

# **IMPACT OF THE 2010/11 FLOODS AND THE FACTORS THAT INHIBIT AND ENABLE HOUSEHOLD ADAPTATION STRATEGIES**

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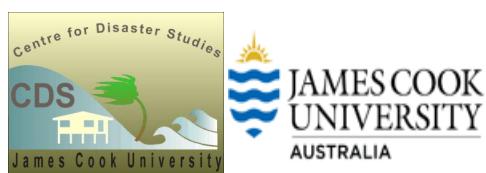
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## **Executive Summary**

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.

## **1. Introduction**

The purpose of this study of flood impacts in Brisbane, Emerald and Donald is predicated on the IPCC prediction that climate change will result in more intense and a greater number of flood events. The 2010/11 floods impacted extensive areas on Australia's east coast, especially in Queensland and Victoria. Small centres are regularly flooded, but the 2010/11 events included extensive flooding of a major city and consequent extreme economic impacts. Regular repeats of such events will force change and adaptation on communities and governments in the long term. These events provide an opportunity to explore the challenges and opportunities for adaptation facing residents and local government officers during the reconstruction period, and to identify the extent to which resilience and adaptive capacity are already present in flood affected communities.

Research was carried out in Emerald and selected suburbs of Brisbane in Queensland, and in Donald in Victoria. People were evacuated from the flood danger in all of these places and some experienced severe losses. Emerald and Donald are both inland rural settlements that have previously faced extended drought. Suburbs in Brisbane that were flooded are in existing flood prone areas where future floods may be expected.

Data were collected from residents, and public servants in each of the three case study locations through interviews and questionnaires. Information was gathered of immediate to long term recovery plans, attitudes towards relocation or out-migration, adaptive behaviour and intention in relation to mitigating the impact of future events, and anticipated adaptations to land use planning, building construction, insurance and protective strategies.

The main objective was to identify the factors that inhibit and enable adaptation strategies within the population. This was achieved by investigating the following issues:

1. Underlying vulnerability and constraints to recovery
  - a. Town planning in flood prone areas and mitigation measures
  - b. Insurance – availability and ownership versus rentals
  - c. Structural changes to buildings as a result of risk knowledge
  - d. Other factors adding to vulnerability such as citrus canker, drought, transient communities, homelessness, housing shortages, changes in local industries etc
2. Adaptation and risk reduction
  - a. Council and government enforced changes
  - b. Adjustments (e.g. sandbagging evacuation kits and future emergency response strategy)
  - c. Adaptations (e.g. moving home, raising level of home, changing exterior and interior design, other permanent modifications to home and changes to insurance policies, etc)
  - d. Attitudes and plans towards relocation, including council/government buy back schemes and other flood mitigation works

The study sought to uncover both adaptation enabling and inhibiting factors within the flood affected populations. While there is evidence of community resilience, the factors that inhibit adaptive change emerged more strongly than enabling factors. There are obvious policy implications in these findings that put greater responsibility on all levels of government to educate the community and to facilitate change.

This report commences with a literature review that places the study in the context of the climate change induced extreme and more frequent floods, as well as the earlier Queensland 2008 flood study and policy implications. The survey methods are outlined and a brief chapter describes the flood events of 2010 and 2011, which began at the very end of December 2010 and constitute the impact of the 2010/11 wet season and summer.

The three case studies are each presented in separate chapters and this is followed by an overview chapter outlining the key findings in Brisbane, Donald and Emerald. The final chapter of within the main body of the report highlights 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).

Following the reference list are three appendices. Appendix 1 contains the briefing notes published by Risk Frontiers during a scoping investigation in Brisbane and Emerald in January 2011. Appendix 2 contains the survey instruments that were used in Brisbane and Emerald and the slightly modified version that was used in Donald. The original questionnaire survey was developed in SurveyMonkey® and administered in a paper form at participating households or was filled in electronically. In order to present the outline of the questions and their response categories within a reasonable space, the survey instruments have been simplified with all formatting removed. Many of the questions were open ended, inviting comments and statements from the respondents. Some of these comments have been used directly in the chapters, but overall they provide a rich data set that deserves to be recorded, and which will be analysed in further research. Appendix 3 contains additional data tables based on the qualitative responses to the open ended questions. These have been edited to remove spelling errors but otherwise record the respondents' thoughts as they expressed them.

## **2. Literature Review**

Understanding how floods impact upon communities gives insights and structure to strategies and policies aimed at reducing or mitigating the impact of future flood events. Places that are frequently flooded have had to deal with disastrous events as a regular pattern of the seasons. As climate change scenarios predict an increase in extreme rainfall events, contributing to a greater frequency of riverine and flash floods (IPCC 2007a) the experience of regularly flooded communities in preparing for and dealing with such events provides information to planners and emergency managers, and an understanding of flood adaptation for communities that have a greater flood risk in the future. Regularly flooded communities can be seen as an analogue for other places that have to make similar responses and adaptations in the future.

A case study of flood experience, hazard mitigation and adaptation was carried out in 2010. Severe floods had impacted Queensland in both 2008 and 2009. Two contrasting towns that had a history of severe floods were selected from 2008 flood events; Charleville from inland Queensland, and Mackay, as an example of a coastal city. Both floods had been flash floods although before and since 2008 they have mainly experienced riverine floods.

The wet season of 2010/2011 brought severe flooding to most of Queensland and further south, with significant flood events in Victoria. The dramatic hazard events of early 2011 raised awareness of climate change, both in the media and amongst the general public. While this sudden raised awareness may be exaggerated in relation to the actual cause of the extreme La Nina wet season, the connection between climate change and extreme hazard events encouraged people to consider a more hazardous future and thus to contemplate some level of adaptive planning or behaviour.

This study of adaptation to the 2010/11 floods is an opportunistic response to a dramatic season of hazards; floods in multiple towns and cities, including the major city of Brisbane, as well as three tropical cyclones on the east coast of Queensland. Community attention was focused on hazards to a far greater extent than in the previous year when the 2008 Queensland flood studies were conducted. However, for the researchers, the 2010/11 floods surveys are linked to and are built upon the 2008 floods study. Therefore this research report begins with a review of the Queensland 2008 floods study.

### **2.1 Queensland 2008 floods: summary**

The background to the 2008 floods study carried out a review into literature that related to the aims and objectives of that study. These were:

1. to understand how societies that are regularly flooded operate, and the characteristics of their resilience or non resilience;
2. to understand the characteristics of communities that are on the edge, where flooding might push them into non-viability;
3. to understand the extent to which flood mitigation measures (including State Planning Policy 1/03) have been applied to reduce the vulnerability to flood events;
4. to identify the characteristics of vulnerability, resilience and adaptive capacity to flooding of households, businesses and institutions.

The review commenced with the context of flood management in Australia (BTE 2001, BTRE 2002) in relation to overall disaster costs. As a specific objective was to examine the effectiveness of Queensland's State Planning Policy under planning legislation, the review outlined the planning framework and legislation in Queensland (DLGP DES 2003, IPA & SPA 2011). The Queensland state

planning policy was introduced for 10 years in 2003, initially under the Integrated Planning Act (IPA) and subsequently the Sustainable Planning Act which replaced IPA in 2009. Thus by the end of 2010 the Queensland State government initiated a review of the policy to improve its efficacy and extent. The 2008 Queensland floods study had identified flaws and shortcomings of the policy from interviews with key informants in the State government departments and local councils in Mackay and Charleville. Findings included problems with understanding of the 1 in 100 year flood recurrence concept and ongoing urban development in flood prone areas below the one in 100 year flood level, as well as a lack of mitigation of flash flooding. Legal findings were summarised as follows and reported in Thomas et al (2011) and Thomas et al (2012).

**Table 2.1 Summary of findings relating to the SPP 1/03**

**SPP 1/03: Mitigating the adverse impacts of Flood, Bushfire and Landslide**

Charleville	Mackay
<ul style="list-style-type: none"> <li>• The Murweh Shire has a flood overlay as part of the Town Plan</li> <li>• Industrial area outside flood prone area</li> <li>• New commercial premises in flood area required to have an upstairs area or an Evacuation Management Plan</li> <li>• Habitable dwellings 300mm above last known flood height (1997 flood event used)</li> <li>• Unaware that SPP 1/03 is a policy – thought merely a guideline.</li> <li>• A levee constructed in an attempt to ‘flood-proof’ the town.</li> </ul>	<ul style="list-style-type: none"> <li>• <i>Mackay City Planning Scheme 2006</i> contains a ‘Flood &amp; Inundation Management Overlay’ which relates to riverine flooding</li> <li>• Storm surge is covered under the <i>Emergency Action Guide</i></li> <li>• No provisions for flash flooding</li> <li>• Min floor level 300mm above the Defined Flood Event (DFE - 1/100 ARI flood event used) which relates to the flooding of the Pioneer River</li> <li>• Extensions to developments permitted if there is 1 “Habitable Room” at least 300mm above the Defined Flood Event (DFE)</li> <li>• <i>Mackay City Planning Scheme 2006</i> specifies a maximum of 50 cubic metres of infilling for a development before it is required to be code addressed</li> <li>• An example of a flooded street where houses with raised floors above the 1/100 Annual Recurrence Interval (ARI) flood event were not flooded.</li> </ul>

Source: Thomas, et al. (2011)

These findings were additionally developed as a submission to the Department of Local Government and Planning (DLGP) review of the Queensland State Planning Policy 1/03 at the end of 2010. However, the flood events of 2011 placed a hold on the state planning policy review, but submissions were forwarded to the Queensland Floods Commission of Inquiry which was examining the planning issues during the latter part of 2011. Recommendations and evidence from the final review report in 2012 will be analysed as part of ongoing research into land-use planning adaptation to climate change.

Social impact and social capital factors are identified by COAG (2004) and IPCC (2007a) and Adger (2003). Emergency management mitigation issues are structured through vulnerability assessments, resilience and adaptation. The 2008 flood review examined the AGSO (2000) vulnerability assessment of Mackay which used a structure of setting, shelter, sustenance, security and society. These areas of assessment underscore the diversity of factors that contribute to vulnerability and were applied to a series of multi-hazard city studies as part of the Cities Project that first developed the methodology in Cairns and Mackay.

Following the UN International Decade for Natural Disaster Reduction, Emergency Management Australia shifted its emphasis for hazard mitigation from vulnerability assessments to a policy of building resilient communities. In establishing the basis for the 2008 Queensland flood studies Apan

et al (2010) defined resilience (UN 2007), identifying indicators, scale and component parts such as stability, learning and self organisation (Carpenter 2001, Thomas et al 2005). Individual and collective resilience include elements of adaptive capacity as well as broadly accepted features of social networks, social capacity and hazard awareness (Eriksen et al 2005, Nelson & Finan 2008, Brown et al 2002). The flood surveys developed measures of resilience based on the literature and on studies of previous past disaster events (Centre for Disaster Studies 2011, Bureau of Meteorology 2011). Analysis of measures of social capital, networks and resilience indicators showed Charleville to be a more resilient community than Mackay: it was a more stable and self-reliant community. However, most respondents in both towns had been resident for over a decade and most had experienced previous floods so that awareness and experience were high. While both towns are extremely vulnerable to the flood hazard, Charleville has additional vulnerability of remoteness, limited services and a more fragile economy, compared to the robust urban diversity of the coastal city of Mackay, that both reduces the vulnerability of the community, while simultaneously lessening resilience in causing people to have higher expectations of government services and intervention. One can expect these same characteristics to be exemplified in Brisbane's flood experience.

Vulnerability and resilience are separate, but overlapping conditions. Government emphasis on building resilience is predicated on resilience attributes representing strengths in people and society that may be built upon or enhanced as hazard mitigation strategies. The difficulty with vulnerability assessment is the lack of capacity of individuals or communities to be able to do much about altering or improving structural vulnerability, such as demographic (the very young and very old), poverty, ethnicity, lack of education etc. It is valuable for authorities to assess vulnerability so that they may be better prepared for hazard impact, but community response is limited in dealing with most elements of vulnerability. While some resilience characteristics are at the opposite end of the scale to vulnerability, many are of different aspects of community or of peoples' lives, such as social networks, volunteerism, previous hazard experience and so on. It is for this reason that resilience is targeted for strategies of hazard mitigation, building on the existing strengths of the community. However, in assessing the resilience of a community we have to balance it with the existing vulnerability. The state of vulnerability does not necessarily reduce any particular characteristic of resilience, but the balance of the two states -- positives and negatives -- has a potent impact on the capacity to mitigate impacts of natural hazards. This may in turn influence the capacity of an individual or community to adapt to a changing state of natural hazard occurrence or severity. Underlying factors of both vulnerability and resilience also involve regional governance and economy (Sivell et al 2008). The contrasts of Charleville and Mackay illustrated the complex imbalance of multiple factors of vulnerability, resilience, governance and economy.

These issues then contribute to measurements or estimates of adaptive capacity. As adaptation involves changes in attitudes, lifestyles and practices of individuals, communities and the broader society there must be some elements of resilience that enhance adaptation and equally the absence, or ability to control or overcome vulnerability. The 2008 Queensland flood review (Apan et al 2010) identified an extensive range of actors and actions of adaptation. Community adjustment and change accepts new opportunities (Nelson et al 2007), new occupations, diversification of livelihoods (Eriksen 2005, Nelson & Finan 2008), the development of community resources (Brown et al 2002) and institutional and governance adaptation, incorporating legislative change and practice (Tompkins 2005). The residential and business surveys of Charleville and Mackay indicated that people had incorporated a number of actions and changed practices in response to frequent flood threats. The primary constraint of cost prevented major win building strategies, such as raising the building, but low-cost actions, increased awareness and knowledge of flood warnings and safety have brought about lower-level modifications; indicative of adaptation. Identification of a weakened

adaptive capacity centred on the lack of experience and social networks of newcomers, as well as problems associated with adequate insurance.

IPCC (2007a), Handmer & Dovers (1999) and others have identified migration as an adaptive strategy in the face of climate change. There is a tendency in the disaster literature to view migration in terms of refugee flights from sea level rise, drought and catastrophe. Migration theory on the other hand (Lee 1966, Todaro 1969) portrays migration as a balance between population and opportunities, in particular a selection of both positive and negative attributes in both potential migrants and places of origin and destination. Thus migration is a process rather than a failure, and it is a powerful adaptation to declining opportunities in one location against emerging or potentially better opportunities in another location. In particular, migration involves younger people, as well as taking place against lifestyle and life cycle changes. As such it is an ingrained characteristic of human beings and most people will migrate at some or several points in their lives.

Individuals, households and businesses will adapt to the balance of declining opportunities, including greater threats, and better opportunities elsewhere. For those involved in migration the process is most frequently a positive adaptation and change in life. The community that receives migrants is enhanced and developed by the process, while the community that experiences a net loss of migrants is diminished. The reality of towns and cities, as well as regions, is instability of population. Therefore some places are in decline while most are growing, even if unsustainably.

Thus any measure of resilience and related characteristics of adaptive capacity is determined by the scale of focus of the study. At the individual or household level migration is a rational adaptive strategy, often relatively low-cost. While some people will leave because they have lost resources or livelihoods, many will leave because there are better opportunities elsewhere. They do not view moving on as necessarily a failure; even those households that have experienced significant loss. Moving on is associated with a new beginning, maybe starting over, often advancing. However, when we focus on adaptive capacity and resilience at the level of the community, immigration is most often a loss of capacity, a reduction of resilience and probably an increase in vulnerability. Net emigration shrinks both the population and the economy, leading to an inevitable contraction of services and opportunities.

The Queensland 2008 flood household and business surveys addressed the issue of outmigration through a small number of scenario based questions (Table 2.2). In Mackay in particular, many people had already left town during the almost 2 years since the flood, and new people had moved in. Migration was complicated by the global recession of 2009, whereby the fly in fly out mining workforce based in Mackay was severely impacted by the economic downturn. The research problem of hazard related outmigration lies in the inability to identify why people have left the town, as well as the complexity of factors that prompt the decision to migrate.

People and businesses that were asked about their intention to move if more severe floods affected them were those who had remained after both the flood and the economic downturn. Thus if they had already made the decision not to move on, the proportion among them who indicated in the survey that they might relocate in the event of further flooding is potentially of significance.

Table 2.2 Intention to relocate in the event of further flooding

	Intentions of businesses		Intentions of households	
	Mackay %	Charleville%	Mackay%	Charleville%
Move to a different part of Town				
Not likely to be considered	64.3	100.0	52.0	57.4
Neutral	14.3	-	25.3	11.1
Likely to be considered	21.4	-	22.6	31.5
Move to a different Town				
Not likely to be considered	92.7	81.8	69.4	77.8
Neutral	7.3	-	16.0	9.3
Likely to be considered	-	18.2	14.7	13.0

Source: household and business surveys 2010

Responses in Charleville and Mackay indicated that significant proportions of both businesses and household residents would consider moving to a different part of town (a much more limited option in Charleville compared to Mackay) or would consider leaving the town if severe flood events were repeated. While only a minority of residents and businesses considered the option of leaving or relocating, the economic and service impact of such a migration would still be significant and in the case of a small outback town like Charleville, could prove to be a tipping point in terms of long-term community viability.

Both Charleville and Mackay had practised protective measures against floods; levees, drainage and land use and building regulations. Structural measures had been adapted at levels of institutions, household property and business premises. Flood mitigation measures also include campaigns, education warnings and monitoring (BTRE 2002). Health agencies also carry a responsibility for dealing with secondary hazards that commonly follow floods (Queensland Health 2008). While health issues are less likely to be life-threatening in Australia, issues of dengue fever, diarrhoea, viral outbreaks and even leptospirosis and melioidosis add to the risks and impacts of severe floods. While health issues were relatively minor following the 2008 floods and similarly in 2011, risks are always present, especially when stagnant floodwaters remain for extended periods of time, compromising sewerage and drainage systems. Remote indigenous communities have reported a range of health issues following floods and these have been compounded by limited services and infrastructure, isolation, poverty and shortage of food supplies. Indigenous communities in such places as the Gulf of Carpentaria and isolated coastal communities like Wujal Wujal, north of Port Douglas, are classic examples of communities with high levels of social capacity and resilience running parallel to equally strong vulnerability.

## 2.2 Adaptation to Flood Hazards

Overall, the analysis of the 2008 floods in Charleville and Mackay identified areas of strengths and weaknesses in their community resilience against the background of high levels of physical vulnerability. Separating and identifying adaptation from resilience mitigation actions that people were practising or were taking up as a consequence of the floods was complicated by the intervening global recession that had deflated the local economy, costing people livelihoods and constraining hazard mitigation activities. Additionally the research project was a short snapshot of response to specific events recording findings that were tantalising and indicative.

Shortly after this project had been completed, the wet season of 2010/2011 brought an even greater number of severe floods, throughout Queensland as well as further south, particularly in Victoria. For many people the severe wet season of 2011 was perceived as a singular phenomenon. In fact, the wet seasons of 2005/6, 2007/8 and 2008/9 had also been above average wet seasons with La

Nina dominating most of the period from mid-2005 until the end of 2011 and forecast well into 2012. Even though the SOI of early 2011 was a dramatic peak to that wet period, many places had already experienced repeated floods over a seven-year period. Thus although the 2011 floods were severe and in a sense exceptional, they were part of a cyclic pattern, that may also be influenced by climate change. Certainly, with climate change attracting extensive public and media attention, both the public and the media drew parallels between a season of disasters and climate change regardless of the complexity of the science of weather cycles and long-term climate change.

This 2010/11 flood study focused on Queensland and Victoria where flood impacts were greatest. Three cyclones in Queensland added to the overall hazard awareness within three months of rolling states of disaster. These events were therefore an opportunity to revisit themes of resilience, mitigation and adaptation to severe floods. This time the floods were much more recent and stood out as dramatic dominating events. However, the recency of the floods presented its own problems. Many people had had to evacuate from flooded areas and were not necessarily able to return to their homes until the buildings had been made habitable. During the early part of 2011 many flood impacted areas were relatively empty and even at the end of 2011, rebuilding and repair is continuing, with some flood victims still in temporary accommodation. During 2011 the severity of the floods and cyclones depressed the economy of Queensland, so that secondary economic factors constrained recovery.

The opportunity for the 2010/11 flood study was to develop research into adaptation strategies and to concentrate on households that had experienced direct impact or loss. Many additional key informant interviews added to the overall picture, but the emphasis was on strategies that households have considered or have taken up in order to deal with future flood events. The research population was thus simpler than in the Charleville and Mackay case studies because of its closeness to the event and the exclusion of businesses, which had proved to be extremely variable in type, size and management. This methodological approach was influenced by the research experience of the 2008 case studies.

### **2.3 Hazard Climate Change Adaptation**

The concept of resilience has shifted from a simple capacity to bounce back (EMA 2011) that indicated the capacity to recover from the disaster. As resilience has been mainstreamed as a strategy to reduce the impact of disasters its importance has called for many and precise definitions, the identification of factors of resilience and their measurement (Zhou et al 2010, Folke 2006). The development of resilience in emergency management has incorporated social ecological systems (Folke 2006), as well as psychological factors (Werner 2000). In particular resilience is identified at a range of levels; including the individual (Bonnano 2004), community (Kulig 2000, Adger 2000, Paton & Johnston 2001), institutional and organisational or governance sectors (Cutter et al 2008).

Implicit within resilience at all levels is the idea of change. People and communities do not just bounce back after a disaster. People and the place are not the same. Some features and institutions have gone and new opportunities, people and structures enter into the community. Recovery, which builds on characteristics and resilience, moves on to a different state. The community hardly ever returns to its pre-disaster state. Rather than being pushed along by changes that it does not control a resilient community must encompass adaptation as a process of transition and transformation (Pelling 2011). It follows that the emergency management strategy of building resilient communities is dynamic in encouraging and facilitating social and organisational change, to adapt to the need to prepare for repeated disasters as well as new levels of hazard.

Pelling's (2011) thesis of adaptation as resilience is developed from the disaster and social ecological systems literature, but emergency management practice remains heavily influenced by the idea of a return to functioning normality, even if emergency managers do acknowledge that nothing is ever the same after a disaster. Also emergency management practice puts a great deal of emphasis on education, learning and social transformation to a more aware and better prepared society.

Resilience is not static. A truly resilient community must possess the capacity to absorb, encompass and action change. Some aspects of community strength, such as a strong sense of place, stoicism and coping capacity reduce vulnerability and contribute to resilience, but on their own (and there are many other similar kinds of community virtues) they may reinforce conservative attitudes that reject change. There are levels or types of resilience, some of which are less conducive to adaptation and change; for example stability resilience, recovery resilience and transformational resilience.

Pelling (2011) presents pathways to adaptation which range from bottom-up to top-down processes of change. As a whole of government, whole of community responsibility climate change adaptation must take place at all levels. Different strategies and approaches will operate in parallel or even together. The process is more important than perceived outcomes, as specific goals or targets once achieved may bring about an end to an adaptation strategy, resulting in complacency and stagnation.

Titus (1991) suggested that hazard mitigation and climate change adaptation strategies fell under three approaches of protection, accommodation or retreat. Protecting communities with physical structures had long been a practice, in many parts of the world. Accommodation as a means of educating people and authorities to be better prepared and to take mitigation actions received a boost during the UN's International Decade for Natural Disaster Reduction that put emphasis on community and social actions during the 1990s. The retreat strategy is more controversial and may be constrained by legislation that requires compensation for property loss or change of use (Titus 1991). However, the Department of Climate Change (Department of Climate Change 2009, Alexander et al 2011) adopted a practical open-ended strategy of protect, accommodate or retreat. Each of these three approaches provides a range of actions, plans and choices for all levels of community, from the household through the residential community, the business community, local government and up to state and national policies and legislation.

