that enable adaptive change and behaviour. However, balanced against the criticisms and fault identification the study showed resilient communities getting on with their lives and largely driving recovery themselves. The extensive qualitative comments and opinions garnered from interviews and questionnaires reflect high levels of acceptance of catastrophe and stoic endurance. This does not necessarily translate to adaptation to future events and a changed hazard landscape, but it does reflect strong resilience in the community. That resilience can be built on to advance adaptive behaviour, but it needs to be nurtured and facilitated by external agencies.

Synthesis and Policy Implications Factors inhibiting and enabling response, recovery and adaptation in flood-prone communities

The main objective of this research was to identify the factors that inhibit and enable adaptation strategies within flood affected communities. To achieve this, a mixed methods survey was carried out in three case study locations: Brisbane and Emerald, Queensland, and Donald, Victoria. In order to understand the broader story from a local perspective, however, we also investigated people's experience of the flood in terms of response and recovery. As a result, the survey results provide a great deal of valuable information on the various barriers people face in making changes to reduce their vulnerability to flood prior to, during and after an event. Similarly, various opportunities to reduce vulnerability are also evident. In the next sections, we highlight each of the factors that inhibit and enable response, recovery and adaptation and where appropriate, these are linked to possible responses (i.e. policy initiatives / changes, community actions, etc).

Direct experience

Direct experience is a key factor driving change within flood affected communities with many people stating that the history of flood events, the inconvenience and stress associated with being flooded and the pain and heartache that the floods caused were significant factors driving their desire to reduce their vulnerability.

However, people can become complacent if their experience is not recent or it did not impact them personally. In this respect, it is essential that agencies responsible for reducing flood risk should ensure that personal stories are captured and promulgated via websites, brochures, documentaries, etc. It is critical that these events are burned into the collective memory now because they will rapidly fade as other more salient issues take priority. One method of achieving this is through recording individuals' stories. Video interviewing is a powerful method of relaying people's experience of disaster and is useful for developing disaster risk reduction education material (Bird et al., 2011; Dudley et al., 2009, Kurita et al., 2006). Many of these initiatives have occurred following recent events (for example, see http://open.abc.net.au/projects/aftermath-08vh8ac/collections/aftermath-features-85vg9us) and such footage can be used to increase awareness during commemorative events (i.e. anniversary of the event). In a similar effort but at a local level, several Emerald residents got together to produce a narrative of people's experience of the flood throughout the Central Highlands Regional Council area entitled 'With a little help' (http://www.judigraphics.com/withalittlehelp.htm). The money from this book was going to the local neighbourhood centre for distribution to flood affected residents.

Outcome expectancy

Another key factor driving adaptation is the need to protect family members, belongings and assets; and, a desire to have peace of mind. That is, behavioural change will produce desired outcomes (i.e. evacuating to a safe location will ensure family members are safe or sandbagging house will protect assets). This is often referred to as positive outcome expectancy. On the other hand, community members had negative outcome expectancy when they simply could not fathom how one could prevent nature from occurring and believed that it was too hard: "*I'm not God*".

There were also issues associated with people wanting to replace for 'better' instead of 'more resilient' and this was possibly exacerbated by situations where residents witnessed businesses, councils and governments building back the same. Perhaps residents did not understand that replacing carpet with tiles or elevating air conditioning units are simple actions that can reduce vulnerability and were within their capabilities.

Also, people are often reluctant to admit they have been flooded in fear of depreciating property values. However, relevant authorities together with local governments and communities are undertaking flood surveys in order to identify those areas at greatest risk. It would therefore be more conducive for residents to ensure their houses are more resilient to flood as they will be officially identified as being located in a known flood-prone area. Some justified their choice of replacing for better with the belief that they had to make their home 'attractive' in order to increase its value. These results suggest that an educational campaign is needed to demonstrate to property owners that greater resiliency is indeed a form of 'better' and that attributes of resiliency can bring with them increased status and higher property prices.