The retreat adaptation strategy is to withdraw, abandon or relocate, applied to families, structures, infrastructure and future developments. It may involve buyback schemes, or a lack of government or insurance companies' support to rebuild in hazardous zones after a disaster. The rezoning of land from residential or commercial etc to recreational, for example, may be part of the retreat option. In the face of sea level rise retreat is an inevitable process that will be equally significant in river flood plains and bushfire zones. The rezoning of land in the face of hazards and climate change is neither flood hazard nor Queensland specific. Storm surge, flash floods and river floods are likely to increase as the climate changes and will be exacerbated by sea level rise. States throughout Australia (Thomas et al 2011) and in other countries such as the USA (Burby et al 2000, Titus 2000, Deyle et al 2007) illustrate the problems facing local government planners in facing the threat of climate change and more frequent hazards within the context of protective legislation. Titus (2000) however, observes that the gradual nature of climate change gives planners some flexibility in adapting land use zones, although the evidence in the US is that most local government planners are not addressing sea level rise.

Retreat also includes migration, possibly not as government policy, but as a very direct individual or household choice. Some settlements may lose viability and population, facing ultimate closure or

decommissioning. Many towns have died at times in the past and will continue to do so in the future.

Accommodation contains the most straightforward and viable strategies in the short to medium-term, involving education and awareness, minor construction alterations to houses and infrastructure, temporary evacuation plans, hazard zone mapping, community self-reliance, new technologies and new forms of social communication, membership and organisation.

Protect involves more expensive structural and infrastructural projects. Politics, public safety and short to medium-term priorities will result in dams, rock walls, major drainage works and levees continuing to be built. Although we are aware of the long term lack of efficacy of many of these measures, they may be relevant in postponing the inevitable retreat.

IPCC (2011) has formulated a range of policy issues and strategies in relation to disaster risk management and vulnerability reduction (Table 2.3). Its policy recommendations are global, such that a great deal of its emphasis on vulnerability and social justice issues are particularly aimed at the situation of many developing countries. However, the policy implications are broadly relevant and inclusive of the wealthier countries of the world.

Table 2.3. Summary of the IPCC and Department of Climate Change Hazard Policies: IPCC – floods more common and more extreme – extreme weather events

**Protect: measures and strategies that protect communities & infrastructure**

Risk transfer - social capital/community resilience, insurance and government disaster relief and recovery programs

Physical measures

protective measures that reduce short-term risk but increase long-term vulnerability levees and dams

Post disaster recovery - opportunity for reducing risks; in rebuilding housing and infrastructure and reducing vulnerability.

danger of disincentive to adaptation creating a false security

Seawalls and tide gates

nourishment of beaches

highly developed urban areas with a long history of protection

preserve cultural, Indigenous and heritage values.

public access to beaches and other recreational areas

Improved public safety

Planning

inappropriate development in hazard prone areas

**Accommodate: Measures and strategies that facilitate adaptation, behavioural change & community resilience**

Vulnerability, Resilience & adaptation

vulnerability - social justice issues

informal economy - indirect (and intangible) impacts

improvements in livelihood, equality and well-being have positive impacts on adaptive capacity

social inequality

vulnerable communities

social change

vulnerability reduction

Vulnerability reduction - adaptation and disaster risk management

Planning

urbanisation

Settlement patterns

elevated floors, increased setback

evacuation plans

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new residents are required to provide a response plan to climate change  
Governance  
risk management an iterative process that involves monitoring, research, evaluation, learning and innovation  
short-term benefits - risk management to be acceptable to communities.  
Local participation builds hazard mitigation.  
development strategies at all levels must include risk reduction.  
disaster risk management  
multi hazard approaches  
All levels of government  
Sustainability  
sustainable development  
environmental degradation - unplanned and rapid urbanisation, failure of governance lack of livelihoods for  
poorer people  
Communication  
risk communication  
questioning of assumptions and paradigms

#### **Retreat: measures and strategies that remove people from locations at high risk**

Land use Planning; hazard zone definitions  
Urbanisation; increase in services etc  
Settlement patterns; form and design  
Reduce inappropriate development in hazard prone areas  
Planned or managed retreat or horizontal migration  
increased setback provisions  
rezoning of land  
relocation of structures within properties  
buyouts of properties  
regional planning  
constraints on property title  
financial instruments  
insurance incentives

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Source: IPCC 2011, Department of Climate Change 2009

IPCC (2011) discusses the probability of many models of climate change in relation to extreme weather events. Of direct relevance to this study is the indication that there are statistically significant trends in the number of heavy precipitation events. In a warming world floods are likely to become more common, and may also become more extreme.

The IPCC 2011 report makes it clear that in the area of exposure and vulnerability there is variable vulnerability that relates to social justice issues, and inequality between social groups. Settlement patterns, urbanisation and social change impacts lead to increasingly vulnerable communities. During the last decade there have been significant increases in losses from natural disaster. The IPCC notes that the informal economy and indirect (and intangible) impacts can be very high but are not accounted for in official data. These kinds of indirect impacts may be identified through qualitative research, where people may report on a range of issues that provide insight into the overall impact of a natural disaster.

Vulnerability reduction is a core element of adaptation and disaster risk management (IPCC 2011). Skewed development practices, especially those which involve environmental degradation, unplanned and rapid urbanisation, failure of governance and a lack of options of livelihoods for poorer people have all increased vulnerability.

All levels of government and sectors must plan for disaster risk mitigation. At the local level, disaster risk reduction lacks data and reduces the capacity of local government to improve the vulnerability

of its client population. Socio-economic and demographic inequalities affect vulnerability and coping capacity and thereby adaptive capacity. Policy has to deal with change in society, vulnerability and climate. National systems are required to reduce exposure and vulnerability. Thus all development strategies at all levels must include risk reduction.

Post disaster recovery (IPCC 2011) is an opportunity for reducing the risks; in rebuilding housing and infrastructure and in identifying opportunities to reduce vulnerability. Risk transfer through social capital / community resilience, insurance and government disaster relief and recovery programs run the danger of such mechanisms proving to be a disincentive towards real risk reduction. Some protective measures may reduce short-term risk but increase long-term vulnerability. For example levees and dams raise the level of complacency in society, creating a false security. Such protective measures may also encourage inappropriate development in hazard prone areas. This specific issue was extremely significant for these flood studies.

In the area of human impacts and climate change adaptation, IPCC suggests that improvements in livelihood, equality and well-being have positive impacts that enable adaptive capacity. Risk management is a multifaceted procedure requiring a range of actions to mitigate risk. The multi hazard approaches that have been widely advocated by emergency management agencies also cover complex and secondary disasters. However, strong international statements and actions do not necessarily lead to local level action. IPCC (2011) asserts that local knowledge is essential in that it empowers risk management and reduction. Local participation also builds hazard mitigation.

To foster community and local level mitigation and adaptation, risk communication for disaster mitigation is crucial. There are policy implications for all the stakeholders involved in developments and processes that impinge upon natural hazards and climate change. Furthermore, risk management is an iterative process that involves monitoring, research, evaluation, learning and innovation to reduce risk and to promote adaptive management. This kind of case study research is clearly embedded within that process.

IPCC (2011) addresses sustainable development and argues that it is enhanced by both disaster risk management and climate change adaptation. Disaster risk management will not be effective unless it is embedded within all social and economic sustainability areas. However, effective adaptation and mitigation needs to offer short-term benefits, as well as having clear long-term impacts, in order to be acceptable to communities.

Sustainability, mitigation and adaptation require a questioning of assumptions and paradigms. New ways of thinking are necessary in order to establish pathways to a sustainable and resilient future (IPCC 2011). While this approach emanates from the researchers and academics who have written the IPCC policy report, the IPCC method of analysis requires government support and agreement. Thus it is not a radical departure for the research and government community to require a formalisation of new ways of thinking that reject unsustainable paradigms.

However, when we consider these IPCC policy priorities in the context of the Australian coastal management strategies of protect, accommodate and retreat, the IPCC policies that are summarised above almost entirely fall into the accommodate category. Policies that align with the protect strategy recognise the short term benefits and longer term problems that are associated with physical protective structures. These are also expensive responses to hazard threats such as floods, and in the context of globally acceptable solutions it would be unreasonable for IPCC to recommend risk management strategies that developing countries could not afford. While the IPCC policy recommendations warn against the dangers of physical protective measures, it does not necessarily

follow that these are strategies that should be completely avoided. The case studies of this research project targeted attitudes towards protective measures such as dams and levees.

The group of IPCC policy responses that fall into the accommodate category are dominated by issues of vulnerability, as well as adaptation. Australian emergency management and hazard mitigation strategies are strongly oriented towards community resilience, which includes adaptation to climate change as a subset and as specific sets of policy strategies. There is less emphasis on vulnerability, not because inequalities have already been reduced or ameliorated, but because many vulnerability issues that relate to socio-economic, demographic, regional and sectoral issues are not under the control, in the short term, of communities and local governments where the responsibility for hazard mitigation primarily falls. This is not to deny the importance of social justice as a sustainability issue, and the crucial global importance of reducing social inequality. Social justice is a much broader political concern that is not easily integrated into community resilience initiatives aimed at hazard and risk mitigation and climate change adaptation.

The concept of a retreat strategy is not acknowledged in the IPCC 2011 policy strategies, although IPCC has earlier acknowledged migration as a climate change response (IPCC 2007a). The closure and decommissioning of settlements in hazard prone areas is an extremely difficult issue for local government and even state and federal government to have to face. It is also a very expensive option, but as we have already seen in Australia, the relocation of the population of the Lockyer Valley to flood safe areas has been accepted as a retreat strategy. Individual and household migration in the face of increased hazard occurrences and longer-term climate change impacts is a very likely response which will re-allocate populations and ultimately necessitate a government and planning response to the redesignation of land-use in the abandoned communities and settlements. Thus while a retreat strategy is unlikely to be taken on board by most governments, there will need to be a response to a population shift.

With knowledge of all of these ideas of resilience and adaptation, the 2010/11 flood study incorporated research questions that could ascertain householders' thinking around future flood impacts and likely responses against the background of the severe floods that they had recently experienced. Concepts of resilience and adaptation that were the focus of the study centred on the following areas; previous experience of floods, the impact of the flood event, personal and household changes or adaptations following the flood, the status of the household and its home at the time of the flood along with length and type of residence, household and flood insurance, flood awareness, preparedness and mitigation, and household wellbeing and community involvement.

### 3. The 2010/11 summer flood events in Queensland and Victoria

The Queensland wet season of 2010/11 and the summer rainfall in Victoria were record breaking periods. La Niña drove the weather systems in early 2011, but had been dominant for much of the period from mid-2005. El Niño had occurred from mid 2006 to mid-2007, returning early in 2009 through to early 2010, but by the end of the year, 2010 had been the second wettest year in Queensland's records, having brought double the mean rainfall. Even in Victoria the rainfall was 30% higher than average, easing a long drought. Thus for both Victoria and the Brisbane catchment, river levels had already risen before the main impact of very heavy rainfall at the beginning of 2011 (Bureau of Meteorology 2011). Brisbane, Emerald and Donald were chosen as case study locations to investigate the impact of floods in Queensland and Victoria (Fig 3.1).

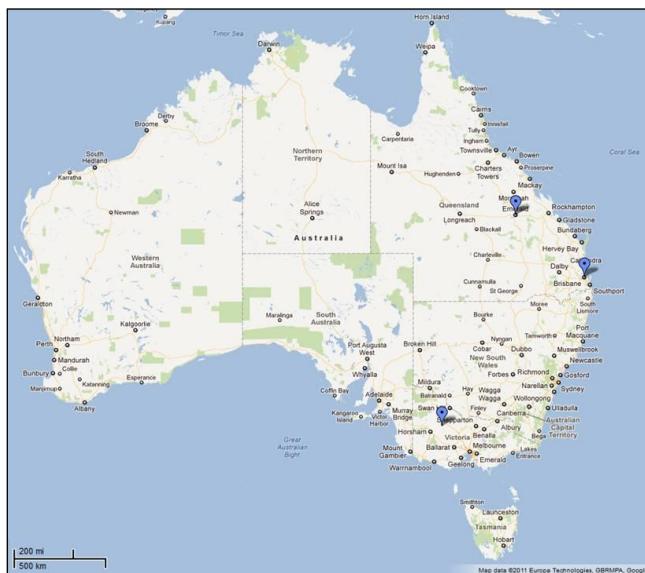


Figure 3.1 Case study locations: Brisbane and Emerald, Queensland, and Donald, Victoria (each marked with a blue indicator).

#### 3.1 Brisbane, Queensland

Before the 1974 flood, four other floods (Shields 1979) had peaked above 8 ms in 1841, 1844, and twice in 1893, plus another 10 floods above 4 ms (Fig 3.2). The previous major flood before 1974 was in 1898 after which the construction of Somerset Dam created a sense of complacency about Brisbane being flood proof (Shields 1979), similar to the attitude after 1974 following the construction of Wivenhoe Dam. On January the 24th 1974 Cyclone Wanda formed and for five days dumped 1,318 mms of rain in the Brisbane catchment (BoM 1974). The impact resulted in 12 deaths from drowning, 6,007 houses flooded, and a damage bill of \$200 million.

Household surveys carried out by the University of Queensland after the 1974 flood showed people to be "capable and resourceful" (Short 1979, 456) with much reliance on social networks and assistance from volunteers and helpers. Helpers were especially drawn from formal organisations, with churches for example providing 44% of all volunteers. This is probably very different from the 2011 flood when virtual networks, such as Facebook and Twitter, were extremely significant and formal organisations, and especially churches, appear to have declined in membership. In 1974 most households had returned to their homes within a month of the flood and three quarters felt they had recovered from the event by the time of the final survey 14 months later (Short 1979).

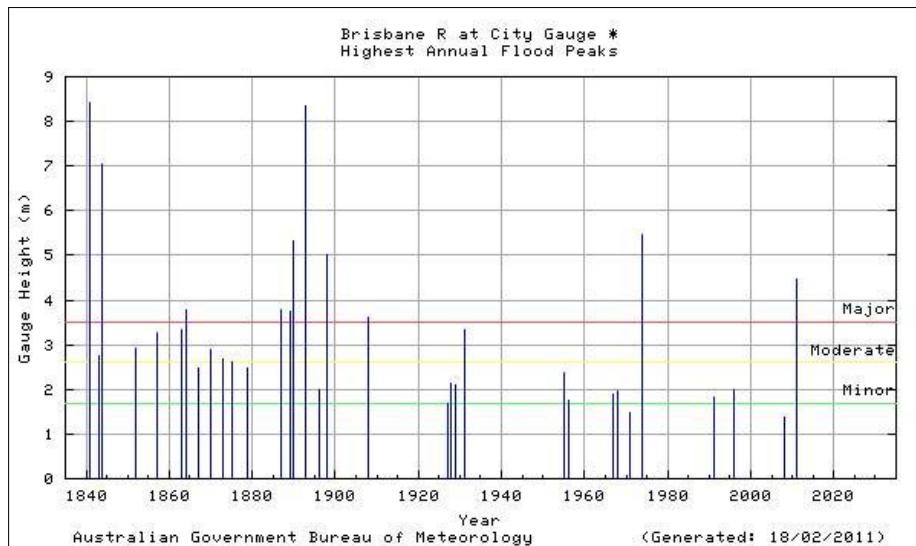


Figure 3.2 Flood History of Brisbane

McKay (1979) observed there to be drainage issues in relation to urban development at the time of the 1974 flood. He called for development planning and engineering responses to deal with creek and flash flooding. These same issues exist after the 2011 flood.

Part of the response to the flood was to construct Wivenhoe Dam for water storage and flood mitigation. Apart from the dam providing a false sense of security, a long period of drought had gradually emptied the dam by the late 2000s. Even when La Nina began to increase rainfalls from 2005 onwards, the Brisbane catchment benefited relatively little and the city experienced severe water restrictions up to 2010. The emptiness of the dam undoubtedly added to the flood complacency.

Category one tropical cyclone Tasha crossed the coast of North Queensland on 25/12/10, but as the ex-cyclone rain system moved south it generated extensive rainfall that caused flooding down the whole coast of Queensland, especially the southern half of the State and westwards inland (Brisbane City Council 2011).

The Brisbane River peaked at 4.46 ms on the 13th of January 2011 (Fig 3.3). The river was above the major flood level of 3.5 ms from the 12th to the 13th of January and above its minor 1.7 ms flood level between the 11th and 14th of January 2011. Heavy rain had occurred in the Brisbane catchment during 2010 and was especially high in December 2010 and January 2011. Over 600 mms of rain fell in the catchment between the 9th and 13th of January 2011. However, the flood run-off in January 2011 was greater than that of the 1974 flood event (Brisbane City Council 2011), but actual flood levels were significantly mitigated by Wivenhoe Dam. Consequently, the 2011 peak of 4.46 m was significantly less than the 1974 flood peak of 5.45 m.

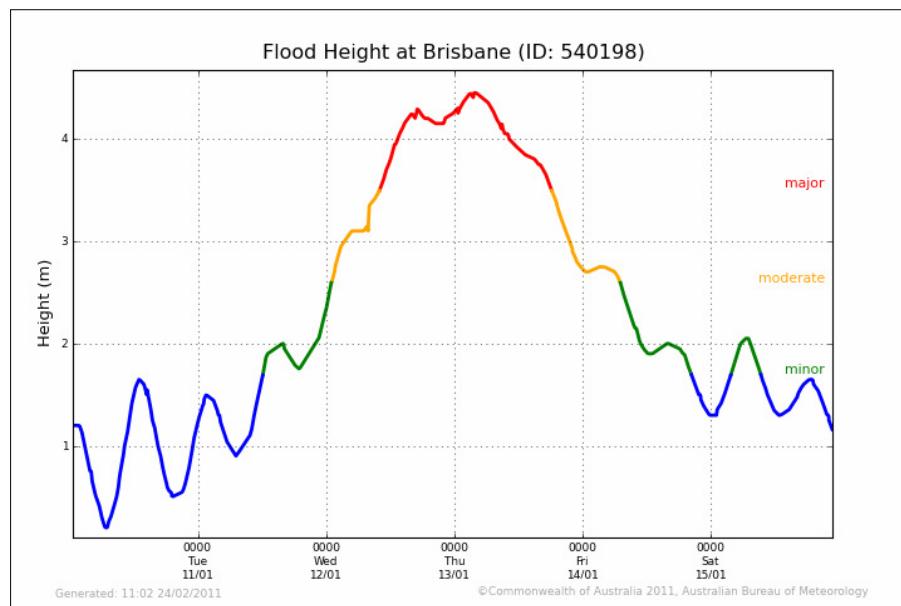


Figure 3.3 Flood heights recorded in Brisbane

Localised flooding reached Brisbane CBD on the 11th of January when a state of disaster was declared, but by then Wivenhoe Dam had reached 188% capacity, prompting a release of water on 12<sup>th</sup> January which exacerbated localised flooding. The impact was the flooding of 14,000 properties, with 1,970 people evacuated from inundated suburbs, 35 of which were directly flooded by the river (Brisbane City Council 2011).

### 3.2 Emerald, Queensland

Emerald is the main town in the Central Highlands Regional Council with a population of 11,575 residents - 5,565 females and 6,010 males, including an indigenous population of 373 (ABS 2007). In terms of age, the largest group is between 25 and 54 years (47.1%) followed by groups between 5 and 14 years (16.9%) and between 15 and 24 years (16.4%). Median weekly household income in Emerald is \$1,672, representing approximately 163% of that in Australia (\$1,027 per week). Coal mining is the most common industry of employment (14.5%), followed by school education (5.1%) and heavy and civil engineering construction (3.3%) (ABS 2007).

The Central Highlands area is within the Fitzroy River catchment which drains to Rockhampton. Emerald's local river the Nogoa flows through the town subsequently becoming the Mackenzie River then the Fitzroy (BMT WBM Pty Ltd 2011).

Fairbairn Dam was constructed upstream of Emerald in 1972 for water supply. Before the dam was constructed the previous largest flood in 1950 was at 15.7 m with subsequent floods in 1955 and 1974 (Fig 3.4). Between 2001 and 2004 flooding had occurred at Rubyvale, also in the Central Highlands Regional Council area. Most recently, however, Emerald flooded in January 2008 at a peak height of 15.7 m. Prior to the 2008 event, the Fairbairn Dam was at about 35% capacity. By 20 January 2008, the dam reached 156% capacity and a depth of 3.5 m over the spillway.

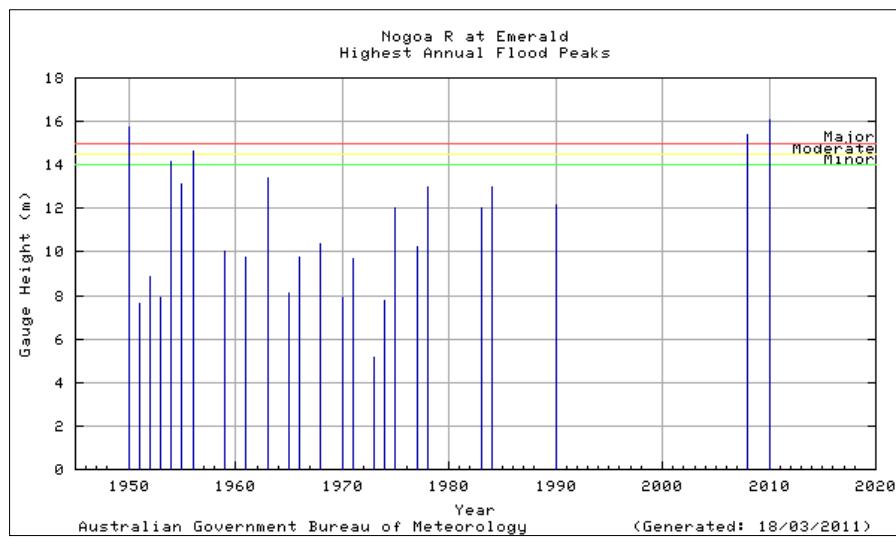


Figure 3.5. Flood History of Emerald

Before the major floods of late 2010 and early 2011, heavy rain had begun in the latter part of 2010, filling the dam, swelling the rivers and causing minor flooding in November. Two rainfall events on the 3rd and the 27th of December 2010 and then on into early January 2011 brought the main floods (Fig 3.5). The early December flood peaked on 5/12/10 at 13.6 m and the second peak of 16.05 m occurred on 31/12/10. It was above the major flood level of 15 m from the 30th of December 2010 to the 2nd of January 2011 and above the minor flood level of 14 m between the 29th of December 2010 and the 3rd of January 2011. Over 600 mm of rain fell in the Nogoa catchment during December 2010 and January 2011. Very heavy rain of more than 400 mms fell on the Carnarvon Ranges between the 26th and 28th of December 2010. During the peak of the flood the dam reached 176% capacity and a depth of 5.56 m over the spillway.

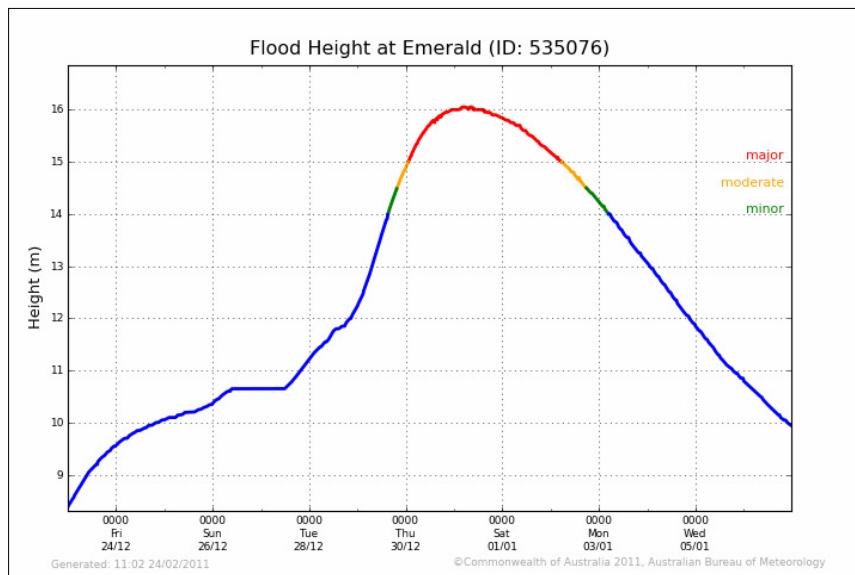


Figure 3.5 Flood heights at Emerald

The first flood caused isolation of many properties, while the second event flooded 1,000 houses, inundated 3,000 properties and all industrial areas. In total 80% of all buildings and properties were

inundated to some extent, with 1,200 people evacuated (out of a population of 14,000). A number of relatively flood free ‘islands’ were isolated for several days (BMT WBM Pty Ltd 2011).

### **3.3 Donald, Victoria**

Donald is located on the Richardson River within the Avoca/Avon-Richardson catchment area and is major town in the Buloke Shire located in the North-West of Victoria, some 300km from Melbourne. According to the ABS Census data (2006), the town has 1,697 residents – 892 females and 805 males and the indigenous population is 18. The largest age group is between 25 and 54 years old (33.0%) followed by the group of 65 years old and over (25.4%). Median household income in Donald is \$613 per week that represents approximately 60% of that in Australia (\$1,027 per week) (ABS 2006 Census). Employment and income opportunity in the Shire is mainly generated from agriculture (Buloke Shire Council 2010).

Donald had been the focus of an earlier NCCARF synthesis case study (Kiem et al 2010) which examined drought impact upon an area that had endured extensive periods of drought. The experience of a small rural community’s adaptation to drought was analysed in order to understand how other communities may deal with extended drought in the future. The big dry or millennium drought had lasted from 1997 to 2010 during which the mean annual rainfall of Donald had decreased by 10%. Earlier severe droughts had afflicted the area between 1895 and 1902 and between 1937 and 1945. The recent longer period of drought had resulted in significant increases in farm and debt, ‘exceptional circumstances’ assistance, and a reduction in income and employment. However, farmers and service providers who were interviewed in Donald and Mildura as part of the study (Kiem et al 2010) cited a complex situation where irrigation and water trading policies associated with the River Murray, along with the closure of the Australian Wheat Board and lower international agricultural commodity prices exacerbated the drought impact. In fact many farmers had reported that they felt they could deal with the drought but not so effectively with these compounding economic factors. Donald and other small towns within rural Victoria are vulnerable to extreme weather conditions, but as the case study shows resilience and community strengths are high with potential for innovation and adaptation.

The shift from drought to high rainfall was sudden. The Victorian summer of 2010/11 was the wettest on record. Extensive areas of northern and central Victoria experienced flooding during January 2011, but floods have occurred in Donald as frequently as droughts, with major floods in 1909, 1918, 1956, 1975 and 1992. During the summer of 2010/11 Buloke Shire which contains Donald and neighbouring communities such as Charlton experienced floods three times, with the most severe occurring in January 2011. Donald's summer rainfall was 375 mm, its previous highest rainfall being 298 mm, contrast and to a summer mean of 82 mm.

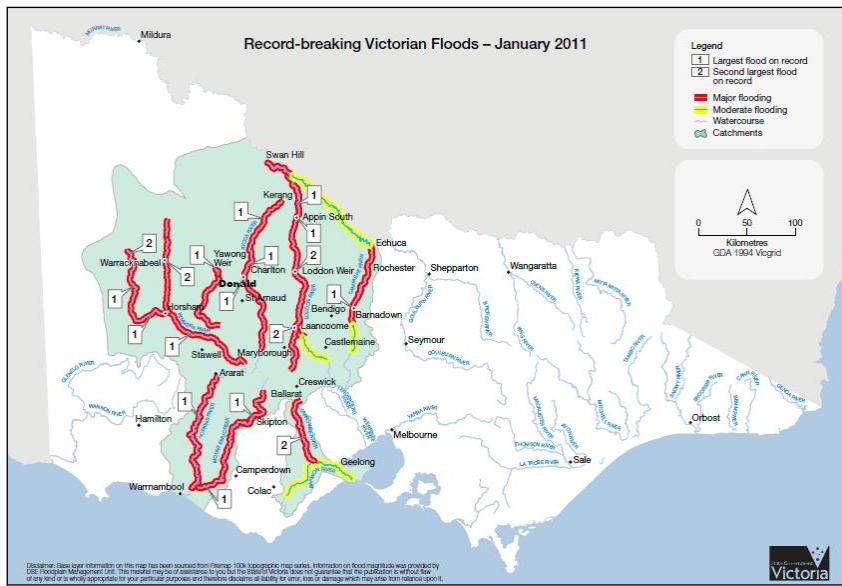


Figure 3.6. Severity of Floods in Victoria in January 2011 (Department of Sustainability and Environment, 2011)

The flooding that commenced on the 13<sup>th</sup> of January 2011 heavily affected the townships in the Shire particularly in Charlton, Donald and Culgoa, causing a large scale damage to the farms in rural areas as well (Buloke Shire 2011). Floods occurred in Donald due to heavy rain between the 12<sup>th</sup> and the 14<sup>th</sup> of January in the Avon-Richardson catchment, which resulted in the highest water levels in the Richardson River since 1909 (Buloke Shire 2011).

In Donald, 2 motels and 13 houses were inundated. Residents in an aged care facility were required to evacuate to other towns due to flooding on site. The flood water across highways that cut the township into half isolated the town from the surrounding towns. Extensive damage to agricultural land and public infrastructure such as roads were generated by the flooding. Inundation of the Charlton sub-station led to power failure in the town for 3 days, causing problems in communication methods including use of mobile phones and the internet, which also occurred in Charlton (Buloke Shire 2011).

## **4. Methods**

### **4.1 Literature review**

Related literature was collected and reviewed including Commonwealth, Victorian and Queensland government reports, policy documents, manuals, newspaper articles, journal papers, web pages and social media.

### **4.2 Data Gathering**

Reconstruction of the flood events and assessment of their overall impact was conducted from data and viewpoints of Bureau of Meteorology (BoM), Emergency Management Queensland (EMQ), State Emergency Services (SES), media and local governments (Brisbane City Council, Central Highlands Regional Council and Buleoke Shire Council) using secondary data, interviews and text analysis of news media. Records of previous and subsequent flood events were also consulted in order to place the 2010/11 floods in context.

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. The research applied a mixed methods approach whereby different qualitative (i.e. face-to-face interviews) and quantitative (i.e. questionnaires) methods contributed to different aspects of the study. These methods are described below.

#### *4.2.1 Data collection via face-to-face interviewing*

**Official interviews** were carried out with emergency management staff, planners, engineers and administrators in Council and State government departments responsible for flood and natural hazard risk reduction. These interviews explored issues of engineering, land use planning, business continuity, management of the 2010/11 flood event crises, lessons learned, changes and adaptations following the floods and the barriers / limits to adaptation. Interviews also gathered data on flood mitigation plans and the potential for buy back schemes.

Official interviews were conducted during the scoping trips to Brisbane and Emerald in January 2011 and at all case study locations during the main component of fieldwork in August and September 2011. Information derived from the scoping analysis was written up in the form of briefing notes and these are presented in Appendix 1. On all occasions, interviews were first conducted with council officials in order to gain a more detailed perspective of the specific impacts within the community. Advice was sought regarding potential target locations and different demographic groups. All survey methods were revealed to officials during these interviews to ensure that they were fully aware of our intentions and purpose. Officials were also asked if there were any specific questions they wanted covered during the study.

**Resident interviews** were conducted at the community level to gain an idea of the household experience before, during and after the flood. During the interview, residents' were prompted to give information on the warnings they received, how they responded, what adjustments they made to their house, the extent of damage to their property and what, if any, adaptations they had made or were planning to make to reduce their future risk. Residents were also asked what they thought were the main things that could be done within the community to reduce the overall risk to flood. More specifically, questions relating to factors enabling or inhibiting adaptation were asked.

Some interviewees were recruited through door-knocking in flood affected communities. Other interviewees were attained using an opportunistic technique – where the initial respondent (council official or resident) suggested others who might be willing to participate in the research (often referred to as snowballing). During the recruitment process, potential respondents were informed that they could decline the invitation to participate in the research and they were assured that if they declined, no further approaches would be made. In addition, respondents were informed during the interview process that they may withdraw from participation at any time, without consequence.

#### *4.2.2 Data collection via questionnaire surveys*

Questionnaire surveys were used at the household level to gather quantitative data from a broader population. The data collected included demographic and socioeconomic characteristics of households, location, house type and ownership type, insurance, adjustments made prior to and during the flood, experience of the flood, adaptation strategies that relate to structural changes, potential for relocation and perception of future flood risk.

Although questionnaires were used to record factual data of impacts and the situation of the respondents, they also garnered information on households' capacity to cope with the 2010/11 events, the implementation of any current changes during the reconstruction phase and views, expectations and plans for further adaptations. Other questions garnered information on respondents' perceptions of government and volunteer organisations' roles in reducing flood risk. More specifically, questions relating to factors enabling or inhibiting adaptation were asked.

In the results, all percentage data are based on questionnaires. Please note: some additional questions were added to the Brisbane and Emerald questionnaire and others were slightly altered. The questionnaires are provided in Appendix 2.

#### *4.2.3 Location specific methods used to collect qualitative and quantitative data*

Although targeted to the flood impacted areas, all effort was taken to ensure representation from people of different socio-economic status and cultural identity. To achieve this, the following measures were taken in each community:

Brisbane –

- Scoping analysis undertaken from 13 to 16 January, 2011 by Deanne Bird and Katharine Haynes
- Field work conducted from 29 August to 4 September, 2011 by Pamela Box and Kate Nairn
- One interview with a local councillor
- One interview with the head of the flood recovery centre
- 16 interviews with local residents
- Interviews ranged in length from 5 minutes to 1 hour
- One community flood recovery meeting
- 62 questionnaires were completed
- Approximately half of all questionnaires were dropped off and collected from residents during fieldwork, which consisted of door-knocking in flood affected areas. Other questionnaires were completed online by residents who had provided their email address to the research team during door-knocking and it is possible that some residents gave the link to family / friends who were also impacted by the floods.

Donald –

- Field work conducted from 6 to 11 August, 2011 by Deanne Bird, Katharine Haynes and Tetsuya Okada
- Four interviews with council members including the mayor
- Two interviews with social workers from a religious organisation
- 10 interviews with local residents
- Interviews ranged in length from 5 minutes to 2 hours
- Data recorded during two meetings with members of the Donald Community Flood Recovery Group
- 53 questionnaires were completed
- Some questionnaires were dropped off and collected from residents during fieldwork, which consisted of door-knocking in flood affected areas. Other questionnaires were completed online by residents who had provided their email address to the research team during door-knocking and it is possible that some residents gave the link to family / friends who were also impacted by the floods. Most questionnaires, however, were distributed to and collected from residents by the Donald Community Flood Recovery Group.

Emerald –

- Scoping analysis undertaken from 10 to 13 January, 2011 by Deanne Bird and Felipe Dimer de Oliveira
- Field work conducted from 22 to 28 August, 2011 by Deanne Bird, Pamela Box, Tetsuya Okada and Matthew Mason
- Four interviews with council and local government members including the mayor
- Four interviews with social workers from government departments and religious charity organisations
- 13 interviews with local residents
- One interview conducted with a local builder involved in rebuilding flood affected homes
- Interviews ranged in length from 5 minutes to 2 hours
- 95 questionnaires were completed
- Questionnaires were dropped off and collected from residents during fieldwork, which consisted of door-knocking in flood affected areas. Other questionnaires were completed online by residents who had provided their email address to the research team during door-knocking and it is possible that some residents gave the link to family / friends who were also impacted by the floods. The Central Highlands Regional Council also provided a link to the online questionnaire on their website and regional ABC radio advertised the research during two of their morning programs.

Demographic data from the household questionnaires are given in Table 4.1.

Table 4.1 Respondent demographics (please note: all data are given as a percentage and not all categories equal 100% due to rounding or instructions for respondents to tick all variables that apply).

	Brisbane	Donald	Emerald
Gender:			
• Male	43.5	52.8	36.6
• Female	56.5	47.2	63.4
Age group:			
• <35 years	20.9	9.6	20.0
• 35-44 years	21.0	3.8	36.8

• 45-54 years	24.2	32.7	20.0
• 55+ years	32.3	53.8	23.2
English <u>not</u> main language spoken at home	9.7	3.8	3.2
Highest achieved education:			
• No formal qualifications	6.5	11.3	12.8
• Higher school certificate or interstate equivalent	17.7	35.8	27.7
• Vocational qualifications	32.3	26.4	36.2
• Bachelor degree	25.8	18.9	19.1
• Postgraduate qualification	14.5	1.9	2.1
• Other	3.2	5.7	2.1
Annual household income:			
• <\$50,000	25.2	52.1	23.1
• \$50,000-\$100,000	29.0	31.3	20.9
• \$100,000-\$150,000	9.7	10.4	23.1
• \$150,000+	16.2	-	20.9
• Don't know / don't want to answer	17.7	6.3	12.1
Working status:			
• Full-time (30+ hrs / wk)	33.9	69.8	52.6
• Part-time (9-29 hrs / wk)	17.0	7.5	25.3
• Looking after house / children / other dependants	12.9	-	8.4
• Retired	22.6	22.6	9.5
• Other	1.6	-	8.5
Respondents who were <u>not</u> working, or <u>did not</u> have a family member working, as a paid or volunteer member of any emergency services group, community group, council and/or government organisation	83.9	49.1	75.8
Composition of household:			
• Couple with children or other dependents	45.2	39.6	46.8
• One adult with children or other dependents	-	-	7.4
• Couple without children or other dependents	25.8	34.0	23.4
• One person household	12.9	9.4	9.6
• Shared house with other adults	11.3	5.7	10.6
• Other (including aged care facility)	1.6	11.3	2.1
Respondents who themselves, or someone within their household, requires assistance due to disability or long-term injury/illness	9.7	13.2	7.4
Housing status at time of flood:			
• Owned/mortgage	80.6	80.8	72.5
• Renting	12.9	5.8	20.9
• Living in work funded accommodation/government funded accommodation/with family or friends/other	3.2	13.4	6.6
Structure of house:			
• Single storey house (not raised on stumps / stilts)	11.7	38.5	53.8
• Single storey house (raised on stumps / stilts)	31.7	40.4	23.1
• Multiple storey house or duplex	53.3	3.8	11.0
• Unit ground floor or single storey duplex	1.7	5.8	8.8
• Other	1.7	11.5	3.3
Length of time lived at this address:			
• < 1 year	13.1	9.6	22.3
• 1-5 years	19.7	15.4	26.7
• 5-10 years	26.2	23.1	24.5
• 10-20 years	19.7	11.5	19.1
• 20+ years	21.3	40.4	7.4
Length of time lived within this council region:			
• < 1 year	6.6	1.9	5.3
• 1-5 years	4.9	-	19.2
• 5-10 years	14.8	7.7	13.8

• 10-20 years	4.6	5.8	24.5
• 20+ years	49.2	84.6	37.2

#### 4.2.4 Specific demographic details of the three suburbs surveyed in Brisbane

In Brisbane the suburbs of Chelmer, Graceville, Tennyson, and Rocklea were surveyed. These suburbs were chosen following discussion with officials at the Department of Communities - Communities, Child Safety, Youth and Families, as residents within each represent a variety of demographic groups.

Located southwest of the city centre, on the south side of the Brisbane River, the four suburbs vary socioeconomically. For example, according to ABS data (2006), the average annual income of Chelmer is \$53,421, whereas it is \$46,020 in Graceville, \$35,427 in Rocklea, and \$40,287 in Tennyson. By suburb, 27.4% of survey respondents were from Chelmer, 21.0% in Rocklea, 19.4% in Tennyson, 16.1% in Graceville, and 16.1% did not indicate. Of the survey respondents who indicated they spoke a language other than English at home, 33% were in Rocklea, 16.7% each in Chelmer and Graceville, and 33% did not indicate their suburb. This is somewhat reflective of the actual demographics of the suburbs, with the 2006 census putting the percentage of residents speaking a language other than English at home at 22.5%, compared to 6.1% and 6.6% for Chelmer and Graceville respectively.

Topographically, Rocklea is a low lying and flat area, while the other three suburbs have a mix of high and low ground, resulting in many streets flooding at one end or on one side but not the other. One resident of Chelmer said: "*our geography is our worst enemy here.*"

### 4.3 End-of-project workshop

The final stage of the research entailed an end-of-project workshop to report our findings and discuss their implications with a stakeholder / reference group. This workshop was held on Tuesday 6 December 2011 and the group consisted of officials from Emergency Management Queensland and Queensland Government Department of Community Safety; Urban Research Programme, Griffith University; Bureau of Meteorology, Queensland; Emergency Management Capability Development Branch, Attorney-General's Department; Queensland Government Department of Communities - Communities, Child Safety, Youth and Families; Australian Emergency Management Institute and the National Climate Change Adaptation Research Facility. Also invited but unable to attend were members of the Central Highlands Regional Council (Emerald) and the Donald Community Flood Recovery Group.

Discussions during this workshop helped frame the discussions presented in Chapter 9 of this report.

## 5. Case study results: Brisbane, Queensland

### 5.1 Experience and effects of the flood

#### 5.1.1 Personal experience of the flood and adjustments made

At the time of the flood, most respondents were living in a single storey house raised on stumps / stilts or in a multistorey building (85%) and 73.3% were aware that their home was vulnerable to flood when they bought the place or began living there. Prior to the 2011 event, many residents raised household items off floor, moved household items to a safer location and followed warning advice (Table 5.1). The number of residents who devised an evacuation plan, prepared an evacuation kit, sandbagged their house or cleared their drains was notably small.

Table 5.1. Percent of respondents that made adjustments to help protect their family and home from flood prior to the 2011 flood event.

	%
Devised an evacuation plan	22.6
Prepared an evacuation kit	12.9
Followed warning advice on radio/television/internet	41.9
Sandbagged house	12.9
Built temporary flood barriers around property	0.0
Kept drainage clear of debris	8.1
Raise household items off floor	64.5
Moved household items to a safe place	61.3

Most respondents (75.8%) indicated that nothing had prevented them from making adjustments. Those that differed in opinion cited issues of a lack of clear and timely information as a barrier to preparing for the flood. One respondent commented: “[S]hockingly poor information - did not get told that at 10:30pm on the Tuesday night that dam would be opened to full open. Someone must have known days earlier this was going to occur so WHY WEREN’T WE TOLD!” Other residents noted access to storage space, sandbags, and manpower were limited, while one resident wrote: “as we are both old, it is too hard for us to lift everything”. In comparison, some residents began making preparations when Toowoomba flooded.

Two interviewees – one resident and one builder, specifically stated they had begun preparing for a potential flood late the week before based on the predictions of higher than average rainfall. Both said neighbours had dismissed them as ‘overreacting’. While the resident’s house was completely destroyed by the flood, at the time of the fieldwork, the builder was finishing rebuilding their house while the rest of the street still had significant damage. In interviews, residents in both Chelmer and Rocklea indicated they had returned early from holidays to prepare for the flood, but this was only in the immediate lead up to the flood and was to enable them to move household goods to a safe place.

While the flood itself was a negative experience, most people were positive about the response of the local community during and after the flood, talking of neighbours offering help, allowing furniture and possessions from flooded homes to be stored on their properties, assisting in evacuations, protecting / keeping an eye on properties, etc. The head of the flood recovery centre described the attitude succinctly, saying: “People want to help someone else; they just need

*permission to do it. And the floods gave people permission to go to their neighbour and say, is there something I can do for you?"*

That feeling of community strength and pulling together was most strikingly demonstrated in the 'Wall of Thanks' at the Fairfield shopping centre (Fig. 5.1). While the flood experience was negative and many in the community had various concerns about how the floods had been handled, the resilience of the local community is an encouraging sign.

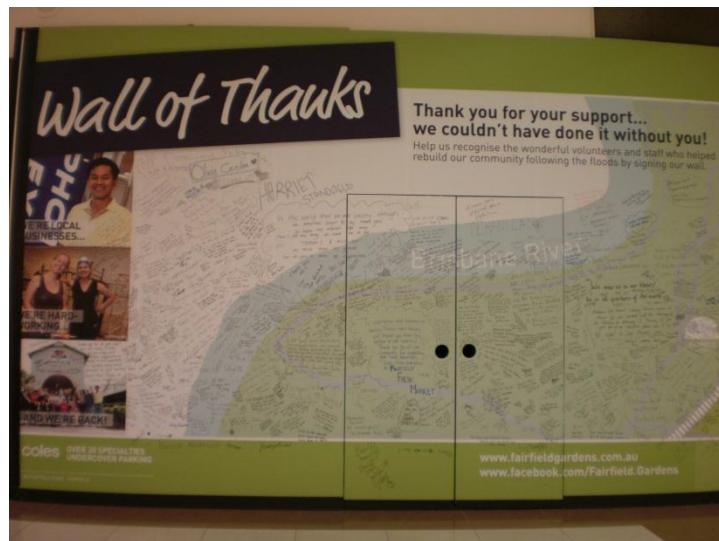


Figure 5.1 The 'Wall of Thanks' at Fairfield shopping centre, with signatures of local residents and business owners. It was put up over two shops that were not ready to open when the centre reopened, and is to remain as recognition of the volunteers and actions of the community in rebuilding the centre and neighbourhood.

Respondents were positive about the number of volunteers – the so called 'Mud Army' – on the first two weekends after the flood (Text box 5.1). Even residents who were critical of the council itself felt their organisation of so many volunteers was very good. However, concerns were raised over the lack of organisation or structure on the ground and the consequent feeling of a lack of control in many residents over what happened to their possessions.

Text box 5.1 A Chelmer resident talks about the volunteers who came after the flood and the lack of awareness of the still ongoing repairs in the wider community.

*"It was amazing the number of people here when it all first happened. It was fantastic in fact. I think it was a really good thing for a lot of people to be able to contribute because they found that they felt so good doing it, and so you had that lovely community feeling that's, really so largely lost, you know, when you live in a city environment. You just lose it and suddenly it was there, it was really good but, it goes then. People pack up and leave, as they must, go back to their lives well, people are shocked when they come and see what's going on, they've got no idea. And even drive through and, other than the amount of trades people's cars, there's no other real indication. If you walk along and you peer in you can see signs, but if you actually drive through there's really no indication."*

The flood recovery centre received frequent donations (Text box 5.2) and an official mentioned a website called 'Givit' ([www.givit.org.au](http://www.givit.org.au)), which allows people to donate goods to those in need, and 'Baked Relief', ([www.bakedrelief.org](http://www.bakedrelief.org)), set up by a Brisbane mother who could not volunteer in the

clean up and so instead organised to cook cakes, etc, for people involved in the clean up. Baked Relief has also operated in other post-disaster locations, such as New Zealand and Japan. Some spoke of friends donating plants to flood-affected residents as a contribution to restoring their gardens. Stories like this were not uncommon to hear, and were greatly appreciated by residents. There was a clear trend of people offering assistance using whatever goods or abilities they had. The most interesting story, related by the head of the flood recovery centre, was of a former car thief using his ability to hotwire cars to move vehicles from the Rocklea markets site to Yeronga School on higher ground. One Rocklea resident said he was so overwhelmed with volunteers coming every day from various community and religious groups that eventually: “*you had to tell the volunteers to go away*”.

Text box 5.2 The head of the local flood recovery group discusses the donations they received in the immediate aftermath of the flood.

*“We had people sending stuff. One of our families at the school moved to Japan, and they got on Coles online and ordered a great big order of everything that I’d put on my list and just had it delivered. So it was really, it was amazing just the bits and pieces. Kids would come in and so oh, you know, I used my pocket money to buy, you know, I saw you needed, Weet Bix and cornflakes so I’ve done that. So it was really amazing. There were kids with lemonade stands everywhere all around the neighbourhood trying to raise money, and it was really, it was yeah. That side of it was fantastic and the volunteers, you know they just came out of the woodwork... Facebook and twitter made it so much easier this time that you could, I could post on our Facebook site what we needed, and people would just arrive in the door with it, you’d hardly have it up. And then next minute, you know, someone would arrive with spaghetti Bolognese for the afternoon. So it was really quite amazing.”*

A common complaint, however, was a lack of SES and council presence during the floods. A number of residents stated they saw no SES officers during the floods, including one person interviewed in Rocklea who had called the SES asking them to come and evacuate her family. The family were eventually rescued by neighbours. This lack of SES and council presence has led to a widespread feeling of dissatisfaction with how the floods were handled. While Brisbane City Council publishes flood information and maps on their website, the availability of information was a concern, with many people stating it was not clear or they didn’t know where to find it. People were also concerned about the lack of specific information for their location, such as one Chelmer resident who didn’t hear her suburb mentioned as being at risk so she assumed she was fine. The local councillor also said that she herself was unaware of much of what the council was doing and that councillors were not privy to decisions being made. She felt that councillors need to be more included, as residents turn to them for advice and information, yet they were no more informed. The running of flood evacuation and recovery centres was also criticised by the flood recovery official as there was a lack of clarity or guidance from council about what requirements there were for running such a centre, resulting in some confusion on the ground.