Communication and information

The most widespread series of responses called for more communication and more information prior to and during the flood. While it is understandable that people want to be informed about potential flooding and receive adequate and timely warning advice when flooding is imminent, this result suggests that residents are more willing to adopt reactive strategies rather than proactive measures. This is particularly evident when considering that although many residents recognise that a flood is

likely to occur within the next year in Brisbane and Emerald, most have not, or do not, intend to make changes.

People in Brisbane and Donald felt the warnings were inadequate, but more importantly people were not sure what to do when they received flood warnings. The criticism was that the warnings were uninformative and did not provide location specific advice. This was particularly evident in Donald, where there is a definite need for better flood gauges and better flood response plans, ensuring that someone can take the lead role of providing advice to residents in the absence of the mayor. In order to be effective, this leadership role must be filled by a trusted person from within the community, such as the chairperson of the Donald Community Flood Recovery Group.

In Emerald, good leadership was apparent with the council providing regular flood updates to residents via sms and phone calls to landlines. Moreover, ABC radio was onsite at the council chambers where they attended all meetings relating to the flood. This collaborative effort ensured that the majority of the local population were well informed prior to and during the event. The experience of the 2008 flood contributed to the council's response in 2010 but we should also note that Emerald was one of the first communities to be flooded and therefore media and government resources were readily available.

After the floods had receded, the need for communication and information continued, specifically in relation to recovery and reconstruction - people needed to know what to do, where to go to get information, how to implement changes to reduce vulnerability, and how to deal with insurance companies. This was particularly evident in Brisbane and Donald. In comparison, the Emerald community was making a collaborative and rigorous approach to support and recovery.

Governance and physical protection

Governance issues related to planning and development, building regulations and information. A lack of SES and Council presence was specifically cited in Brisbane and Donald. Many people regard the SES as an arm of government, such that it is their right to receive help and service. While this is obviously an unreasonable expectation, it is clear from this study (and from many other post disaster studies) that more information about the voluntary nature of the SES and its limited capacity needs to be made available.

There were calls for both more dams, and for better control and management of existing dams. Some people have also demanded more levees, walls and barriers. A few individual households have adapted to future flood threats by constructing their own barriers and drains. This is indicative of strong resilience that may need to be monitored to avoid unintended impacts, such as flooding neighbour's properties. However, many viewed this response as problematic, particularly in Donald, as council regulations prevented them from building such structures.

Many residents also called for better drainage, specifically creek drainage controls and backflow controls. Oxley Creek in Brisbane and drainage adjacent to the railway line in Emerald are targeted. A lack of sandbags was also cited in each location.

Overall, it is clear that good leadership is essential in times of crisis. In Emerald, the mayor, council and NGOs provided good leadership which helped the community respond and recover. However, good leadership was not available in Donald or Brisbane and as a result, response and recovery has been poor. One form of good leadership which has assisted some with recovery occurred when the Brisbane City Council instated the Temporary Local Planning Instrument (TLPI) 01/11 as an interim measure to change flood levels and standards and rebuilding could occur without the

need for a development application. In Donald, however, residents and council officials were sceptical about recovery in Victoria due to the slow process of enforcing changes in policy with an estimated period of two years. It is therefore questionable as to whether households and businesses will make changes to reduce their vulnerability when new policy is instated because other more salient issues might be more important at the time, particularly from a financial respect.

Insurance

People were impatient to rebuild and get back to normal, but in all places respondents cited the slowness of obtaining insurance approval and payouts as a barrier to recovery. There is a great deal of anger directed towards the attitudes of insurance companies, the quality of the assessment process, and a lack of clarity in relation to what was covered. Many people referred to 'being held hostage' by insurance companies with little idea of their personal rights. For example, several stated that they were uncertain whether or not they could start clearing and cleaning their premises before the insurance assessors had reviewed their case. Residents were also hesitant to book tradespeople to undertake repairs until the outcome of their claims were known, and for some, this was an ongoing battle.

Moreover, there was little or no immediate support coming from the insurance industry to assist people to make changes to reduce their risk. The survey revealed a few cases where insurance companies had rewarded their clients with coverage (or reduced premiums) following improvements that they had made to reduce their flood risk. One example of this was a house that was raised following the 2008 flood in Emerald. Prior to this, these residents were refused insurance cover for flood since they lived adjacent to the Nogoa River. However, after raising their home, they were able to negotiate full coverage with their insurer.

It appears logical given the cost of the 2010/11 flood disasters in Australia that we as a community adopt a proactive approach in reducing hazard risk. This includes insurance companies supporting household changes to reduce future risk rather than insisting they'll only pay out claims if people build back the same. People are dependent on insurance. They must be encouraged to reduce their risk at the household level to ensure less damage during future events. This will equal lower payouts for the insurance companies and more insurance options for residents.

Partly in response to the insurance issues that arose during the 2010/11 summer floods in Queensland and Victoria (this work had been ongoing for several years), the Insurance Council of Australia released a ten point plan that advocates government policy and industry initiatives that support the development of a more effective and sustainable response to disasters. These are: standard definition for flood; improved disclosure; provision of adequate flood data; removal of insurance taxes; improved land-use planning; improve building standards; improve community infrastructure; education and financial literacy campaign; measure effectiveness of disaster relief payments; and, better advice to consumers (see http://www.floodcommission.qld.gov.au/__data/assets/file/0005/6494/Insurance_Council_of_Australia_2.pdf for details).

Financial restraint and relief assistance

Obviously, those people who were not covered by insurance are very limited in their capacity to make changes to their homes due to a lack of funds. Compounding the insurance issue was the fact that many people were not eligible to receive financial assistance from sources such as the Premiers Flood Appeal. While such funding provided much needed assistance to many families, these strategies can be detrimental to a community's recovery during future events as they instil an

expectation within the community that relief payments will be available during future events. Two factors which may contribute to the likelihood that this scale of funding will not be available in future are: 1) many people stated that they would be reluctant to donate in the future particularly if large-scale hazardous events occur more frequently and 2) governments cannot afford to continually bale communities out when disasters occur.

Many residents also thought that they should wait for the outcome of the insurance claim before applying for financial assistance. However, this was problematic since many of the options for financial assistance had time limits which often expired before residents had received a response from their insurance company.

Housing – including design / construction of home, rental properties, lack of housing, builders and guidance

In many cases, residents felt they had no options to make changes to reduce their future risk due to the structural design of their home and / or the fact that they resided in a rental property. Respondents cited 'slab-on-ground' constructions as the main reason for not being able to make changes because raising their home was simply not an option. Understandably, respondents questioned why such constructions were still being developed in flood-prone areas. If developments on floodplains are to continue we must be sensible about the design of homes and legislate against building slab-on-ground constructions.

On top of the slowness of insurance decisions, households were also hampered by a lack of guidance for appropriate reconstruction, as well as a lack of builders and tradesmen. This situation was further exacerbated by an existing housing shortage in Emerald.

Since this study was undertaken, the Queensland Government through the Queensland Reconstruction Authority have assembled information brochures entitled 'Planning for stronger, more resilient floodplains', in which they quote "The traditional 'Queenslander' style home was designed to allow the cool breezes to circulate through the house in the hot summer and let flood waters flow underneath" (Queensland Reconstruction Authority, 2011; p. 14).

Health and wellbeing

Health impacts, both physical and mental, were identified, leading to problems in recovery. Interestingly, those respondents from Brisbane and Emerald who were mid-high household income earners ($100-$150,000) indicated more negative impacts in terms of wellbeing compared to those in the low and low-mid income brackets. Perhaps they had more to lose, choosing to purchase a house in an 'ideal' location but unable to afford the high insurance premiums. In many cases, these residents thought they were insured but found out that they were underinsured or not fully insured and they were also not eligible for financial relief assistance from government or NGOs.

A flood recovery centre in Brisbane reported a significant increase in people visiting the centre when it rains, as people would return to somewhere they know is safe during times of uncertainty. Officials also noted a reluctance of people to come forward and ask for assistance, particularly in Emerald, because they were too proud to do so, or did not believe that they were the type of people who accessed help from NGOs such as the Salvation Army. In this instance, community groups and networks play an extremely important role in supporting residents who would not necessarily seek assistance on their own accord.