### *5.1.2 Impacts of the flood on house and property*

A significant proportion of respondents believed that their building structure (42.4%), property (39.0%) and house contents (33.9%) suffered major impacts and a further 13.6% indicated that their house contents had been completely destroyed (Table 5.2). The level of damage is also notable, with over 50.0% of respondents stating their houses had been impacted to a depth of at least 100cm.

Table 5.2 Respondents' perception of the degree of impact

	Not Impacted	Minor Impacts	Moderate Impacts	Major Impacts	Completely Destroyed	N/A
House contents	25.4	10.2	15.3	33.9	13.6	1.7
Building structure	13.6	11.9	28.8	42.4	1.7	1.7
Property/yard	5.1	15.3	30.5	39.0	8.5	1.7
Own business	18.8	10.4	6.3	14.6	6.3	43.8

The owner of a house dubbed the 'Mud House' (Fig 5.2) said they required 65 volunteers to empty their house, and removing the mud took two fire truck teams six hours, resulting in three dump trucks of mud. While it was the most severely damaged property seen in the survey area, significant damage was by no means unusual.



Figures 5.2 Interior damage at a property dubbed by the owners 'The Mud House'. Due to the severity of the damage to the structural integrity of the property, the house was due for demolition shortly after the survey was undertaken. The owners had not demolished their house earlier as they were awaiting the outcome of an insurance decision.

A large amount of damage was still evident at the time of the field work (Fig 5.3), along with a lot of rebuilding. In total, 86.4% of respondents have had to or will have to carry out repairs to their properties and at the time of the survey, 56.0% of properties either had not completed or had not started rebuilding.

77.4% of respondents evacuated their property, and of those, 15.1% had not yet permanently returned. Those that had returned were out of their homes for between three days to over seven months. Some respondents who had yet to return estimated they would be returning soon after the survey period (i.e. late September), while others estimated it would be as late as mid-2012 (Text box 5.3). The time taken to rebuild was a concern for many, both for practical and emotional reasons. One Chelmer resident stated: "*this is what none of us realised, how long it would take or the extent of the damage.*" Another resident said the rebuilding and recovery process after the 1974 flood took 15 years, and he expects it to be similar for this flood.



Figure 5.3 Left-hand photo shows flood damage in Tennyson. The ground floor of this house has been gutted. The height of the flood can be clearly seen on the garage door. Right-hand photo shows an abandoned house in Rocklea, with waist high grass and mail falling out of the mailbox.

Text box 5.3 The local councillor discusses how she thinks the repairs are going, and her concerns about the small but significant number of residents and properties that do not appear to be making any progress.

*"I would say, just to give you an idea of where we're at now, we're, what 7 months after the flood? 8 months? Generally I would say to you that 50% of people are back in their homes, this is just my anecdotal observation, about 50% of people are back in their homes. There is a huge amount of building work underway at the moment. I would think that - and they're hoping to be back by Christmas so, you know, I'd be hopeful that we can get to 70% home by Christmas. Another 20% just because the insurance companies are slow or the tradies slow, or whatever it might be, that recovery will happen, but will probably roll into 2012 calendar year, so it's just going to take time. Um but there is clearly a small percentage, so less than 10%, just round figures, of homes that, clearly are not progressing – there's no one in them, they've been abandoned, and, I'm concerned that they may never recover."*

#### 5.1.3 Impacts of the flood on personal wellbeing

The psychological and emotional impacts of the flood were still very evident in discussions with residents, particularly for those who had yet to return permanently to their home (Text box 5.4). Other health impacts were also reported in both the interviews and the surveys, with respondents reporting respiratory problems, asthma, and issues with mould and damp-related illness.

Text box 5.4 The head of the flood recovery centre discussing the psychological and emotional impacts of the flood

*"I think every milestone that people pass, it's just, they're not back in their home or their house isn't how they want it, and it, you know they go, oh well, by spring we'll be back in the home, and then yesterday was spring. So it sort of does that. You know, I think every date that comes along people have got, have had an expectation of where they'll be. And when they don't meet that goal, then, it's hard to do that. Cause really, you know, if you would've asked me in January do you think that we'd still be running now, there is no way that I would have thought. And even the psychologist said yesterday, she thought the 6 month period, most people would be over it. You know, ok, I'm back into it. And she said it's actually getting worse. You know, people are, they're just not hitting those goals"*

*that they set. You know, like most people said 6 months I'll be back in, and you know some of them, they haven't even started yet."*

The impact on people's emotional wellbeing was a recurrent theme with the process of trying to recover described by one resident as "*creating a new normal*". People have heard stories of suicides or people just 'not being the same' after the flood, with a Rocklea resident, stating "*I'm messed up*". One Chelmer resident who has been particularly involved in the flood recovery said: "*there's been at least 3 suicides that they can directly attribute to the flood just in this western suburbs area.*"

The flood recovery centre sees more people when it rains, as people return to somewhere they know is safe. They also get many people around major milestones – 6 months after the flood, a new month, the beginning of spring, etc – as people struggle with not having reached the milestones they'd hoped to reach, such as beginning or completing rebuilding.

The struggles and stresses on relationships were described by many residents. One man, a Chelmer resident who had no downstairs walls for 6 months, described the slow rebuilding process as "*depressing*" and "*a long haul*". Other residents talked about the stress it has caused them, fears their children feel when it rains, and even pets getting anxious when it rains. A few residents also raised concerns about what the impact of a possible future flood would be, with some voicing the opinion that a flood in the next 5 or so years would 'destroy' many people.

Some interviewees made references to having heard of family breakdowns resulting from the flood, and residents in Chelmer and Graceville both indicated they were aware of a higher incidence of domestic violence. Nevertheless, residents indicated that their relationships with family and friends were largely unchanged (86.0%) (Fig 5.4). The highest reported negative impacts were on happiness (44.1%) and financial status (46.6%). Very few respondents listed any positive wellbeing changes but there were a couple who felt it had brought them closer to family and friends: "*We have become very close to some of our neighbours who were also flooded*".

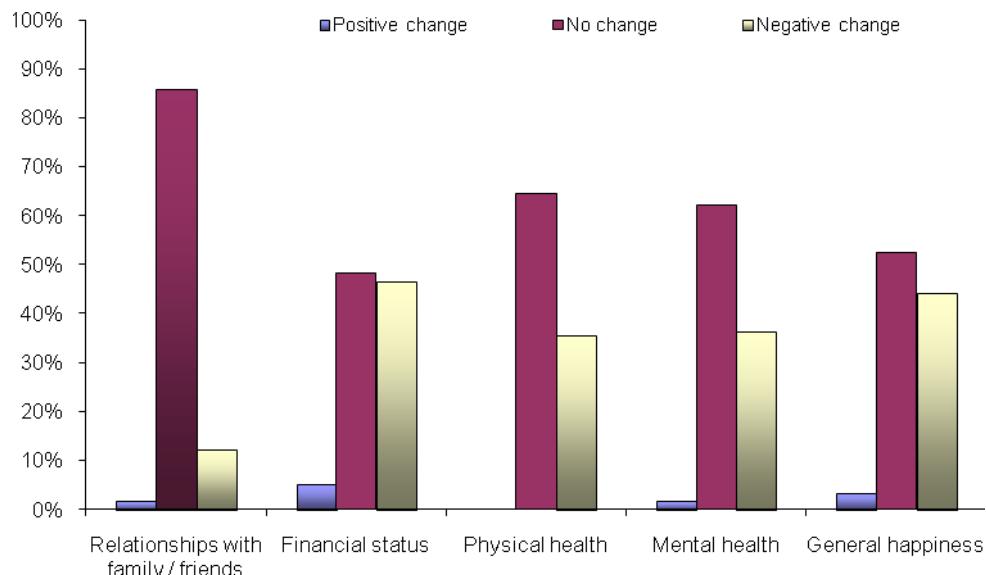


Figure 5.4 Changes to wellbeing – on a scale from very bad to very good, respondents were asked to rate their relationships with family / friends, financial status, physical health, mental health, and general happiness at the time before the flood and at present.

The loss of sentimental personal items was deeply felt by many respondents. The head of the flood recovery centre recounted stories of people with boxes of soggy photos that are now ruined. She described people as feeling “*disconnected*”, and recounted the story of an elderly woman who lost a kettle that had belonged to her grandmother and every morning she turned the new kettle on was a reminder that that part of history is now gone. Others spoke of lost jewellery they were the ‘custodian’ of, of heirlooms they had not been able to save, with one Rocklea resident saying he felt it was ‘silly’ he cared about those material things, but that they were important to him.

As the Brisbane study area covers four suburbs, the results were also analysed on a suburb basis (Table 5.3). The only suburb where less than half of respondents indicated negative wellbeing impacts is Rocklea, which also reflects a lower socio-economic demographic. Results analysed by income present a similar result, with those on incomes below \$50,000 per annum reporting the lowest wellbeing impacts at 60.0%, while 100% respondents with incomes between \$100,000 and \$150,000 reported their wellbeing had been impacted negatively.

Table 5.3 Reported negative impact on wellbeing by suburb

Suburb	Negative change to at least one factor	No negative changes to any factor
Chelmer	64.7	35.3
Graceville	90.0	10.0
Tennyson	53.8	46.1
Rocklea	38.5	61.5
Total	60.4	39.6

Women reported a slightly higher negative impact on their wellbeing at 62.9% compared to 55.6% for men. Respondents aged 35 to 44 or over 60 were significantly more likely to report negative impacts on their wellbeing, at 77.8% and 76.9% respectively. Those aged under 35 were the least likely to report negative wellbeing impacts, at only 35.3%. Those who were not aware of their flood vulnerability reported more impacts on their wellbeing at 64.3%, but this result was only slightly higher than those who were aware of their vulnerability (59.1%), suggesting awareness of flood risk had little bearing on wellbeing.

## 5.2 Underlying vulnerability and constraints to recovery

### 5.2.1 Town planning in flood prone areas and mitigation measures.

There was a widespread feeling that the council and state government has few options in the way of mitigation measures within the city, as so much of the city and flood prone land is already developed. However, development in flood prone areas was raised by a number of residents, with some feeling that if an area is flood prone no development should be allowed there. One resident in Chelmer commented that the building of riverside homes after 1974 directly ignored the risk of flood.

Town planning issues were raised not just in relation to the suburbs surveyed, but other areas developed since the 1974 flood. For example, a resident of Rocklea said he felt that the Ipswich Highway and developments in the area were: “*contrary to the town plan*”. Others highlighted the types of houses being constructed, i.e. slab-on-ground construction in flood prone areas rather than the traditional Queenslander style, as well as infill under new developments and so diverting water into neighbouring properties causing flooding, an approach described by one resident as the: “*flood your neighbour policy*”. Houses had already been required to be built above the 1933 flood height

(for those built prior to 1974) or above the 1974 or Q100 height (those built after 1974). Many people felt this should have meant their houses were not vulnerable to flood.

Multiple residents talked of being ‘assured’ that Wivenhoe would prevent any possible floods, and subsequently felt they had been lied to about the potential for flood. One resident interviewed in Chelmer said she would not refer to the flood as a ‘natural’ disaster, “*because I’m really sceptical about Wivenhoe and water releases and mismanagement there.*” The capacity of Wivenhoe and Somerset Dams was raised as a concern, with many people feeling that the water levels should not have been maintained so high.

### 5.2.2 Insurance

Overall, 33.3% of Brisbane respondents thought their insurance covered them for all types of flood, but only 24.6% of respondents knew their insurance covered them for all types of flood (Fig 5.5). Of those who thought they had full insurance cover, most were mid-high household income earners (> \$100,000) (57.1%), aged between 35 and 44 years (50.0%) and had lived in the wider Brisbane City Council area for more than 20 years (39.3%). In contrast, only a quarter of those in lower income brackets were unsure about their insurance cover, with the majority being aware what their insurance did or did not cover them.

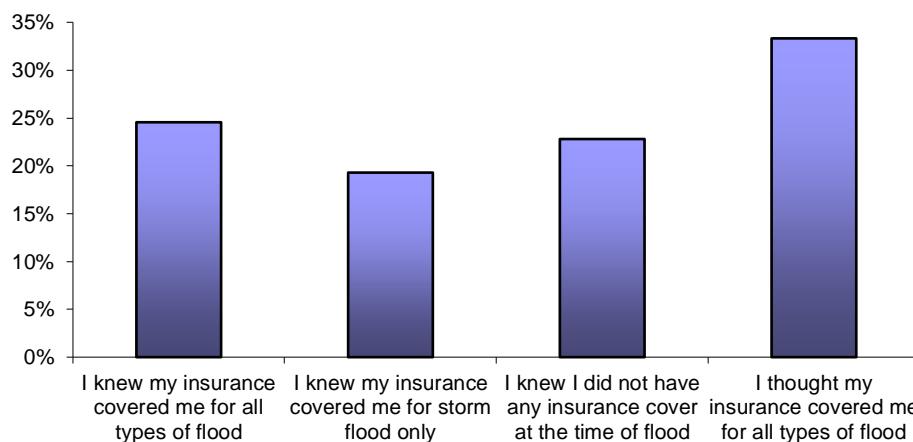


Figure 5.5 Knowledge of insurance cover prior to the flood

The length of time living at their current address did not have any significant impact on knowing what their insurance covered, with 66.7% of those who had lived at their location less than 2 years aware of what their insurance covered (whether it was full cover, storm flood only or no cover), and 65.2% of those who had been resident between 2 and 10 years, and 68.0% for more than 10 years. Interestingly, only 8.3% respondents aged between 35 and 44 years actually knew they had full cover. All suburbs except Graceville had residents with full insurance cover. Residents in Chelmer were most likely to have full insurance cover, at 40.0% of respondents, with those in Graceville most likely to have thought they had full insurance cover, at 44.4%. Renters were significantly less likely to have flood insurance (11.1%) than those who owned their home or had a mortgage (27.1%). Most renters (55.6%) knew their insurance did not cover them for flood.

The cost of insurance did come up as a reason for not having insurance, as well as for choosing cheaper policies and others believed that flood insurance was not available to them. Several residents looked into flood insurance but decided the cost was prohibitive while others tried to

purchase flood insurance in the immediate lead up to the floods, but were told that there was a ban on new flood policies. One resident in Rocklea said he had attempted to take out flood insurance in the years before the flood, but only one insurer would offer such cover at his location, and the cost of the premiums (\$6,000) was prohibitively expensive for his family. Some respondents admitted to not reading their Product Disclosure Statement in full. This issue was discussed at length during the flood community meeting, where residents also raised the lack of clear language in insurance policies as a concern (Fig 5.6). The point was made, however, that detail may be contained in the Product Disclosure Statements of insurance policies, and that it is necessary to be aware of that information.



Figure 5.6 Left-hand photo shows a banner on home in Graceville that had their insurance claim rejected on the basis that their policy excluded flood. Right-hand photo shows a banner on home in Chelmer whose insurance claim was rejected.

People's opinions of insurers were generally very negative, with interviewees describing them as: "*bastards*", "*thieving mongrel lousy guys*", "*pathetic*" and "*morally corrupt*". One resident commented at the flood community meeting that: "*the flood was bad, dealing with insurance was 1,000 times worse*". Even the councillor was highly critical of the insurance response, saying: "*The insurance companies are pricks – and you can quote me on that*", while another resident summed up the general feeling quite succinctly, saying: "*insurance isn't insurance*." A number of residents specifically highlighted the differing definitions of flood for insurance purposes as a concern, with one Graceville builder saying: "*I think it's a rort, the whole types of flood, sort of stuff. A flood's a flood, water rising is water rising, it doesn't matter where it comes from, it's still gonna go up.*"

Insurance decisions have been slow, which has resulted in a delay of much of the rebuilding. Those who moved back into their homes sooner knew they had no insurance cover and therefore had no choice but to "*get on with it*" and begin rebuilding. Some of those surveyed were still in negotiation with their insurance companies about decisions and flood definitions, or are considering challenging decisions. The approach of insurers to assess the cause of damage was a concern for a number of residents who felt the assessments were not detailed or location specific. One resident in Chelmer said: "*People right on the river are in our area, people two streets back, that didn't even get water in their driveway are in our area, and I just think it's a bit of a cheap shot.*"

### *5.2.3 Structural changes to buildings as a result of risk knowledge*

A lack of awareness of flood risk was evident in some residents' responses, due both to the long amount of time since Brisbane was last flooded and a belief that Wivenhoe Dam would prevent any potential flooding. Therefore, some people did not consider there to be a need to make any changes to their property. However, a significant percentage of residents recognised that they lived in a flood prone area and felt flood events were inevitable and those living in low lying or riverfront areas should also be aware of the risk.

When surveyed, 72.6% of respondents said they had not previously experienced flood at any address they lived at. Of those with previous flood experience, 50% specified that they had experienced the 1974 flood. A higher number of residents who had past flood experience had full insurance coverage (31.3%) than those who had no flood experience (22.0%). A few residents did mention their awareness of the city's flood history, including the much more severe 1893 flood, including one Graceville builder, but knowledge of Brisbane's long-term flood history was relatively low. While some people did know about or remember 1974, with 11.2% of respondents having experienced the 1974 Brisbane flood, many others were either unaware or thought it would not happen again. Preconceptions or assumptions about the role and capacity of Wivenhoe were again raised as a reason for this.

It was therefore not surprising to learn that only 6.5% of residents said they had chosen to live in a house that was outside of the flood hazard zone. While a handful of residents did say they had done land searches to check if their property was flood prone, others assumed the position of their house (height, distance from river) meant they were not at risk. At least one respondent felt the information found in their property search was misleading (Text box 5.5). The availability of flood information even when residents requested it was variable, with one builder, a resident of Graceville, being told his property had no history of flood as the property had been subdivided since the 1974 flood and was, in essence, two new blocks. People in Rocklea showed a greater awareness of flood risk as that suburb has suffered infrequent minor flooding in the past.

Text box 5.5. One resident voices her anger at what she sees as having been misleading information from the council.

*"We bought this house with the understanding that Wivenhoe would protect it, would protect here. Like we did all the searches really carefully before we bought, and the very worst it was only supposed to go into that very downstairs area which is a granny flat so we were fine with that. And that was like meant to be a 100 year flood, like the very worst. And so I would just never trust the government again, so I assume the house is going to be flooded again, so I don't want to be here."*

#### *5.2.4 Other factors adding to vulnerability and impeding recovery*

Wivenhoe Dam was a particularly controversial issue for many residents, with regards to its dual roles for flood mitigation and water supply. The lack of extra dams and the decision to keep water levels high in case of future drought was criticised. Some raised concerns about Wivenhoe's structural stability, as they felt predictions of its capacity were based on false assumptions, and that if they proved inaccurate there would be a 'tsunami' through Brisbane.

Issues of funding and rebuilding costs recurred frequently, not only in relation to insurance cover, but also access to various sources of relief funding, both government and charitable. The Premier's Relief Fund was means tested and not available to those with incomes above \$150,000 or to renters or investors, so a number of respondents did not qualify for support, adding to financial strain on some families. One interviewee said "*the means testing for assistance I think it's quite appalling. You know, it should be on your hardship*". A number of residents said they thought the way the relief fund was handled, and particularly the means testing, would dissuade people from giving to similar appeals in future disasters. A Graceville resident recounted that a friend working in the relief fund call centre had received numerous calls from people wanting to get their money back because they disagreed with the means testing. Another resident spoke of the 'humiliation' of not getting an insurance payout, not qualifying for the Premier's Relief Fund and having a charity representative

tell her that they would not receive assistance because they were too wealthy. Despite the dissatisfaction of some, others supported means testing not just for the Premier's Relief Fund, but also for other payments.

Oxley Creek was raised as a concern both by residents and the local councillor. The Creek flows into Brisbane River facing upstream and so residents in Tennyson and Rocklea are flooded by the backup. This causes further and more severe flooding in those two suburbs. The age and capacity of storm water drains was also of concern to many residents. A few streets in Chelmer and Graceville had very specific complaints about stormwater drains that were blocked or overflowed, causing or contributing to local flooding. Both residents and the local councillor discussed the need for backflow valves in some of the lower-lying areas.

Residents who choose to sell have also faced a drop in house price following the flood, creating greater financial loss or risk. One builder said that the houses on the top of the hill had risen in value by \$100,000, and those at the bottom of the hill had dropped by the same amount. Despite this, numerous 'For Sale' signs were seen in the case study area. For those who are staying, much of their sentimental possessions have been lost, either through the flood impacts directly, or during the clean-up after the flood. Both of these factors weighed down their recovery.

### **5.3 Adaptation and risk reduction**

#### *5.3.1 Household adaptations*

Almost two-thirds of respondents (65.8%) said they would not or were unlikely to make changes as a result of the flood (Table 5.4) and 26.4% of respondents stated that they have made or are likely to make changes. Half of all respondents stated they were either likely, very likely, or already had modified their insurance policies. However, the cost of insurance was prohibitive for some residents before the floods, and the likelihood of premium rises means some residents will continue to see it as too expensive, if at all available. Those residents who had suffered major impacts on at least one of the following: house contents, structure, yard, or business; scored slightly higher on likelihood of making or having made changes, at 27.8%, compared to 23.2% for those whose properties suffered no major impacts.

All builders surveyed said that changes have been minimal, with many people opting to just rebuild, but one builder estimated 50% of people were making some sort of change, even if just choosing tiles rather than carpet. When interviewees were asked about changes they had made to their houses during rebuilding, many talked about general home renovations, with one resident saying: "*The house will look better than it ever did before!*", but fewer discussed using flood proof / flood resilient materials. However, the most common response revealed during interviewing was replacing carpets with floorboards or tiles, which corresponds to the builder's suggestion above.

In spite of the above results, observations in flood affected neighbourhoods revealed that many houses are being raised where possible but a lot of newer developments (i.e. recent decades) consist of slab-on-ground construction and therefore cannot be raised. One respondent commented that the only options for people in low-lying areas near the river were to: "*either not live here or be miles up in the air*". He was fairly dismissive of nearby residents who had chosen to raise their houses, particularly as both the 1974 and 1893 floods had been significantly higher. Others believed it was foolish to raise homes to such a level due to aesthetic reasons (Fig 5.7) with one resident commenting: "*we contemplated for about 3 minutes going up higher, and then we realised that's*

*just ridiculous because we're already stumped at the Q100 level as it was, to go up another, we would have to go up another 1.7 metres [to meet council requirements]".*

Table 5.4. Responses to the question: "Have you, or how likely are you, to make the following changes as a result of the 2011 flood?" All data are given as a percentage

	Not at all likely	Unlikely	Undecided	Likely	Very likely	Already done	N/A
Permanently move to a flood safe location	34.0	28.0	12.0	0.0	18.0	2.0	6.0
Raise level of home	52.2	15.2	6.5	2.2	4.3	0.0	19.6
Change exterior and/or interior design e.g. use flood proof materials	40.0	20.0	2.2	8.9	17.8	2.2	8.9
Move electricity outlets/meter boxes higher	44.2	11.6	11.6	9.3	4.7	7.0	11.6
Move air conditioning unit higher	34.1	14.6	4.9	9.8	12.2	2.4	22.0
Anchor water tanks to the ground	38.1	7.1	7.1	2.4	9.5	2.4	33.3
Improve garden drainage	41.5	7.3	7.3	4.9	17.1	4.9	17.1
Build permanent flood barriers around property	60.5	14.0	2.3	0.0	4.7	0.0	18.6
Modify insurance policy	22.0	8.0	10.0	12.0	22.0	16.0	10.0
OVERALL	65.8		7.8		26.4		20.2



Figure 5.7 Left-hand photo shows raised houses in Rocklea. The truck parked in front of the right-hand house gives a perspective of how high these houses have been raised. Right-hand photo shows a house being raised in Tennyson. The height to which the flood had affected the house is visible just below the windows.