Relocation

During the study, the researchers found places to be empty or abandoned in Brisbane. Many people had to leave following the floods, and as was seen in the Queensland 2008 flood surveys, large numbers of people did not return to areas that had been flooded, although new people have subsequently moved in. This was also the experience after the 1974 floods in Brisbane, where dam construction encouraged a sense of complacency that resulted in extensive new and re-developments in areas that had been flooded.

The household questionnaire asked people about their intentions to relocate to a flood safe location and identified significant proportions of households in Brisbane and Emerald who are doing this or who would consider relocation in the future. This directly relates to the retreat policy option which will require significant local government intervention in the future. In looking at just those who expressed a high likelihood of relocating to a flood safe location, there is a distinct socio-economic and demographic pattern: young adult to middle aged, middle range household income, vocationally qualified, couples with children. This is middle Australia. This response represents the ordinary average residents, and is consequently a highly significant indicator. It is of course, only an indicator, because the numbers are small, but the 2008 Queensland flood study showed a similar pattern, and other flood and cyclone impact studies (research in progress) are returning congruent patterns.

However, the dominant response is that people do not consider that it is likely they will move, especially in Donald. This is as one would expect, or hypothesise. It reflects resilience and community strengths. 88

Volunteers and community initiatives

Positive and negative aspects of volunteerism were cited. It was recognised that people felt a need to volunteer, in order to do something, but there were problems of a lack of control and some inappropriate assistance. However, there are many good examples of community volunteer groups that have sprung-up as disasters strike, such as the Farmy Army and the Student Volunteer Army, (see www.sva.org.nz for details), which developed in response to the Canterbury earthquakes in New Zealand. These groups are still actively involved in recovery efforts and it is important to maintain this motivation during quiescent periods in order to initiate a rapid response when the community is faced with peril. An example that arose in response to the flood disasters in Queensland and Victoria were the community Facebook groups and they are still active today (see Bird et al., 2012 for details).

At the local level, these initiatives could involve local sporting clubs such as football and netball, or the local TAFE or university. This is particularly important in the smaller country towns where SES units are simply not available or are overwhelmed with calls for assistance. Moreover, sporting clubs are the backbone of small country towns in terms of youth. They can not only provide a valuable resource for response and recovery efforts but also provide an outlet and support service to those members impacted by the hazardous event, whether it is flood, fire or drought, etc.

Natural hazards tend to be more prevalent during the summer months when many people are on vacation and away from home. Therefore, a registered person / friend network might prove valuable. This would involve giving a trusted person access to your home in order to make changes, such as raising furniture or sandbagging, if you are away when a flood is likely to occur. This is particularly important for communities like Emerald where people move in and out on a regular basis and therefore do not necessarily have a good reliable support network within the community. Alternatively, a registered support network could be initiated within agricultural and / or mining companies to provide support for their employees, who are quite often residing within the community for a relatively short time. A good example of a community support network, called “The Go List” was set up in Emerald, Victoria as an online resource to provide support for people living in bushfire-prone communities (see www.thegolist.org.au for details).

The support network could also aid the elderly / disabled are who might need assistance during a hazardous event to either move heavy items or simply to evacuate. This is an important aspect of response and recovery. Moreover, a strong impact of flood response and evacuation fell on the community, especially friends and relatives, rather than institutions and organisations.

A strong impression from the case study responses was the willingness of residents to get on with their own recovery and to make improvements to reduce the flood risk in the future. This was particularly evident in Donald where local residents established the Donald Community Flood Recovery Group and applied for, and received $135,000, in government funding to undertake a flood survey.

Further policy implications of the 2011 Floods

The review of background literature in chapter two examined some policy options as they relate to extreme hazards and climate change. There was a tendency for IPCC to stress vulnerability reduction and governance (IPCC 2011). In Australia greater emphasis has been placed upon resilience and climate change adaptation policies, and some of these have recently been structured by the Department of Climate Change (2010) into strategies that fall under protect, accommodate and retreat.

A summary of policy approaches has been used as a structure to list those policy areas that were identified, or were referred to in some way by respondents in Brisbane, Donald and Emerald. Some of the policy areas identified by IPCC and DCC were not mentioned by respondents, or were not relevant to these flood events.

This summary chapter extracts a range of issues, ideas and attitudes that relate to the potential for policy development. Within each case study chapter there is quantification of some of the findings, which provides an indication of acceptability or otherwise of some solutions and strategies. Chapter 8 provides a summary overview of experiences and issues that emerged as particularly significant. However, the text responses from householders provided a richer insight into an extensive range of concerns and attitudes. These add to the themes that have been identified in the case studies and in this chapter, but they have not been quantified. Many of the issues only relate to subsets of each population, a minority, and cannot necessarily be construed as widespread acceptance of any specific strategy. At the same time that equally does not reflect a rejection of a potential policy, or a reason not to consider it as an option.

To illustrate how this works, an example of such a minority issue is the idea of planned retreat, or relocation of people out of the flood hazard zone. The surveys indicate that most people have no intention of moving, but that up to 20% are seriously considering moving to a flood safe location. Thus a policy on planned retreat may, especially in the first instance, be structured for a minority in a voluntary capacity. Those who are adamant that they would not move may be the majority, but they would not be initially affected by a policy that facilitated relocation for the minority. Over a longer time period such a movement would reduce overall vulnerability, probably contributing to a larger outmigration, which would have extensive implications for rezoning and redevelopment. It is in this sort of context that a range of policy implications are identified from the case studies and listed here as possibilities for dealing with future events and longer-term adaptation.

Many policy areas identified by IPCC were less relevant to householders in the case studies. Social inequality and poverty are probably less important, although lack of money to make adaptive changes was cited by many respondents. Governance issues were not a major part of people's responses, other than in the sense of finding fault with government or council responses, management and information; although criticism is also balanced by some positive comments about councils and the SES.

There is a significant range of responses relating to physical protection measures and to the idea of relocation. For some people these things were very important but they were generally a minority.

Since the floods and during the time that the surveys were carried out, the Queensland Flood Commission of Inquiry collected evidence and produced an interim report. This has already made many recommendations that relate to some of the issues raised by our respondents.

Recommendations have been published concerning:
1. The dams, especially Wivenhoe, with many management procedures suggested;
2. The disaster framework -- recommendations that underscore emergency management practice suggesting the strengthening of existing practices rather than radical new directions;
3. Forecasts, warnings and information -- recommendations for a more extensive range of warning mechanisms and locally specific systems;
4. Emergency management response -- recommendations also make no radical departure from existing procedures but a call is made for the recruitment of more SES volunteers, and the need for more planning for evacuation;
5. Essential services;
6. Lockyer Valley -- no specific recommendation was made to relocate the community, although that has subsequently taken place.

Additionally Brisbane City Council introduced a temporary planning instrument, TLP1 01/11 to enable people to rebuild as quickly as possible without the need for time-consuming paperwork and applications. For example roof heights are permitted up to 9.5 m. However, the instrument only applies to areas impacted by the river and overland flow. While enabling people to take control of their recovery and protection, the instrument proscribes flood protection structures that exacerbate flooding to neighbouring properties.

All of these responses that have already taken place answer many of the comments and issues that were raised by our respondents. On the other hand the commission of inquiry has only made recommendations. These are yet to be formalised into policies and legislation. The responses from the surveys therefore reconfirm many of the submissions already made to the commission and reinforce the need for policy responses. The overall impression of the interim report that was issued in August 2011 is of a very commonsense document that deals with emergency management and dam control procedures that will benefit from direction and guidance before the onset of the next wet season. The final report in March 2012 was focused on land use planning. It contains some recommendations that may yet prove to be more radical, but that will be the focus of ongoing research as part of an NCCARF analysis of the built environment adaptation to climate change.

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Submission from Associate Professor David King, Director of the Centre for Disaster Studies, James Cook University, on behalf of all contributors/authors identified in the three research studies.