Many houses are either still empty or completely abandoned as people have yet to receive a decision from their insurer, cannot afford to rebuild, or just do not want to return. More empty houses were seen in Tennyson and Rocklea, with the fewest seen in Chelmer, where there was much more rebuilding taking place. Rocklea has a higher proportion of rental properties, so there were places where the property owner had yet to rebuild. One person (spoken to but did not complete the survey) told us his tenants had moved out, he did not qualify for any relief funds, and so was

trying to rebuild the property himself. Chelmer and Graceville had a higher proportion of owner-occupied houses.

People were specifically asked about their attitudes towards relocation to a flood safe environment. This question relates to the retreat policy, and has enormous implications for migration and shifts in the city and regional economy. The clear absence of people in the suburbs where the study took place; some directly away from their houses while they waited for insurance settlements and repair work, but others who had probably already relocated to other suburbs or towns. A number of respondents gave examples of properties they knew to now be empty. The potential for relocation is a significant adaptation strategy, so the fact that 18% of those who were interviewed while resident in the flood zone, felt that it was likely that they would relocate to a flood safe location, adds to the size of the population that may eventually be displaced by this event. Such a proportion is socially, economically and demographically significant. When looking at the demographic data, it reveals that those respondents most likely to relocate were aged between 25-34 years, had vocational qualifications, an annual household income of \$75-\$150k and were couples with children or other dependents.

A level of complacency, or lack of realism, may be concluded from some of the proportions of responses considering such repeat floods being unlikely at timescales of 50 and 100 years. However, in relation to the potential for population relocation it is significant that 9.7% think another such flood is likely in just one year, and 27.4% in ten years. Surprisingly, it was those who were undecided about the likelihood of a flood in the next 10 years who were the most likely to be planning to make changes to reduce their properties' flood risk. However, there is little consistency between peoples' perception of future flood risk and their decisions about making changes to their properties (Fig 5.8).

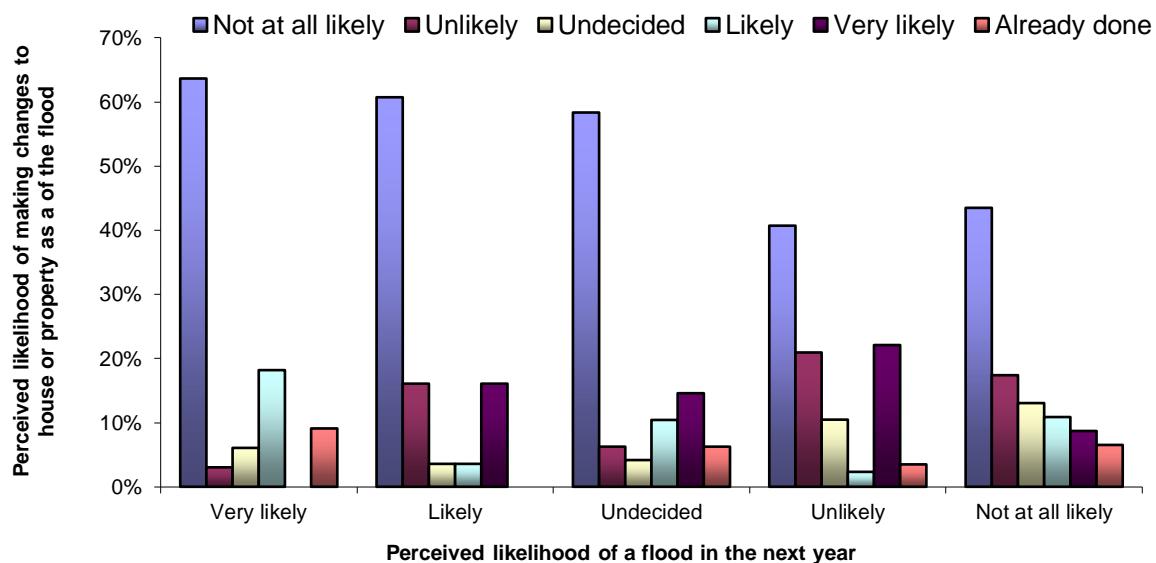


Figure 5.8 Distribution of the perceived likelihood of making some element of change to house or property for a given perception of the likelihood of a flood in the next 10 years

The cost of building in a way that would reduce flood risk – either by raising the property or using flood proof materials – was raised as a barrier by many respondents. Some homes have been completely demolished due to structural damage, such as the owners of the Mud House, who received a partial payout from their insurer but it was not enough to cover the costs and they have had to borrow money from family members. Another family received an insurance payout but well

below the cost of repairs, as their house had contained extensive asbestos which needed to be replaced.

### 5.3.2 Public attitudes to council and government responses to flood mitigation

The survey gave residents the opportunity to name three things that could best reduce the risk of flood in their area. The most common responses were related to the dams, particularly the management of Wivenhoe Dam and its dual roles of flood mitigation and water supply. The capacity of Wivenhoe and Somerset Dams was raised, with many people feeling that the water levels should not have been maintained so high. Some also suggested building more dams, both as flood control on the Bremer River and for water supply. Broken down by suburb, the majority of responses about the dam were from residents of Chelmer and Tennyson, showing that issues surrounding the dam are evidently of greater importance to the two most riverfront suburbs.

The need for council or government works or intervention was listed by a number of respondents, with one stating: "*flood mitigation work on the mouth of Oxley Creek needs to be done by the government; it can't be done by individuals.*" Respondents were concerned about Oxley Creek as it feeds into the Brisbane River facing upstream. This was highlighted both by residents and the local councillor. The suggestion was made by a Rocklea resident to resume the houses beside the mouth of the creek so that the mouth could be moved to face downstream. Backflow valves were also discussed as an option for Oxley Creek, as well as for stormwater drains.

Since much of Brisbane is already built on flood-prone land, building and height regulations were also seen as one of the main ways to mitigate flood risk. Many people were not positive about possible mitigation in terms of land use planning. Responses varied widely, however, from those who felt that by knowingly living on a flood plain people should be prepared for or accepting of occasional floods, to those who felt people should not be allowed to live in locations that will flood.

Brisbane Council passed a Temporary Local Planning Instrument (TLPI) 01/11 as an interim measure to change flood levels and standards. It is applicable to areas that were flooded by the river or waterways, but not those flooded by overland flow. The TLPI allows houses in flood zones to be built with a roof height up to 9.5 metres above the ground level. All homes that were flooded are also now classified as being located on a floodplain, which will have an impact on future purchasing of flood insurance. Much rebuilding can also be done without the need for a development application. One builder was very positive about these changes, saying "*Campbell Newman just wiped that [the old height restrictions] and said no, for 12 months we're going to let you, if it's a flood prone or flood affected building you can go up to 9.5 metres. And I think that's probably one of the best initiatives that any council's come up with.*"

Currently, properties must be built above the level of the 2011 flood, meaning some houses floors will be at the previous height of their roof. This new requirement, however, led to at least one resident in Rocklea deciding against raising their house as they felt the new height was impractical. The TLPI also requires that any retaining walls or fill must not cause drainage problems or flooding to other properties, which some respondents raised as a concern in regards to existing developments, with people recounting places flooding this time that had not flooded in 1974.

Better education and awareness of flood risk was seen by a number of residents as of high importance (Text box 5.6). Four residents in the Graceville and Chelmer area are putting together a residents' information booklet about how to prepare for floods, which they hope to make publicly available. At the time of writing they were yet to secure funding for its printing and distribution.

Despite this, attitudes towards marking areas that flooded were variable, with some supporting visible reminders of the flood's height, while others did not want to see a reminder, or were worried about the impact on the value of their property.

Text box 5.6 One resident's suggestion for a checklist so people know what they need to do in case of another flood

*"We had a lot of people who did not actually know what to do when they vacate their house. And I thought by putting in a form inside the power box, so that when people leave they can say right, the power's off, I've flicked the switches, I've unplugged this, I don't have food in my refrigerator, etc, so a nice little check list for people who are under stress and are probably not thinking correctly, they can do that. But also some sort of flag or notice or something, to let emergency services know that people have vacated, there's no one here. So people don't have to go busting down doors..."*

## 6. Case study results: Donald, Victoria

### 6.1 Experience and affects of the flood

#### 6.1.1 Personal experience of the flood and adjustments made

Most Donald respondents were living in a single storey house either raised (40.4%) or not raised on stumps / stilts (38.5%) and few had taken measures to protect their family and home from flood prior to or during the 2011 event (Table 6.1). However, 54.9% of respondents indicated that their house was not vulnerable to flood, 37.3% stated they were not aware it was vulnerable and only 7.8% were aware it was vulnerable upon purchase or taking up residence in their home.

Table 6.1. Percent of respondents that made adjustments to help protect their family and home from flood prior to the 2011 flood event.

	%
Devised an evacuation plan	13.2
Prepared an evacuation kit	1.9
Followed warning advice on radio / television / internet	17.0
Sandbagged house	32.1
Built temporary flood barriers around property	11.3
Kept drainage clear of debris	15.1
Raised household items up off floor	17.0
Moved household items to a safe place	9.4

Only 32.1% of respondents had previous flood experience. Nevertheless, legend of the Bullock's Head in the centre of Donald serves as a reminder to residents and visitors that Donald is vulnerable to flood (Fig 6.1).

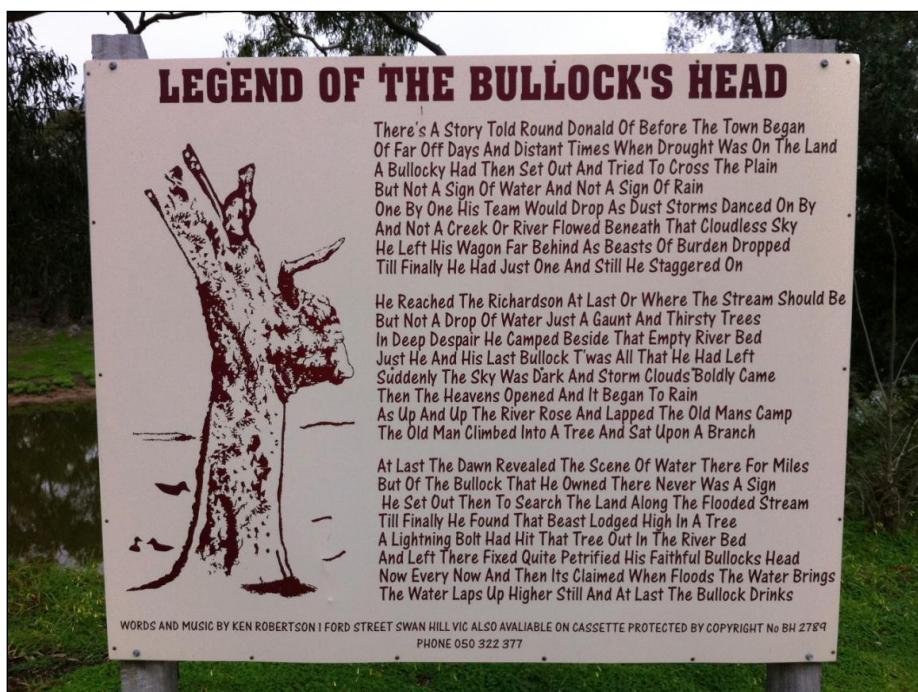


Figure 6.1. Folklore of the Bullock's Head telling the tale that whenever it floods, the Bullock gets a drink. Words and music by Ken Robertson, 1 Ford Street, Swan Hill, VIC. Photo: Deanne Bird.

However, residents informed us that during the January 2011 flood the Bullock's Head had more than a drink. Flood water flowed over the top of its head and the Murray Cod had a swim (Fig. 6.2).



Figure 6.2. Flood water flowed over the Bullock's Head (right-hand side) during the January 2011 event and the Murray Cod (left-hand side) was partially submerged. Photo: Deanne Bird.

Of those adjustments made, sandbagging, following warning advice and raising household items off the floor were the most common: “...*basically we lifted our computers and a few things like that, and that was all that was done...* So there was a lot of things ok because they were higher up but anything that was a foot or lower was damaged.” Others were more diligent with their attempts to minimise flood damage: “...*we put the black plastic up against all the doorways and the windows and things and sandbagged over that. And the day before... they'd sealed up all the little gaps in the bricks like the little vents.*”

Another resident likened the situation to a battle, where they kept putting up the defences (sandbags), then losing ground, retreating and repositioning the defences as a consequence: “*the boys stayed up all night. Our son and his mate stayed and I think it was about a three slab night but they got through it, they had the pump going and they just kept repositioning all the sandbags and they kept the water out of the house, which is a great effort... we saved the house... we had one win in the war.*”

Some residents discussed a lack of sandbags in town: “*we couldn't get anymore sandbags anyway. It was hopeless, just hopeless.*”

Nearly all respondents (98%) indicated that nothing had prevented them from making adjustments. Nevertheless, most interviewees agreed that there was little information available to them: “*Not enough positive advice. As Christmas holiday time the CEO of the retirement village was on holiday and the Mayor was also away. Both had to return immediately after the disaster.*” Officials agreed that there was a lack of accurate warning due to the positioning of the flood gauges. Such circumstances confounded the situation in Donald, and the limited amount of information scared

and confused people. They could not find out how to take measures in a most effective way, although they tackled the situation vigorously (Text box 6.1).

Text box 6.1. Resident's description of preparing for the flood with limited knowledge and help

*"[There was] a lot of stress and panic amongst the elderly people because... all of a sudden they get these phone calls to prepare to evacuate... We just didn't know and... we didn't have leadership and we just did not know what was coming down the river... We had no direction at all, absolutely none. The SES weren't here. I think they dropped one or two vehicles here for the local fire brigade to use, and some elderly gentlemen in the fire brigade used them until they ran them out of diesel and, of course, the BP Service Station had no power so we couldn't get fuel. The other service station... went underwater. So we had no access to fuel..."*

Each town in the council area was isolated by floodwaters and adequate support could not be delivered. Consequently, neither food nor health services could get in or out. Lack of alternatives in lifelines such as modes of communication and transport made the situation worse: "...the substation in Charlton got flooded, all the power went off in this whole region. So if you can, imagine trying to do a flood emergency with no power and no mobile phone."

Disappointingly, there was some angst in the community regarding the SES: "If it wasn't their job they wouldn't do it whereas the CFA would do anything needed" and the lack of information on Donald on ABC radio (Text box 6.2). An official considered that there is a lack of local knowledge among the SES because there is no local SES unit in Donald. However, Donald lacks the population to form their own unit.

Text box 6.2. A flooded resident describing her experience of the flood and the limited information.

*"We quite often get what's called a flood here, and it comes up the side road, and just comes in our backyard. And we've never worried about it because this house was purposely built above the 1909 flood level. So we thought, "Well, we won't think anything of it." But this time it came further up in our backyard, so we thought, "Well, look, we'll ring the State Emergency Service and just see what information they can give us." And they said that they had been issued with an evacuation order for the whole of Donald. Well, everybody's just looking at each other and thought, "What in heaven's name's going on?" So no one really sort of took much notice of that, and I... 'cause I asked them why. Oh, they weren't sure. Just that someone had rung in. And I thought, "Fine." So I thought, "Well, we'll ring the flood hotline number," because the ABC were broadcasting this number. "We'll ring them and see what's going on." Well, not only did they not really know where Donald was, they had no idea of the Richardson River, or where it was coming from, or anything. So we had no information there. We had the ABC radio going all day, and nothing was being said anywhere. Probably about half past three in the afternoon I rang one of the fire brigade... we were told at that stage to go and get sandbags... my husband's 78, and I thought, "How are we going to sandbag?" ...but we went up there, and I reckon every teenager and every kid in the town was up there filling sandbags. We were lucky... we sandbagged the back of the house. So we thought, "Well, we'll be right."...But the lack of information... and then, of course, the next day we're hearing all this about they were told that it was going to be the worst one on record... But, see, no one sort of told us anything, so we didn't take any furniture out or anything. We thought, "Well, we're safe." But what no one told us was that you can get a sewerage backflow through your showers and toilets. When we came back three days later, the water had come up four inches outside the house, but 14 inches inside the house, because once the toilet and shower started flowing over it couldn't get out because we had it all blocked."*

Since Donald had been in drought for so long, it is understandable that the flood in January 2011 had taken many residents by surprise. Many people therefore understood the lack of coordination between the SES, local council and residents willing to volunteer. Unfortunately, however, some residents who needed help were overlooked while others had a plethora of volunteers working to protect their place: “*there’s a need for that co-ordination. Because you can see the volunteers we had at our place. I mean, they were out there and only too willing to help if somebody just told them where they could go.*”

Only 26.5% of respondents evacuated their home and included in this are 16.3% who have not yet returned on a permanent basis. Significantly, all residents living in the aged care facility were evacuated and none had yet returned. Those that had returned to their home stated that they were evacuated for several months.

### *6.1.2 Impacts of the flood on house and property*

While most respondents reported no flood damage to their house contents and building structure (Table 6.2), 56.2% stated that their property / yard had sustained *some* damage. Similarly, a greater percentage of respondents (40.9%) revealed that their business had suffered *some* damage as well. Most devastating for the Donald area was the impact on agriculture (Text box 6.3).

Table 6.2. Respondents' perception of the degree of impact

	Not impacted	Minor impacts	Moderate impacts	Major impacts	Completely destroyed	N/A
House contents	68.8	6.3	8.3	8.3	6.3	2.1
Building structure	63.0	13.0	2.2	19.6	-	2.2
Property / yard	41.7	10.4	22.9	20.8	2.1	2.1
Own business	34.1	15.9	6.8	18.2	-	25.0

Text box 6.3. Impacts and benefits of flooding rain on agricultural land around Donald

*“I think at the end of the drought people were better mentally than... in the middle. It was sort of like, this can’t be happening. This is just appalling, you know, we can’t cope. And by the end of the drought people were ‘Well, this is how it is.’ There was... very high depression. But it was almost like they were accepting that, you know, this is just another horrible year... So last year we had some fantastic rains which really kick-started the crops and come September they were looking magnificent. In fact, people were saying they’d never seen crops like them ever. And the September floods weren’t bad. They were sort of quite cope-able. Yes, they cut the town in half... and then we had more rain in December, which basically sealed everybody’s fate. And then the January one’s came and that just killed the whole shooting match... But fortunately, the prices of feed were the prices of good grain in years gone by... because there was a world shortage, the prices stayed up. And even though they had inferior quality grain, which they were able to harvest, they got a reasonable price for it... most people got a reasonable outcome, but not enough to lift them out of the years of drought, whereas if we hadn’t had the flood... it would have lifted them. You know, perhaps not completely clear of the drought, but it would have really made... a big difference.”*

However, some residents suffered major impacts including the motels in town and there was a consistent problem with mould and the lack of information during the immediate clean-up on how to deal with it appropriately (Text box 6.4).

Text box 6.4. Impacts of mould and appropriate methods for eradicating it from buildings

*"The rooms cleaned up really well and after two or three weeks we thought oh, this is okay. With...a coat of paint...Then the assessor came up and he said well we could have a mould problem...you know, that it's got to be done properly. And then they started arguing about that. All of a sudden we're two months down the road. And then they come up with the, with the practice that, yes, the, the plaster will have to come out of every room. So they cut the plaster out to the height of the flood in every room and they brought up a professional company from Melbourne that put [drying] machines in. This is three months now arguing about it all. Any how the rooms were starting to smell. And in behind the cavities you could, you could see the mould was starting. So thank goodness we did the right things. But that week cost the owner \$30,000."*

Of those households that were damaged by the flood, 10.0% of respondents indicated that the repairs were complete and 20.0% stated that they were ongoing.

#### 6.1.3 Impacts of the flood on personal wellbeing

Residents whose households had flooded had evidently suffered in terms of wellbeing, especially the elderly residents of the aged care facility. One resident reported that: "...*a number of the elderly people that were in the hostel have died since the flood, and a lot of that's around... yes, it's around being old, but it's also around the fact that they had to be moved from one point... to another. So it was traumatic.*"

Positively though, few respondents indicated that they had suffered negative impacts to relationships with family / friends (10.4%) and physical health (7.8%) (Fig 6.3). More respondents, however, had suffered in terms of financial status (22%), mental health (27.5%) and general happiness (31.4%).

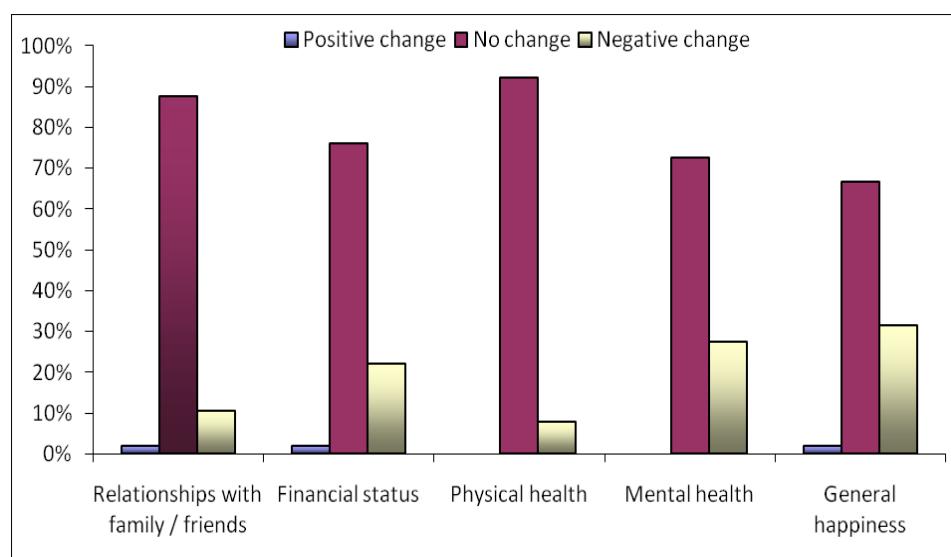


Figure 6.3. Changes to wellbeing - on a scale from very bad to very good, respondents were asked to rate their relationships with family / friends, financial status, physical health, mental health and general happiness at the time before the flood and at present.

Surprisingly, less female respondents (35.7%) than male respondents (52.0%) indicated that they had suffered some form of negative impact. On the other hand, some social workers suggested that there had been a large and visible impact on female residents (Text box 6.5). An official discussed how the floods had made it difficult for people to take a break. It was also noted that the flood had a larger effect on farmers both socially and economically. This was mainly due to the fact that there was an incredible amount of rain at harvest time which prevented harvesting and caused considerable damage to crops. Following this, there was an infestation of mice. Nevertheless, officials considered that the farmers were financially better off after the flood than during the drought.

Text box 6.5. Social workers describe the hardship of local farmers, particularly women.

*"So harvesting didn't finish until April this year, because they couldn't get on the ground... and that was... the real factor that depressed people. You know, we were buying services from different agencies to help with depression; counselling services... I know there were a lot of extra women this time. Because I think they had been so busy for so long with the harvest just going on and on and on. And that's providing meals, three meals a day for not only their family, but for whomever else is involved in the harvest and by the time they'd actually finished that they're ready to start sowing... the agricultural year sort of goes in a boom-bust cycle but everybody gets to relax during the bust bit. But it just didn't ease off and I think the women had held things together for so long that they were just falling over."*

Social workers also discussed a noticeable impact on children. Some youth groups had lost all their sporting equipment and the local football and netball grounds had been "...under six foot of water". These fields were unusable for more than six months with the first games played the weekend the research team were in Donald and: "*with a lot of the youth, everybody in these little country towns, sport is the key thing that holds people together.*"

Moreover, residents discussed the fear of another flood and having to relive that experience: "*...what's to say in six months time we see the same thing happen again? I don't know what I'd do, what we'd do... I couldn't stand it... I'd have to leave, I really would. I don't know how a lot of these people... and they're worse off than us, I don't know how they've managed it.*"

Respondents who had lived at that particular address for less than 10 years suffered more (58.3%) in terms of wellbeing compared to those who had lived there for more than 10 years (29.63%).

As expected, more than half of the respondents (57.9%) who indicated that they experienced major impacts to either their house contents, building structure, property / yard, or own business, suffered negative impacts on at least one factor related to their wellbeing.

Nevertheless, there were some positive stories. One resident described how they had been displaced for a couple of weeks and a local family had taken them in. The elderly mother of the displaced couple had to relocate from the aged care facility so the same family offered to house her as well: "*she's only 93, but she was displaced too and the same family took her in and took us in and, it was just remarkable some of the human responses you get from it... out of all this there was some pretty heart-warming stuff... I think we're richer for all the heart-warming experiences we've had. We might be poorer for a few other reasons. But really, we've been very fortunate.*"

## **6.2 Underlying vulnerability and constraints to recovery**

### *6.2.1 Town planning in flood prone areas and mitigation measures*

According to officials, there are basically three levels of planning classification in relation to flood risk:

- Land subject to inundation: requires building 300mm above the Australian Height Datum (AHD) – referred to as an overlay
- Flood extent: a more significant level of flood risk with a requirement to build 500mm above the AHD – referred to as an overlay
- Urban floodway zone: very strictly controlled zone in which most developments are denied – referred to as a zone

There is no urban floodway zone in Donald. Some of areas places inundated during the 2011 flood were classed as public use zones which included a caravan park and nursing home (Department of Planning and Community Development, 2011). Therefore, it is expected that the flood overlays will be expanded according to the area of land subjected to inundation.

Due to lack of information on the latest flood event, the overlays and their floor level constraints remain the same, i.e. the planning information is not up-to-date for the rebuilding / renovation process, something which may delay the recovery: “*...the only thing that we can enforce as a shire is our established levels, [which ensure that houses] in overlay areas are built 300-500mm above the ground level... But we are saying use commonsense. If your house got flooded 450mm, put your house up 500, you know, if you don't want to get your feet wet... it will probably be another 12 months to 2 years before we can actually enforce planning permission on areas that were affected by flooding but are not currently covered by an overlay.*”

Prior to the 2011 event, flood mitigation measures were not implemented due to the prolonged 14-year drought. Measures taken against drought had high priority and may have negatively affected the consequence of the 2011 flood: “*...being in the middle of the drought, you know 10 years into drought, the council had probably prioritised their funding... away from urban drainage. If we had have looked at spending money on urban drainage to mitigate flood levels or flood effect, it would have been a bloodbath. It would have been a front page of a newspaper, and people would have gone nuts that we are spending money on maintaining infrastructure that they didn't see as the priority.*”

Residents recognised that the council had limited capacity to provide flood mitigation due to financial constraints but were doing what they could, when they could: “*I know they've got no money like a lot of councils in these areas... but they worked hard and tried hard... a lot of their employees absolutely worked tirelessly for three and four days for no money, for no income.*”

Residents discussed the options to release water in various ways and how mitigation methods used elsewhere caused Donald to flood: “*I can understand the Wimmera River had to put some water this way because unfortunately what happens is either... businesses in Horsham go under, or they release the water our way, and keep your fingers crossed and hope not many houses go under... the bottom end of Horsham that's low, that's got the big Harvey Norman and all of them, you can understand why they want to try and protect them because there'd be millions of dollars' worth of infrastructure there that they had to try and protect.*”

In reference to old irrigation channels no longer in use, one resident remarked: “*I certainly think the farmers should be having those channels opened again... If those channels were open a lot of that water that came off the farms up there would have gone into the channels. But they blocked all the channels off, and Wimmera Water could have released water into the channel system, 'cause that could have taken millions and millions of litres of water... So I think that's a must. They've got to get those channels open again.*”

### 6.2.2 Insurance

A greater percentage of Donald residents (42.6%) thought they had full-insurance cover but very few (4.3%) actually knew they were covered for all types of flood (Figure 6.4). Some of those that were affected found out the hard way: “*I rang our insurance company and I just said to them 'Now we're right, we've got flood insurance' and they said 'yes you have but it's not from a natural waterway so you haven't got any coverage'*”. Other respondents thought they were covered for everything but upon reviewing the paperwork discovered fine-print stating “*not covered for flood*”.

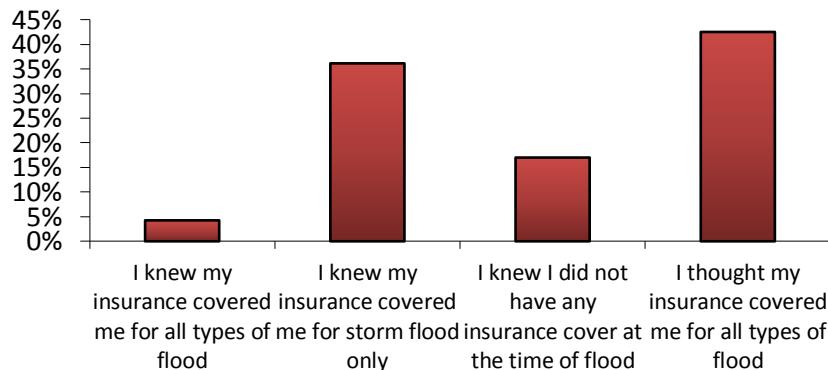


Figure 6.4. Knowledge of insurance coverage prior to the flood.

One resident described how she had been hopeful that the insurance company would cover her claim but received a letter 6 months later stating: “*you're not covered*”. She called the company and pleaded with them to at least consider covering something that she had lost, especially her children’s swing set and toy boxes: “*I said, at least the kids stuff?*” and he said, “*Oh, you can claim for your food in your freezer – didn't you lose some?*” And I was like, “*Yeah, but...*” He goes, “*You've got to write a list of what you lost in your freezer,*” and I said well we were flooding – as if I'm going to know what was in my freezer!...Who cares? You know, I wasn't thinking about my meat, I was thinking about my furniture and my house.”

Notably, a high percentage (53.2%) of Donald respondents knew they were not covered for riverine flooding. However, 68.8% of these respondents stated that they knew their house was not vulnerable to flood. One such person lived adjacent to the river and she discussed how her house had been raised above the 1909 flood level and therefore did not think it was vulnerable. Nevertheless, they sandbagged the house but effluent and floodwater came up through the drains and toilets causing 14 inches of water to be trapped inside the house with only four inches of water around the outside: “*We're still going with the insurance because they have agreed that we had... coming up from the toilet and shower they class as storm damage, which we're covered for, but the insurance policy does say "not covered for flood."* Then they said that the storm damage we had was

*caused by the flood, so they're not paying. But then we had the assessor come – three times we've had him now – and he's advised the insurance company that they should be paying."*

Similarly, others were still waiting to hear the outcome of their insurance claim: "...they said no to everybody for a start. And I mean, it's just the standard answer they give... either you are or you're not. I mean, if you haven't got insurance, well you accept that. But if they give to some and not others, I mean, well, that's very hard to accept. So we, we'll see. There's no doubt the first lot of water came up through the sewerage... Three days after the water had gone it was still coming out through the sewerage."

Interestingly, *all* respondents who knew they did not have any insurance cover at the time of flood had a household income of less than \$50,000 and the very few respondents who knew they were covered for all types of flood (only 4.3%) had lived at that address for more than 20 years. A greater percentage of respondents (46.9%) who had no flood experience indicated that they *thought* their insurance covered them for all types of flood while half knew that they were not covered or covered for storm only.

#### *6.2.3 Structural changes to buildings as a result of risk knowledge*

34.0% of respondents had chosen to live in a house located outside of the flood hazard zone, showing a third of them were aware of the designated flood zones. However, only 5.7% of respondents stated that they had chosen, built or modified their house or property to be more resistant to flood.

Although Donald has been in drought for many years, some elderly residents knew too well that Donald is also vulnerable to flood. Many farmers have been in this region for several generations and they have learnt from their forefathers on how to deal with long periods of drought and flooding rains. One such person said that when his great grandfather came to settle in this region some Indigenous people had commented "*long time wet, long time dry*" in regards to the local climate and since this family had been there, this is what they had experienced. As this person lived upstream of Donald, he provided detailed advice to local residents on the extent of water coming down the catchment during the 2010 event and many people valued his advice.

The abovementioned farmer discussed how his grandfather had built their current place of residence on an elevated piece of land so as to avoid the reoccurring floods. However, this decision to build there had come about through trial and error as some of the previous farmhouses that the family had built and lived in, which are still standing, are vulnerable to flood.

Interestingly, local officials discussed how residents had become "*apathetic*" towards building in flood prone areas because of the drought and many were seeking permits to build on properties that were covered by flood overlays: "*They would say "there has never been water on this property as long as I've lived there". You know, "this is my dream to build on this property"*". It was also recognised that people focused on drought proofing their homes instead of flood proofing or developing flood mitigation strategies for their property.

One resident whose home flooded in 2011 discussed how her house had been built above the 1909 flood: "*I thought at the time... we're quite a distance from the river... and in fact, it's been empty for so long... for years and years there was nothing in it... And we've never worried about it because this house was purposely built above the 1909 flood level... they put loads and loads and loads of dirt on*

*this block before they built the house so that it was so much higher than the 1909 flood... they're living in Mildura now but they couldn't believe that the house had been flooded."*

Similarly, other residents who also lived adjacent to the river did not think their home was vulnerable to flood because: "...it's never been under water before... it didn't surprise me that it could go under but you always think it's going to happen to someone else."

#### *6.2.4 Other factors adding to vulnerability*

Donald residents discussed how the Richardson River, which circles the western side of Donald from the south to the north, is not recognised as a river and therefore flooding is not recognised as a problem for Donald.

Lack of funds in the council makes the recovery very difficult and the fact that many roads were impacted: "...if you wanted to go from east to west in the shire, you would have to drive through cut-off roads and damaged roads, and this will go on... it will take us 12 months probably to repair the roads. And, you know, it will be in the tens of millions of dollars. We've got one of the biggest contracts out at the moment... it will be, probably over \$20 million... so, without the support of you know... the federal government and the state government, small little shires would be in dire straits."

Most importantly, as there were few houses that flooded in Donald, almost all of the focus was on the neighbouring town of Charlton, which was severely impacted. Those residents that were affected in Donald therefore felt that they had been forgotten: "*Everyone's helping Charlton. We had a friend who lived in Charlton on the main street. She got flooded out, and she actually said to us that our place was worse than hers... And then at one stage she came with a box of things for us – slippers, shoes, socks, towels. They were handing them out left, right and centre in Charlton but no one in Donald was getting anything... Everyone was going to Charlton, everything was going to Charlton. They were getting everything. Now, even now, in the paper we got last week, Tupperware are giving parcels to every household in Charlton to help out. What do we get? Nothing.*"

Disappointingly, a mother of four received information on grants that were available to households impacted by flood but when she called she was told: "*you're not eligible for it because it's only Charlton residents.*" However, this woman's house was severely impacted by the flood and she received notice, six months after the flood, that her insurance claim had been rejected. This family had received a small payout of \$30,000, which they used to repair what they could and St Vincent de Pauls covered two bills that totalled \$1,600 for replastering and installation of a new hot water service. Still, they were quoted \$139,000 in repairs. The fact that only two local residents had checked to see that they were coping after the flood, caused further grief to this family.

The two motels in Donald obviously bring in a large amount of revenue for the community with visitors staying overnight, eating at the local restaurants and cafes and purchasing goods and services from local stores. Due to the fact that many of these visitors are company sales representatives and therefore represent repeat business to those outlets that they know and trust, the town suffers on the whole, when the motels are flooded and unable to offer accommodation: "*we're sending 'em on to everywhere else... and if you ask the ladies in the shops and everything around here, they've lost a lot of money; income too, by not having these people staying over in Donald.*"

## 6.3 Adaptation and risk reduction

### 6.3.1 Household adaptations

As a result of the 2011 flood, 35.9% of respondents stated that they have modified or are likely to modify their insurance policy; a further 24.5% have or are likely to improve their garden drainage and 15.8% have or are likely to build permanent barriers around their property (Table 6.3). However, there are restrictions to building flood levees around properties and residents must apply for permits: “*the local council has given us approval to do some landscaping and initially sort of level our site... eventually we might have to put in for a planning permit to put up a levee so it goes through the proper catchment management and council regulatory procedures.*”

Table 6.3 Responses to the question: “Have you, or how likely are you, to make the following changes as a result of the 2010 or 2011 flood?” All data are given as a percentage.

	Not at all likely	Un-likely	Un-decided	Likely	Very likely	Already done	N/A
Permanently move to a flood safe location	51.1	22.2	8.9	-	2.2	2.2	13.3
Raise level of home	56.8	8.1	5.4	-	2.7	-	27.0
Change exterior and/or interior design e.g. use flood proof materials	45.9	10.8	2.7	2.7	5.4	2.7	29.7
Move electricity outlets/meter boxes higher	48.6	13.5	2.7	5.4	-	2.7	27.0
Move air conditioning unit higher	47.6	11.1	2.8	2.8	2.8	5.6	27.8
Anchor water tanks to the ground	45.7	17.1	-	2.9	2.9	2.9	28.6
Improve garden drainage	26.8	17.1	4.9	9.8	9.8	4.9	26.8
Build permanent flood barriers around property	39.5	15.8	-	5.3	7.9	2.6	28.9
Modify insurance policy	17.9	12.8	15.4	12.8	12.8	10.3	17.9

Moreover, building flood levees is costly, which some residents must weigh against the benefits, particularly in terms of whether or not a similar event is going to happen within their lifetime: “*...we could put a retaining wall around. But it's a massive area. And I've priced one and reckon it's about \$20-\$25,000... we'd love to do it [but] we're restricted, we can only put it 1.4 m high because of the council regulation, which would be okay... we'd only probably have to put two or three sandbags on top of that... So that's something we're tossing up with as to whether we do or we don't. Then you talk to other people and they say well why would you? It's not going to happen for another 100 years.*”

Some residents were finding it difficult to renew or update their insurance policies. However, others found it surprisingly easy: “*it was probably only about two months ago our renewal was due, and somebody else that was flooded... said they've just changed to Westpac, who were accepting and covering flood, because a lot of the companies that covered flood weren't accepting people that had just been flooded. So we rang Westpac, and it was cheaper than what we were paying for Elders!*”

One resident who was refused insurance understood that insurance was not the answer to minimise their risk to flood: “*The minute they put in our postcode; 3480, no don't want anything to do with us... and as far as insurance goes we've got to work away from insurance... prevention is better than cure... even if we were insured wholly and solely, I just wouldn't want to go through it anyway.*”

The results also show that respondents whose wellbeing suffered after the flood perceive that they are less able to make changes to reduce their flood risk compared to others in their community (Table 6.4).

Table 6.4. Responses to the question: “In comparison to other people in the community, do you think you are more or less able to make changes to reduce your risk from flood?” All data are given as a percentage.

	Significantly less able	Less able	About the same	More able	Significantly more able
Wellbeing suffered	5.0	45.0	25.0	10.0	15.0
Wellbeing hasn't suffered	7.4	7.4	51.9	18.5	14.8

While some residents described building back the same, others described modifications to make them more resilient to the impact of flood: “...we discovered that the tiles were fine because we had tiles in the bathroom and ensuite and they survived no problems you know just give them a wash and they were good. We just sort of said ‘Well if it ever does happen again we’d be mad to put the timber floor down, we’ll put tiles’.”

In spite of this, the same resident described why they opted to keep some parts of their house carpeted for reasons of comfort: “We did think about tiling the other lounge room... and we thought if it ever did come to the stage where we thought we might get flooded we’d just rip the carpet up... it’s cheaper to get it re-laid than what it is to have to replace... we opted for the nice carpet instead... because we do find with the tiles... everything echoes and they do sort of seem a little bit hard.”

Other residents had adopted similar strategies in relation to comfort: “...the only rooms that have carpet are the two kids’ bedrooms because it’s so cold – I’d rather rip up two lots of carpet than a house full of carpet.”

The aged care facility was making structural changes to their buildings in order to ensure better evacuation of residents, their belongings and some equipment during the next event. For example: “...our beds [are] all high-low electronic beds and they’ve all got big castor wheels on them and with the upgrade, all the doorways were widened to fit the beds out so next time we’ll wheel the beds out of the rooms and take them up to the high school. We can put all the residents’ belongings on them.” However, many respondents living in the aged care facility believed that the very fact that they were residents of the facility prevented them from personally making changes to reduce their own risk to flood.

Relocation was not an option that many Donald residents considered as a result of the 2011 flood with 90.6% of respondents stating that they would remain in their current location or within the town. This is not surprising given that 84.6% of respondents had lived in the Buloke Shire Council region for more than 20 years.

For some, the biggest barrier that was inhibiting changes to house and property after the flood was money. One resident was asked what she would do if she received money from the insurance company. She replied: “I’d let it dry out properly and I’d get a stumper in and I’d up it at least a foot off the ground. But yeah, like the other half said we don’t really have the money so we can’t do it. I was really wanting it done... I must have my head screwed on somewhere ‘cause the first thing I thought of is ways to prevent it from doing more damage next time.”

Another barrier was the house structure itself with residents living in brick and / or slab-on-ground constructions unable to modify their home to reduce future risk: “...brick-on-brick you can’t

[change]... if we had a weatherboard home, you can knock out a wall here, build it up a bit. Or if we were on... stumps and that, we might just think, "Look, it might pay to spend the extra money and put it up higher." But we couldn't do any of that..."

Nevertheless, this resident did make some changes to the home to make life a little easier: "while we're at it we paid a bit extra to put a wall oven and hotplates in, save me having to bend down. And the builders put in taps that are easy to handle and doorhandles that just... little things like that so that as we get older..."

Other respondents believed there were physical limitations restricting their ability to reduce their future risk to flood due to their location adjacent the river and the factors that were out of their control such as flood plain management through the shire and GWM Water.

Despite many respondents' belief in the likelihood of a flood in the next 10 years, many do not intend to make changes to reduce their risk (Fig 6.5). One resident remarked: "We can't say it's a one-in-100-year event, because it could happen again next year. But they don't know. And the problem is, what do you do about it?"

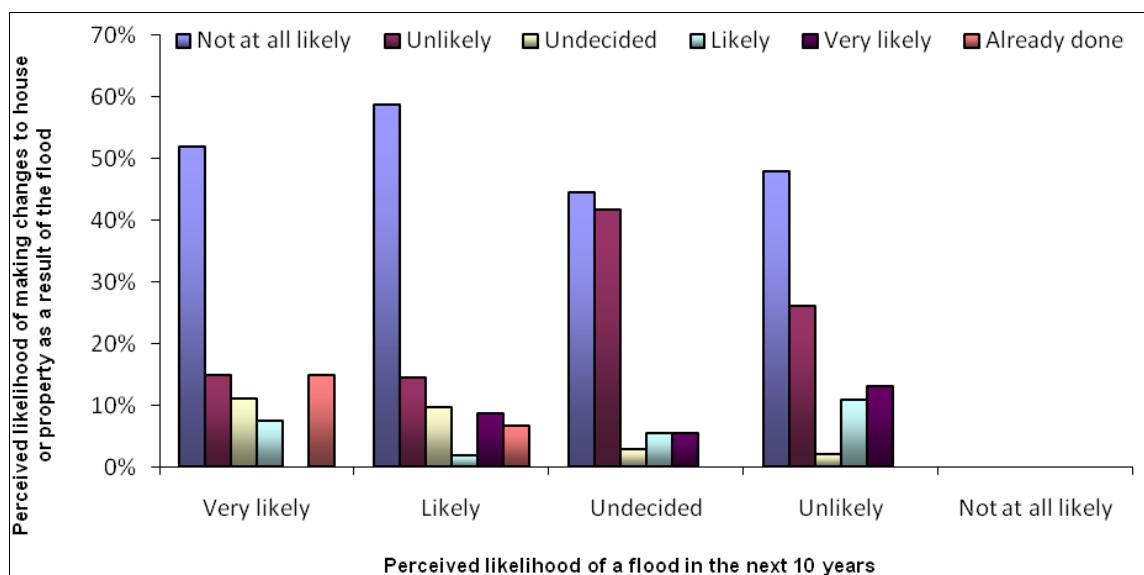


Figure 6.5. Distribution of the perceived likelihood of making some element of change to house or property for a given perception of the likelihood of a flood in the next 10 years

An interesting adaptation that some farmers were making for drought and flood was the planting of River Saltbush as fodder for sheep. Saltbush provides some nutrition for livestock but there must be good quality water available for the animals to mitigate the salt content and an alternate food supply is necessary. However, saltbush grows in high salinity soils and drought conditions. Moreover, the River Saltbush survived the flood even though it was submerged for an extended period. In comparison, the Old Man Saltbush is dying.

### 6.3.2 Public attitudes to council and government responses to flood mitigation

Residents were asked to name various measures that they think would help reduce the risk of flood in Donald. The most popular response was to build levees around low-lying areas such as the aged care facility. Cleaning the river of rubbish, silt and debris was also high on the list. Several residents

related the flood problem in Donald to the bridge extending over the Richardson River on the Sunraysia Highway to the northwest of the town centre. Calling for the bridge to be raised to allow floodwater to flow without restraint, residents believed that this was possibly the only option they had to reduce their vulnerability to flood: “*...we could lift it up a metre and that's probably the only thing we could do and let the water run underneath it.*”

Many other residents called for better protection around the substation in Charlton to ensure power remains on during future flood crises: “*...they've got to protect that substation. They can't allow that to happen again. So surely they'll build a bank around that or raise it up or do something... I mean any plan should be that you can't afford to let power go out because everything goes with it. You know telephones and everything. So, so I hope they're doing something about that one.*”

Respondents were supportive of the development of an adequate flood monitoring and early warning system, maintenance of storm water drainage networks and better management practices within GWM Water – which is the local water body charged with the responsibility of providing, managing, operating and protecting water supply and sewerage for approximately 30% of Victoria (see [www.gwmwater.org.au](http://www.gwmwater.org.au) for details). Also mentioned was the development of a community response plan with local knowledge and input, ensuring that the community was ready to act early, better communication and greater availability of sandbags.

However, many residents were sceptical as to how involved local and state government would be in reducing flood risk in Donald and they viewed this as an opportunity to take action themselves: “*As I keep saying, 1700 population, at the end of the river. They're not going to worry about us too much... we really should be looking after ourselves, as we are, but we just want to be able to do it, we want a bit of control.*”

Residents therefore formed the Donald Community Flood Recovery Group and through this initiative they applied for state funding to undertake a flood-risk assessment for Donald. Their application was successful and according to Regional Development Victoria (2011), \$135,000 in funding was awarded for a flood study in Donald that includes the simulation of the once-in-200-year event. Although policy changes are hoped to result from such studies, it may take a long time until they are implemented. Moreover, council officials believe that it will be another 1-2 years before planning policies in flood affected areas are enforced as it is: “*quite a long process, it's just not a matter of going 'yep done'*”, especially when agreements must be made between local and state governments.

However, interviewees viewed the formation and work of the Donald Community Flood Recovery Group favourably and many hoped for great things: “*...it was so thrilling to hear that [the Donald Community Flood Recovery Group] were going to look at... flood proofing the town a little bit and get some people and some expertise in to make sure that it doesn't happen again... They'll never stop floods and that's fine. But if we can reduce the height... we won't have as many issues.*”

## 7. Case study results: Emerald, Queensland

### 7.1 Experience and affects of the flood

#### 7.1.1 Personal experience of the flood and adjustments made

At the time of the flood, the majority of respondents (63.7%) were living in a single storey house that was not raised on stumps / stilts, a single storey duplex or a ground flood unit, 24.2% of respondents were living in a multi storey house or duplex and 12.2% were living in a single storey house that was raised on stumps / stilts. Logically, 64.2% of respondents raised household items up off floor and 40.0% moved household items to a safe place (Table 7.1). A further 56.8% of respondents followed warning advice through the media.

Table 7.1. Percent of respondents that made adjustments to help protect their family and home from flood prior to the 2010 flood event.

	%
Devised an evacuation plan	26.3
Prepared an evacuation kit	25.3
Followed warning advice on radio / television / internet	56.8
Sandbagged house	40.0
Built temporary flood barriers around property	11.6
Kept drainage clear of debris	20.0
Raised household items up off floor	64.2
Moved household items to a safe place	40.0

One household went to extreme lengths to save a grand piano due to their experience of flood in 2008. Since it was impossible for them to move the piano out of the house, they removed the legs and raised the body of it up on pallets to as high as they could lift it. Unfortunately for them, the 2010 flood was higher and their actions did not save the piano.

In addition to raising household items off floor and evacuating, a resident living adjacent to the river drilled holes through the floor boards of his raised home to allow the expected flood water to drain from the inside. This was done to prevent flood water pooling inside the house for an extended period.

32.1% of respondents stated that something had prevented them from making adjustments prior to or during the flood. Some of those who did not make any adjustments declared that they did not have assistance to move heavy items while others blamed a lack of information and time. Many also explained that they were not in Emerald prior to the flood due to work or they were taking a Christmas holiday break elsewhere. One such family described their desperate attempt to return to Emerald during the flood putting themselves and their children at risk only to find that Emerald was completely isolated. Many residents who were isolated in Emerald started to ‘panic buy’ instead of simply stocking-up on essential items.

Several residents criticised the lack of sandbags around town with some reporting they sandbagged their home with potting mix after being told they could not take sandbags as they did not live in a flood-prone area. Other residents reported sandbagging their homes with whatever they could find – shopping bags, kitchen tidy bags and pillow cases – as there were no sandbags available. All these residents’ homes, however, flooded in 2010 and some were located in areas, such as Kidd St, that

were most at-risk. Nevertheless, many residents declared that the council did a fantastic job in terms of warnings, response and recovery efforts with particular praise for the mayor.

Residents noted the tremendous job that the Neighbourhood Centre was doing for those in need. According to reports, businesses also played a significant role in helping their employees recover. For example, one local mining company set-up a 24 hour hotline, supplied a care kit with cleaning products and organised tradesman, such as a plumber or electrician to visit employees' homes, when needed. Moreover, many businesses paid their staff salaries even though the business was closed due to flooding, on the proviso that the staff worked around town helping residents and other businesses clean-up.

The Emerald Flood Recovery Centre provided essential assistance and advice to those in need (Text box 7.1). This was set up as the main centre for the Central Highlands Regional Council area and a mobile coverage centre was also established in order to reach people located in other remote communities, such as Rolleston. The mobile unit consisted of 5 or 6 assessors, a couple of cheque signatories and Lifeline and Red Cross representatives, and they based themselves in community libraries or town halls. Those people who were still isolated by flood water were instructed to register via a 1800 number and when able, the team would visit them personally.

Text box 7.1. The Emerald Flood Recovery Centre set up with various government agents

*"So fundamentally what we've got here is a 'one stop shop'. So firstly you come in here and get information and apply for state government funds. So we have 3 forms of assistance. We have an emergency grant, for urgent assistance. Now that is if you're suffering from hardship and is effectively for food, accommodation, clothing and medication... Our second phase is essential household contents. So it is means tested and you only qualify if you are uninsured or your insurance company doesn't cover flood. But then it is means tested so there's a sliding scale. If you earn over \$931 and you're a single person you don't qualify. So, one of the difficulties in this community is because it's a mining town a lot of people are over the income... The third one that we do is a structural assistance. So if your house was inundated and has structural damage then once again it is means tested and if you're eligible you're then assessed by QBuild which is a Queensland Government Building Department. So they go out and assess it and work out what it costs to bring that house back to a habitable status. We also have the Department of Employment, Economic Development and Innovation who do small business and primary producers...We have Red Cross and Lifeline as partners. Red Cross do the meeting and greeting of the people and Lifeline are used for the psychological wellbeing... we also work closely with the council and if anyone needs anything we refer them to Council... up on the wall over there is all the contact numbers where they donate, if they need beds or things like that... We've also got Save the Children Fund. They're here for child care. They're just fantastic because they take the kids away and the parents can concentrate on doing the applications."*

80.5% of respondents evacuated their home and 14.9% have not been able to return on a permanent basis. Those that had returned were evacuated for any length of time from a few days to up to 7 months. One official reported that there were at least eight families on the flood register who had not as yet been housed. However, this official was of the opinion that there were many more still living with family or friends.

The lack of builders available to make repairs was a common story throughout Emerald and many officials spoke of the housing shortage. One explained: *"because it is a mining town with all the mining pressures and it's hard to get accommodation. You've got that influx of mining workers,*

*tradies coming in for the mines, and then we had the flood that hit and then people had to move out of their homes and there wasn't a lot of other accommodation around.*" Therefore, the government authority installed 15 temporary homes and contracted Anglicare to manage the waiting lists. These homes were constructed in town on State Government land and were used to assist people who had extended waiting periods to find out what was happening with their insurance.

### 7.1.2 Impacts of the flood on house and property

A significant proportion of respondents believed that their building structure suffered major impacts (43.9%), property suffered moderate impacts (31.8%) and 24.7% of respondents perceived that their house contents suffered major impacts (Table 7.2).

Table 7.2. Respondents' perception of the degree of impact

	Not impacted	Minor impacts	Moderate impacts	Major impacts	Completely destroyed	N/A
House contents	24.7	17.6	18.8	24.7	12.9	1.2
Building structure	23.2	15.9	13.4	43.9	2.4	1.2
Property / yard	11.8	22.4	31.8	23.5	9.4	1.2
Own business	26.6	1.6	10.9	10.9	0.0	50.0

Some residents who were unable to return to their homes for several days found that although some household items were raised higher than the flood waters they were still damp with condensation due to the amount of moisture in the air. Others found that there were discrepancies in the actual extent of flooding on their properties compared to the official records (Text box 7.2).

Text Box 7.2. One flood-affected household that had their insurance claim denied, describes their dilemma with council rate changes and property devaluations following the flood

*"I had the gentleman who was in charge of documenting what got water and what didn't for the area, and he stood ankle deep in water in my driveway and said, "Is this the water you've got?", and I said, "Yes, and out the back there's a strong current running through the backyard and through underneath the house through the laundry, the lot". Now, when they mapped it out, they put down that our block didn't get any water. Therefore, our land valuations went up. Everyone else who got water, their valuations went down, which means our valuation has gone up so our rates have gone up. So we are having to pay more in rates because we apparently didn't get water... The banks in town have told everyone if you have had water, it's an automatic, I think, 20 or 30% off your value. So we're getting hit from both sides here. We've got less for our house, but we are having to pay more for it... We've got no money to pay for repairing all of this... We're just turning a blind eye to it at the moment. The insurance company won't cover us."*

Of those people whose house sustained damage during the flood, 57.8% indicated that the repairs are complete, 37.5% said they are ongoing and 4.7% stated that they had not yet begun.

### 7.1.3 Impacts of the flood on personal wellbeing

Many Emerald residents were clearly upset about the flooding disaster and the impact it had on their home, family and community – some to the point of not wanting to return to their flood affected home. However, those respondents who had been in Emerald for less than 1 year had suffered less (14.3%) in terms of wellbeing when compared to those who had been there for more than 1 year (57.1%). For renters, it was a fairly straight forward task for them to move on. On the

other hand, it was a little more difficult for those people who owned / mortgaged their home. Many of these people were still trying to figure out what the best options were – whether they should sell up and move, move and rent their property or raise their home – and the decision was dependent upon money.

As expected, respondents who were high household income earners ( $> \$150k$ ) suffered less (42.1%) in terms of wellbeing than all other income brackets ( $<\$50k=61.9\%$ ,  $\$50k-\$100k=63.2\%$ ,  $\$100k-\$150k=71.4\%$ ). Interestingly, those respondents who were mid-high household income earners indicated more negative impacts in terms of wellbeing compared to those in the low and low-mid income brackets.

Surprisingly though, around two-thirds of Emerald respondents implied that they were neither better nor worse following the flood in relation to their financial status (61.5%), general happiness (62.6%), physical health (67.0%), mental health (67.4%), and relationships (90.0%) (Fig 7.1). Where there was change, however, it was overwhelmingly negative (around a third of respondents) with respect to their financial status, general happiness, physical health, and mental health.

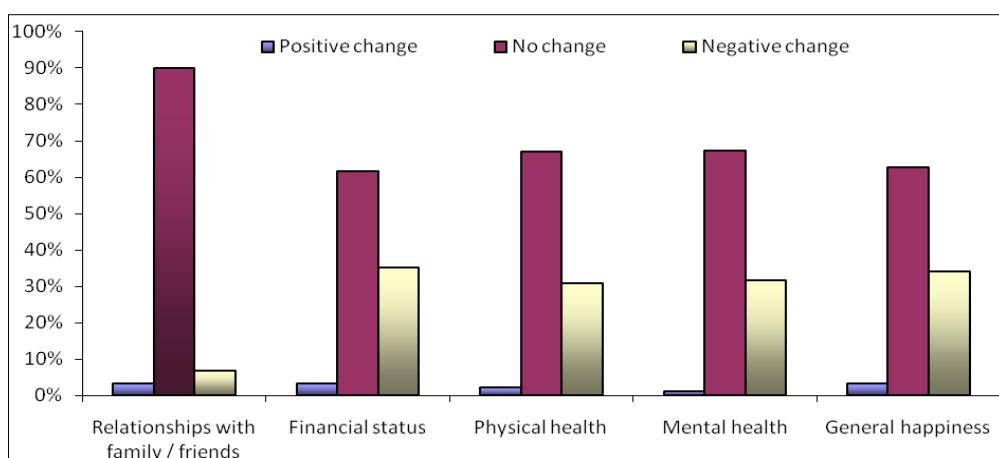


Figure 7.1. Change to wellbeing from before to after the floods - on a scale from very bad to very good, respondents were asked to rate their relationships with family/friends, financial status, physical health, mental health and general happiness at the time before the flood and at present.

In contrast to this result, officials discussed the significant impact the flood has had on personal relationships, particularly where others are relying on friends or family to provide accommodation. In this situation, strain was observed between the two adult families living together, as well as between the two adults of the same family (i.e. husband and wife). A social worker declared that the workload was expanding in terms of relationship issues within households, with a usual client base of 10 to 15 families increasing to a current 48. An official also noted that children were suffering and showing signs of high anxiety and behavioural problems.

Several interviewees discussed how many mothers had suffered greatly as they attempted to provide for their children. One resident revealed her trauma during and after the flood: “...you just had this constant rollercoaster of fear leading up to the floods, through the floods, after the floods, where’s their food, do we get food, are we going to get help? Then... we’re knocked back by the insurance companies.” It is therefore not surprising that more female than male respondents indicated that they had suffered in terms of wellbeing after the flood. That is, 62.7% of female respondents compared to 41.2% of male respondents declared that they were worse off after the

flood in terms of at least one of the following factors: relationships, financial status, physical health, mental health, and general happiness.

One demographic group that stood out with fewer respondents indicating negative impacts in terms of wellbeing were the 55+ year age group (31.8%) compared to all other age groups (<35yrs=63.2%, 35-44yrs=57.1%, 45-54yrs=68.4%). This result could be related to previous experience during times of hardship or because they might be ‘better off’ in terms of social networks due to their longevity within the community.

According to one resident, the flood maps released by the council (Fig 7.2) caused much fear among residents (Text box 7.3).

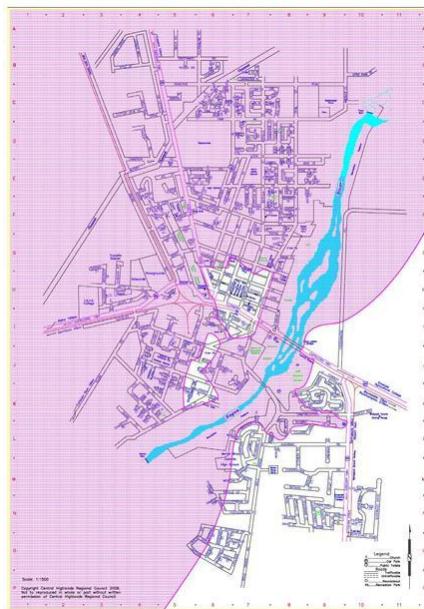


Figure 7.2. Flood map released by council prior to the 2010 flood

Text box 7.3. A resident describing her reaction to the floods maps released by council

*“That’s what they were predicting. That’s what we were faced with, okay. So you can imagine the terror going into people. How can you put a whole town into this little area? The river was already over the bridge. You couldn’t get anyone out there. Where do you go? So the terror had started before it even happened.”*

Residents who were hard hit by the 2008 flood were finding the repeat experience traumatic. Some residents understood that cleaning would help them deal with the shock and grief of being flooded and many residents talked about not being about to “handle going through another one” and had great concern about whether or not the next summer was going to be another “flood summer”. However, some knew that the experience had possibly made them more resilient to certain situations: “I know I’ve changed as a person...in some ways I’ve become more compassionate, in some ways I’ve gotten hardened in, “Look after yourself. Get on the Internet, source it yourself”.”

## 7.2 Underlying vulnerability and constraints to recovery

### 7.2.1 Town planning in flood prone areas and mitigation measures

The township of Emerald was first developed on the eastern-side of the river, in an area that was not vulnerable to flood. As development continued, people moved to the western-side, which is the lower part of town and this area now forms the central hub of Emerald. Many people are of the opinion that development should not have occurred here and that: “*basically the whole of Emerald was built in the wrong part.*” Housing developments in known flood prone areas that were newly established, or continuing to be built after the 2008 flood, are of great concern. For example, the housing estate known as ‘Blue Gums’ consisted of very few houses when the 2008 event flooded the estate but development continued and in 2010, 50 out of 57 homes flooded.

New developments include homes raised on stilts but most consist of slab-on-ground construction which is not popular among residents or builders: “*I don’t like building in Emerald on a slab. I’d rather build on adjustable stumps mainly because the ground is pliable, there’s too much clay here and there’s a lot of, there is a lot of movement.*”

The Fairbairn Dam, which is owned and operated by SunWater, was built to meet the requirements of agricultural and mining developments and for the supply of urban water. It was not built for flood mitigation, which many residents understood. Contrary to this, some thought the council should be able to control the amount of water contained in the dam. But it is not within their capacity to do so.

Nevertheless, council took additional measures to monitor water flow following the 2008 flood with the installation of about 30 extra gauging stations and a radar station. Council, among others, were lobbying for the radar station for many years prior to the 2008 flood and continued to do so after the flood. Federal funding was granted and the radar station was installed before the 2010 flood event.

### 7.2.2 Insurance

A greater percentage (41.6%) of Emerald respondents knew they had insurance cover for all types of flood (Fig 7.3). Of these, most were high household income earners (> \$150,000) (68.4%), homeowners (53%), had lived at that address for more than a year (51.6%) and had previous flood experience (48.9%).

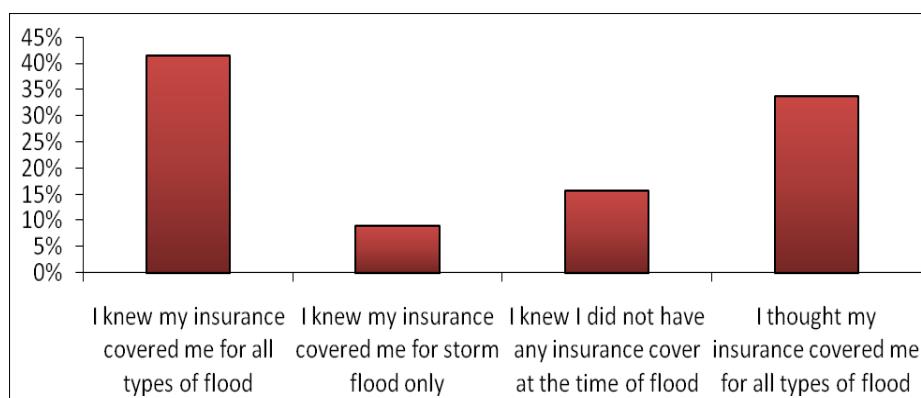


Figure 7.3. Knowledge of insurance coverage prior to the flood.

A greater proportion of respondents in the 45-54 age group knew their insurance covered them for all types of flood (58.8%) compared to those that thought their insurance covered them for all types of flood (35.3%). Similar results were also found in the 35-44 age group (knew=41.2% c.f. thought=29.4%). While a greater percentage of those respondents in the 55+ age group thought their insurance covered them for all types of flood (38.1%) compared to those who knew their insurance covered them for all types of flood (33.3%). In comparison, the same number of respondents (35.3%) in the 18-34 age group knew or thought their insurance covered them for all types of flood.

Of those people who had lived *less* than 1 year at their address at the time of the flood, most (52.6%) thought their insurance covered them for all types of flood. Whereas those people who had lived at their address for *more* than 1 year at the time of the flood, the majority (51.6%) knew their insurance covered them for all types of flood. In comparison, of those people who had lived in the community for *less* than 1 year, most (50.0%) knew that they did not have insurance cover for flood while a majority (44.2%) of those people who had lived in the community for *more* than 1 year knew their insurance covered them for all types of flood.

Those who were aware of their flood vulnerability either knew (37.5%) or thought (43.8%) they had insurance cover for all types of flood. Similarly, those who were not aware of their flood vulnerability knew (44.3%) or thought they had (34.4%) insurance cover for all types of flood. However, some believed that all people should be aware of their insurance due to the high level of flood risk in Emerald.

Several interviewees described agonising battles with their insurance companies (Text Box 7.4) and the fact that many residents that had been impacted by the flood in 2008 did not have insurance in 2010 because they could not afford the inflated premiums, or the insurance companies refused to cover them. Many people referred to ‘being held hostage’ by insurance companies with little idea on 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.

#### Text Box 7.4. One family describes their fight with the insurance company

*“...our cars were sitting in water and our house was an island and we had a current running through our backyard, our laundry was full of water, which has just destroyed all the back area. We got insurance companies in and they couldn’t see a problem. They did all the assessments, wanted us to get quotes, not a problem. No, they sent hydrologists in here and proved we had a flood, therefore we’re not covered. We haven’t got the money to afford to replace a whole laundry that is actually part of the main house structure, and insurances, we can’t afford to change all our insurances. We don’t know who’s going to cover that. NRMA, we phoned them up just before the 2008 floods and said, “Look, are we going to be covered for this flood?”, and they said, “Yes, not a problem”. We didn’t need them in 2008. 2010 they denied ever telling us that.”*

However, not all people had issues with their insurance company. One resident told of how their company had changed the wording in their previous policy so that the word ‘flood’ had been replaced with ‘tsunami’. After some debate the company realized it was their fault and they came good with the payments. Moreover, the insurance company bought them a caravan to live in while their house was repaired since they could not find accommodation which would also house their dog. Another resident explained that his insurance company had assessed his damages to be

\$252,000, which they paid out to him, but his repairs only cost around \$20,000. This resident was of the opinion that his unexpected gains were a result of the insurance company's builders providing inaccurate, unnecessary and over-priced quotes for repairs.

### *7.2.3 Structural changes to buildings as a result of risk knowledge*

Respondents were asked if, when they purchased / started living in their home, they knew that it was vulnerable to flood. 72.2% of respondents stated that they were not aware, 17.8% said they were aware and 10.0% opined that their house was not vulnerable to flood. 10.5% of respondents indicated that they chose to live in a house that was out of the flood hazard zone and not surprisingly, only 7.4% of respondents stated that they had chosen, built or modified their house or property in order to make it more resistant to flood.

One resident, who moved into a home next to the Nogoa River about 10 years ago, was told that they couldn't get flood insurance. Knowing their home was vulnerable to flood, they were not surprised when it flooded in 2008. Having this experience, they felt that they were very lucky and used the opportunity to repair and raise their home. As a result, their home did not flood in 2010. Ironically though, these residents were covered for flood as they had renegotiated their policy and the insurance company had agreed to cover them since they had raised their home.

This household had also made another significant change within their home following the 2008 flood - they replaced their tiled and carpeted flooring, which was ruined in the flood, with a hoop pine floor. This modification, however, had been planned prior to the flood. Nevertheless, the builder had installed a removable floor board in which the resident was instructed to remove before the flood came so as to allow room for the other boards to swell and after it dries out, the board should easily slot back in.

Another Emerald resident had made adjustments to his home in light of risk knowledge he gained during the 2008 flood. Although water had not entered his home in 2008, he expected that a future flood would. This resident therefore drilled holes into the cement around the external doorways (Fig. 7.4) and lined the cement with waterproof rubber tape to create a 'rubber o-ring'. He then sealed the doorway with a sheet of marine plywood that was about 400 mm high and screwed bolts through the plywood and into the holes in the cement in order to hold the rubber o-ring in place and prevent water from entering his home.



Figure 7.4. Drill holes around a resident's external doorway ready to install a sheet of marine plywood to help prevent water from entering the home. This adjustment was made following the 2008 flood.

Upon realising that the 2010 flood was going to be potentially larger than the 2008 flood, the same resident reinforced and extended his flood defence around the external doorways by creating a higher barrier with black plastic and sandbags. Although this protective layer was high enough, water still entered their home via the toilets and drainage pipes. The resident reported that he had anticipated this to happen and had attempted to prevent it from occurring by placing plastic and sandbags in the toilet and over the drainage pipes. As with other residents, however, this was ineffective.

Another resident described some changes made to her home following the 2008 flood, which included mounting the air-conditioning unit and installing a bench-top oven. However, a number of interviewees and respondents clarified that they were unable to make changes to their home because they were renting the property.

#### *7.2.4 Other factors adding to vulnerability and impeding recovery*

Although Emerald is considered to be a wealthy town and therefore one might assume that residents are more resilient, it is obvious that wealth does not necessarily ensure that people are less vulnerable to natural hazard events. Other underlying factors contribute to people's vulnerability and affect their ability to recover. For example, one woman described a family with a handicapped adult son who was reliant on their care. Apparently, government agencies had recorded that their house had not flooded when it had. The government was not aware of their situation and therefore demanded proof before they would provide them with any assistance (Text box 7.5). In order to prevent such situations, the council are developing a 'Vulnerable Persons Register', which will identify those people in the community who might need assistance with evacuation during, or recovery from, a future event.

Text box 7.5. A resident describes the vulnerable situation of one family who has a handicapped adult in their care

*"It's all these little things that people don't hear that go on and it just adds to the heartache that they're dealing with. They're trying to sell because they can't hack it any more. They've got to get out. To sell it they're going to lose a lot of money... They lost everything. How can you say they didn't get water? You know, and for them to try and fight that, how much more is it going to cost them? What do they do? It just encourages people out here to just give up and pack up. Why bother anymore? So many people who I've spoken to out here have said "The next flood that comes in, we're just running. We're just leaving everything. We can't do this again", and that's sad to hear that."*

Wealth also appeared to be a constraint to many people's recovery as most were not entitled to the Queensland Premier's Flood Appeal because their annual income was above the award: "yes, we're a wealthy town, but take out the tax, we aren't." These people had lost a great deal of annual income due to their businesses suffering flood damage, their insurance companies were not paying up and they could not afford the repairs on their homes. Officials recognised the detrimental effect this can have on people's emotional wellbeing.

Residents also reported that it was difficult to secure rental properties in Emerald even before the flood, with a three to four bedroom home priced between approximately \$600 and \$1,200 and a

single bedroom unit priced between \$400 and \$500 a week. One official noted the difficulties people were facing if they were still waiting, eight months on, for an outcome on their insurance claim. In this instance, people were often paying a mortgage for a house they cannot live in and rent on the house they live in but do not own. As a result, people were rushing to get back into their homes.

Due to the inflated rental prices, some new residents with jobs had no choice but to live by the river, including pregnant women and families. To ensure the welfare of these people, the Neighbourhood Centre runs a '*River Pantry*' every Friday. It was suggested that these people had a steady income but could not afford housing and there was nowhere else for them to go. This situation was heightened before the 2008 flood but has escalated since the 2010 event.

The lack of accommodation in town was also impeding the recovery process because builders who were available to work in Emerald could not afford to live there. According to some residents, the already expensive rental properties increased 20% after the 2010 flood, particularly those properties located on higher ground. One new resident, who had moved into a rental property in Blue Gums Estate in 2011, indicated that they had very little choice of where they could live. Upon moving to Emerald there were only three rental properties on offer and all were located in flood prone areas.

Those who were renting, however, had an alternate and maybe faster means for recovery since they were able to pack up what was left and move on, whether it was within Emerald or to another town. Leasers were given the option of terminating their lease early if the house had sustained flood damage. Otherwise, they could continue their lease and stay in alternate accommodation (at the expense of the landlord / landlord's insurance company) until the rental house had been repaired.

One factor impeding people's recovery was the lack of builders in town with some residents, who were impacted by the 2008 flood, booking local builders a week before the 2010 flood in anticipation of their homes needing repairs. Another barrier to recovery was people's pride with officials stating that rural men were reluctant or felt guilty to come forward and ask for assistance.

Emerald is a diverse and multicultural community with many South African and Zimbabwean residents, among other nationalities. Furthermore, there are some residents who live out of town and are not as well connected to community networks. As such, the council and local government agents tried many methods of communication to ensure that these people were aware of the support available to them. These included public meetings, community events, adverts in local newspapers and providing information on relevant websites such as the regional council.

### **7.3 Adaptation and risk reduction**

#### *7.3.1 Household adaptations*

Overall, 49.5% of respondents indicated that they have not made, or are unlikely to make, changes to their house or property as a result of the flood, 6.8% were undecided and a further 23.5% have already made changes, or are likely to make changes (Table 7.3). The highest ranked changes that were done, or were likely to be done, were 'modify insurance policy' and 'move air conditioning unit higher'. However, only one-third of respondents (33.3%) who did not have full flood insurance cover at the time of the flood have updated their insurance policy.

17.6% of respondents were undecided if they would permanently move to a flood safe location while a further 21.7% stated that they were likely, very likely or had already taken this measure. One interviewee in January stated: "*our plan is to buy in the 20% of Emerald where it didn't flood.*"

However, this resident was still in the same home when we returned in August. Nevertheless, some officials reported that they were aware of some, including longer term residents, who had already moved from flood affected areas with many leaving town altogether. When looking at the demographic data, it reveals that those respondents most likely to relocate were aged between 35-44 years, had a High School Certificate or vocational qualification, an annual household income of \$100-\$150k and were couples with children or other dependents.

Table 7.3. Responses to the question: "Have you, or how likely are you, to make the following changes as a result of the 2010 or 2011 flood?" All data are given as a percentage.

	Not at all likely	Unlikely	Undecided	Likely	Very likely	Already done	N/A
Permanently move to a flood safe location	35.1	20.3	17.6	9.5	10.8	1.4	5.4
Raise level of home	63.1	12.3	4.6	3.1	1.5	6.2	9.2
Change exterior and/or interior design e.g. use flood proof materials	43.5	8.1	9.7	8.1	8.1	6.5	16.1
Move electricity outlets/meter boxes higher	43.3	13.3	3.3	11.7	3.3	5.0	20.0
Move air conditioning unit higher	27.3	12.1	4.5	7.6	12.1	24.2	12.1
Anchor water tanks to the ground	25.9	5.2	1.7	1.7	3.4	3.4	58.6
Improve garden drainage	32.1	12.5	5.4	7.1	1.8	14.3	26.8
Build permanent flood barriers around property	54.2	11.9	8.5	1.7	1.7	8.5	13.6
Modify insurance policy	21.2	4.5	6.1	13.6	6.1	28.8	19.7
OVERALL	49.5		6.8		23.5		20.2

Although very few residents stated that they had or were likely to raise the level of their home, the research team witnessed several homes, which were adjacent to the river, being raised (Fig 7.5).



Figure 7.5. Left-hand photo shows house in the process of being raised. Right-hand photo shows the wooden pallets used to stabilise the house as it is gradually raised.

Significantly, those respondents who did not own their home at the time of the flood are unlikely, or not at all likely, to make changes following the flood (56.6% c.f. 36.8% who have made, or are likely to make changes). However, surprisingly, of those people who owned their home, there was a very significant difference between those who are unlikely, or not at all likely, to make changes following the flood (63.0%) compared to those who have made, or are likely to make changes (27.5%).

More respondents who do not own their home believe that they are less able to make changes to reduce their flood risk (30.4% c.f. 21% more able) compared to others in their community. In comparison, respondents who own their own home do not feel that they are more (20.4%) or less able (18.7%) to make changes than others in their community.

Those respondents whose wellbeing had suffered after the flood indicated that they were less able, or at best had the same ability, to make changes to reduce their risk from flood compared to others in the community (Table 7.4).

Table 7.4. Responses to the question: "In comparison to other people in the community, do you think you are more or less able to make changes to reduce your risk from flood?" All data are given as a percentage.

	Significantly less able	Less able	About the same	More able	Significantly more able
Wellbeing suffered	12.2	12.2	63.3	12.2	0.0
Wellbeing hasn't suffered	7.9	10.5	50.0	21.1	10.5

Those that were able to make changes described the various measures they had taken to help reduce their risk to future flood. Some discussed minor changes such as replacing gypsum board with rendering and carpet with tiles. Several other residents, however, had or were in the process of taking more extreme measures to flood-proof their homes by installing concrete walls around their property. One resident described his construction consisting of: 100 mm x 100 mm galvanised fence posts inserted a meter in the ground, concrete slabs weighing two ton each inserted between the fence posts and positioned 800 mm below ground level with another 200 mm of space underneath (Fig. 7.6). The concrete slabs sit in a trench 700 mm wide and concrete is poured under and around the slabs up to ground level (i.e. 1 m deep). An agitator is then used to ensure the poured concrete is all solid. Rubber and Sikaflex® line the joints to allow for expansion of the concrete while ensuring it remains water proof. The final level of the fence above ground is about a half meter above the height of the 2010 flood.



Figure 7.6. Beginning in January 2011, one resident sought advice from a carpenter, concreter, plumber and several engineers for the development of flood-proofing measures. These included the construction of this concrete wall around his property which is reinforced along the river-side with a concrete trench that forms the garden bed.

Other additions to ensure the house remained flood proof during the next big event included: the installation of one-way valves to prevent sewerage and effluent from entering the house via the

toilet and drainage pipes; concrete troughs with sump pumps in the lowest part of the garden areas to drain excess water that enters the yard; and, a diesel generator to provide electricity for lighting, refrigeration and operate the sump pumps when needed. This household also replaced all carpets inside the home with tiles and had installed several solar panels and multiple rainwater tanks which could be used for drinking water (although these installations were done prior to the flood).

Despite many respondents' belief in the likelihood of a flood in the next year, most have not or do not intend to make changes to reduce their risk (Fig 7.7). Nevertheless, local builders were encouraging flooded residents to make basic changes that are not too costly, including replacing carpets with tiles throughout and plasterboard walls with Villaboard, which is a type of fibro that can be literally hosed out after a flood.

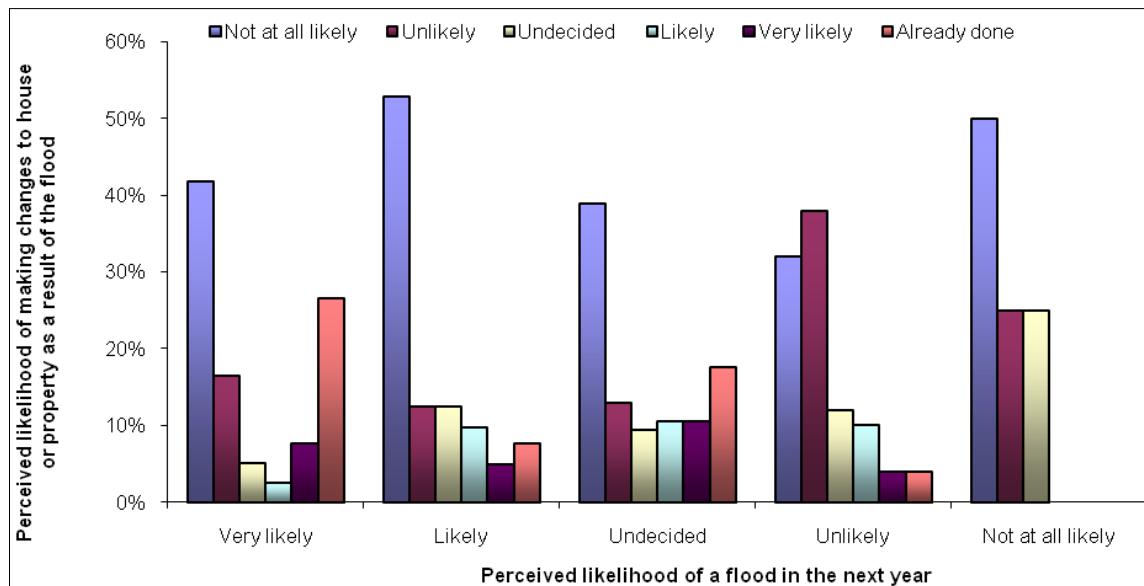


Figure 7.7. Distribution of the perceived likelihood of making some element of change to house or property for a given perception of the likelihood of a flood in the next year.

Some barriers to adaptation might be linked to the irregularity in which funding was allocated: *"there were people saying that they got absolutely no help and yet they had a shit load of water go through, and other people saying they didn't get any water and yet they did get help financially."* Other barriers to adaptation relate to the influence of the insurance industry with particular companies using their own builders for repairs and insisting that they build back the same. On the other hand, some residents openly admitted to officials that they weren't making any changes to reduce their risk from flooding because they'd rather use the money to build back better (i.e. installing a more elaborate kitchen) rather than making their home more resilient (i.e. by raising it). Some justified their choice with the belief that they had to make their home attractive in order to increase its value.

Several interviewees described some of the adaptations that local businesses were making to reduce their risk from flood. For example, instead of replacing the flood damaged floor coverings, a local gymnasium had treated the concrete slab with a paint that could simply be hosed off after the next flood. They also positioned their cupboards higher and stored the files on the top, instead of the bottom shelf. A local chemist replaced their non-transportable shelving with moveable shelves on wheels so their stock can simply be wheeled out before the next flood.

Disappointingly, the large shopping complex (which includes a Coles supermarket) situated next to the Nogoa River on low-lying land sustained major flood damage in 2010 but was rebuilt. According to reports, the centre management would not release any tenants if they indicated that they wished to move to the new shopping complex that was being developed on higher ground.

### *7.3.2 Public attitudes to council and government responses to flood mitigation*

At the government level, residents called for building code changes that would ensure residential buildings were less vulnerable to flood damage. This included building on stilts / stumps instead of slab-on-ground constructions and compulsory installation of one-way valves on sewerage pipes in order to prevent effluent from re-entering the house through drainage pipes and toilets, which was a common problem during the floods. At a council level, some residents raised concern about the material used to construct roads stating that in flood prone areas better road base must be used to prevent continued damage when roads are submerged. Many people called for better management of the Fairbairn Dam's water levels and related this responsibility to the local council, while others accurately realised that this was an issue for SunWater, who owns and operates the dam. Also, nearly all interviewees agonised over issues associated with flooding at various points along the railway and a notorious drain labelled LM1 (Text box 7.6).

Text box 7.6. One resident's complaint about drains causing localised flooding, which was echoed by many

*"The one thing that I would like to see is that they bloody do something with the frigging... this railway...this bridge opposite the TAFE College that backs up all the water... it's the problem that Kidd Street got all the damage...It's why we get so much damage like at our house, because of that big drain that goes there, and then you've got a railway line which is this low... and the water just has nowhere to go. I mean, that's my one big thing: fix that LM1 drain."*

The construction of a new shopping complex on the eastern-side of the river was considered a positive step for reducing an element of risk during future flood events: "...there will be access to food on the other side of town... that side of town, when the main bridge in town is cut off, you've got nothing; you've got no food..." Not only was this perceived as crucial due access being cut but also because the Coles supermarket had flooded and hence lost everything and Woolworths had limited stock as the roads into Emerald were all cut by floodwater.

It is highly unlikely that the township of Emerald will be relocated like its neighbour Clermont (Text box 7.7) but many residents opined that they should prevent further residential development in low-lying areas.

Text box 7.7. Resident's description of the great flood that led to the relocation of Clermont in the early 1900s

*"Clermont, our neighbour up the road had an awful flood back in...about 1915, and of course in those days it actually took about three weeks for the authorities to even find out that they were flooded. I'm only here because my great-grandfather had an orchard [near Clermont] and he sold that a week before the flood happened, and moved the family into a pub that he'd bought in Clermont. The family that bought the orchard and farm off them all died, they were all drowned in their beds, and that's Theresa and Sandy Creek when they flood, they come up so silent and so fast. There was a lot of life lost... my grandparent's pub was the only one that didn't flood so everyone was staying there, and they basically had to ban the sale of alcohol until they had dealt with all the dead bodies and the*

*dead animals, as well. When you drive to Clermont you can still see, there's an ornamental piano up a tree. It was stuck there after that great flood, and they've left it there every since and replaced it over the years, that's what that's showing is the height of that flood. They then relocated the entire town to higher ground, and there's a wonderful book... of photographs from when that town was relocated. They literally did it with horse teams and huge big logs, and there's classic photo of... the boarding houses all being moved... they moved and restumped the entire town."*

## **8. Case study results: Overview**

### **8.1 Brisbane, Queensland**

The majority of Brisbane respondents were aware that their home was vulnerable to flood yet very few tried to protect their house with sandbags, which could be due to the availability of sandbags in flood-affected neighbourhoods. The most common form of adjustment prior to or during the flood was raising or relocating household items to a safe location. There was a widely held assumption that Wivenhoe Dam had ‘flood proofed’ Brisbane, and that the risk should have been minimal. The belief that Wivenhoe Dam had made their location safe from flood contributed to the lack of preparation of some residents.

Eight months on, flood damage was still evident around Brisbane. In all, 56.0% of respondents had either yet to complete or start rebuilding and 15.1% had not returned to their property on a permanent basis. This was due to a number of factors, including cost, the need to wait for insurance decisions, and there being more properties to be rebuilt than there were builders. A number of abandoned properties were evident in the case study area with a local councillor suggesting up to 10% of properties may be abandoned permanently.

Respondents voiced their dissatisfaction of how the flood response had been handled, with a number remarking that the rest of the city has moved on while they continue to deal with the flood’s aftermath. The emotional stress of the flood event and recovery process has had an impact on wellbeing, with 62.9% of women and 55.6% of men reporting the flood had negatively affected their wellbeing, in terms of at least one of the following factors: relationships with family / friends, financial status, physical health, mental health, and general happiness. The loss of sentimental items was also deeply felt by many respondents.

Flood insurance was a source of dissatisfaction for many respondents, with 33.3% having thought their insurance covered them for all types of flood. The percentage was even higher for those with incomes over \$100,000 (57.1%). Those residents also did not qualify for the Premier’s Relief Fund - a restriction a number of residents felt was unfair. While some respondents believed flood should be a standard inclusion on insurance policies, others expressed cynicism and distrust in the insurance industry making flood coverage more available. Moreover, insurance was considered to be too expensive for some.

Respondents were largely positive about the considerable amount of help from volunteers provided on the first and second weekends after the flood, but there was a feeling that the volunteers, while eager, were not well organised. The volunteers, however, were held in much higher regard than the council and SES, with many residents reporting not having seen council workers or SES volunteers during the flood or in the immediate clean-up. This was reflected in a high level of dissatisfaction with both organisations’ response to the flood. The one exception to this was the local councillor, who was held in high regard by residents for her involvement in the flood response.

Most Brisbane respondents were not considering significant changes to reduce their flood risk. While 50.0% stated they were likely to or had modified their insurance policy, few other changes were favoured by residents. Some properties were being raised or rebuilt at a higher level, but many respondents did not see the value in this. Residents largely felt responsibility for flood mitigation was in the hands of the council, as well as better management of Wivenhoe Dam, and so felt there was little they could personally do to reduce their risk.

While cynicism towards insurance and council were very common, there was a strong feeling of resilience in the community. Many respondents talked of how much closer they felt to their neighbours and wider community, expressing that, while the flood was a negative experience, it has produced some positive outcomes.

## **8.2 Donald, Victoria**

In Donald, the perception of risk was low with few residents making adjustments to protect their family and home from flood. This is not surprising, however, since 54.9% of respondents indicated that their house was not vulnerable to flood and a further 37.3% stated they were not aware it was vulnerable. It is therefore understandable that nearly all respondents indicated nothing had prevented them from making adjustments since they did not believe it was necessary to do so.

The lack of information available to residents prior to and during the flood may have also contributed to their lack of motivation to make changes, such as raise household items, sandbag house, devise an evacuation plan or prepare an evacuation kit. Residents did not receive detailed hazard information and were therefore uncertain about the risk during this specific event. Known and trusted sources of information (e.g. the SES and ABC radio) were unable to provide appropriate, relevant and timely advice to residents and on the whole, residents lacked knowledge of the various measures that can be taken to reduce the impact of flooding to their home. However, it would be fair to assume that in light of the recent flood in September 2010, residents should have adequate awareness of how they can protect their homes and properties. Nevertheless, the January 2011 flood was much larger than that experienced in September 2010, there were a lack of sandbags during the 2011 event, the SES were unable to gain access to Donald and volunteers focused their efforts on specific places instead of working throughout the town where needed. The cumulative effect of all these issues resulted in many residents being ill prepared.

Most residents' low risk perception was reasonable as few reported flood damage to their house contents and building structure although more than half reported property damage and some revealed that their businesses were impacted. It is likely that some, but not all, recorded property / business damage occurred outside the urban area as a number of residents living within the township of Donald own and run rural farms on the periphery. This might explain the fact that a higher proportion of men who completed the survey indicated that they had suffered negative impacts to their wellbeing as a result of the flood as it is predominantly men who physically operate the farm. However, this result contradicts observations by social workers who reported an increase in women suffering from depression and we cannot offer a viable reason for this anomaly without further investigation.

As with other parts of Australia that were flooded during the 2010/11 summer, the prolonged drought had assured flood mitigation efforts in Donald had been placed on the backburner. Local government feared reprisal if they maintained or implemented flood mitigation works during the 14-year drought and some residents pushed for development in flood-prone areas based on the fact that that property had not flooded since they had lived in Donald.

Many Donald respondents thought they had full insurance cover but very few actually knew they were covered for all types of flood. The remaining respondents, which equates to a little more than half, knew that they were not covered or covered for storm only. Nearly half those who were unaware of their insurance cover indicated that they had no previous flood experience. All respondents who knew they did not have any insurance cover at the time of flood had a household income of less than \$50,000, possibly indicating that full insurance cover was too expensive.

Despite many respondents' belief in the likelihood of a flood in the next 10 years, many do not intend to make changes to reduce their risk. Of those who indicated they would consider changes, the most popular methods were to modify insurance policies, improve garden drainage and build permanent barriers around properties, which could prove difficult due to government restrictions. Respondents whose wellbeing suffered after the flood perceive that they are less able to make changes to reduce flood risk compared to others in their community.

An interesting adaptation that some farmers were making for drought and flood was the planting of River Saltbush as fodder for sheep. River Saltbush survived the flood even though it was submerged for an extended period. In comparison, the Old Man Saltbush is dying. However, both these plants survive well in high-salinity soils and drought conditions. These findings may prove valuable to other sheep farmers in the area.

The resident formed 'Donald Community Flood Recovery Group' has received \$135,000 in government funding to conduct a flood study that includes the simulation of a once-in-200-year event. Although policy changes are hoped to result from such studies, it may take a long time until they are implemented. Nevertheless, local residents are very positive about the group and the work they are undertaking. The dedication and persistence of this group of residents is not only encouraging to Donald residents, but should also serve as a good example to other affected communities around Australia.

### **8.3 Emerald, Queensland**

Despite the recent flood in 2008, two-thirds of Emerald respondents were unaware that their home was vulnerable to flood. This is also surprising given the fact that the majority were living in a single storey building which was not raised on stumps / stilts but located in a flood-prone area. Possibly due to the persistent and detailed flood messages communicated via sms by the local council, nearly all residents undertook some form of adjustment prior to or during the flood. Many people raised household items up off floor, followed warning advice, sandbagged their homes or moved household items to a safe location. As with other communities, Emerald residents reported a lack of sandbags which instigated innovative ideas using pillow cases and potting mix.

Only a quarter of respondents indicated that their house was not impacted by the flood but more than a third suffered major impacts to their house contents or noted that they were completely destroyed. Repairs to flood affected homes were slow to complete with 37.5% of respondents stating that they were ongoing and for a few, they had not yet begun. For some, this process had been delayed by a lack of builders in town (possibly due to outside contractors unable to find or unable to afford accommodation) or due to the long, tedious process of waiting for outcomes on insurance claims.

A vast majority evacuated their homes and as of August 2011, several households had not returned on a permanent basis. The housing shortage in Emerald exacerbated this situation with many evacuees forced to live with family and friends or leave town altogether. Although Emerald residents were clearly upset about the flooding disaster and the impact it had on their home, family and community, around two-thirds implied that they were neither better nor worse following the flood in relation to their financial status (61.5%), general happiness (62.6%), physical health (67.0%), mental health (67.4%), and relationships (90.0%). Where there was change, however, it was overwhelmingly negative (around a third of respondents) with respect to their financial status, general happiness, physical health, and mental health, but not relationships (only 6.7% reporting

negative change c.f. 3.3% reporting positive change). In contrast to this result, officials discussed how the flood had had a significant impact on personal relationships, particularly where others were relying on friends or family to provide accommodation. Surprisingly, those respondents with a mid-high household income indicated more negative impacts in terms of wellbeing compared to those in the low and low-mid income brackets.

New residents, who moved to Emerald after January 2011, were renting in flood affected houses with no flood insurance as there were no other options available to them. The inability to acquire adequate flood insurance was a concern to many existing residents as well. However, leading up to the flood a greater percentage (41.6%) of Emerald respondents knew they had insurance cover for all types of flood. Of these, most were high household income earners ( $> \$150,000$ ) (68.4%), homeowners (53%), had lived at that address for more than a year (51.6%) and had previous flood experience (48.9%). During the rebuild, many insurance companies did not support or encourage improvements to reduce their flood risk. However, there were stories of a few households that had taken it upon themselves. One example was a household that was denied full insurance cover but upon raising their home after it was impacted by the 2008 flood, they were offered full cover, which they accepted.

Nevertheless, when rebuilding after the 2008 flood many residents opted to build back better instead of more resilient and this was repeated again after the 2010 flood. Understandably, residents were concerned about property values and therefore wanted to rebuild their homes to a level that would increase sale price. However, few respondents understood that building a more resilient home, especially those located in flood hazard zones, could increase its value. Many respondents who had made changes to reduce their flood-risk did so based on their own intuition and experience.

Unfortunately, the experience and knowledge gained from floods in 2008 and 2010 had not transferred to other development projects around Emerald with many new developments consisting of slab-on-ground construction, even in high flood-risk areas. Even more alarming was the reconstruction of the Coles shopping complex located adjacent to the Nogoa River. This entire building was gutted after the 2010 flood and tenants within the complex were unable to break their lease, according to reports. However, some new developments were building homes on stilts and a new shopping complex was being constructed on higher ground, on the eastern-side of the river. This was considered a positive step for the community as it would provide service to those isolated from the main part of town, which is on the western-side, during the next flood.

Although Emerald is considered to be a wealthy town and therefore one might assume that residents are more resilient, it is obvious that wealth does not necessarily ensure that people are less vulnerable to natural hazard events. Wealth appeared to be a constraint to many people's recovery as most were not entitled to the Queensland Premier's Flood Appeal because their annual income was above the award. However, many people had lost a great deal of income due to their businesses suffering flood damage, their insurance companies were not paying up and they could not afford the repairs on their homes. Officials noted that many of these people, particularly men, were reluctant to come forward and ask for assistance. However, local council and government agencies, non-government organisations and community groups were working together to ensure that all flood affected people were receiving help, where needed.

As a result of the 2010 flood, the highest ranked changes that had already been done, or were likely to be done, were 'modify insurance policy' and 'move air conditioning unit higher'. Significantly, those respondents who did not own their home at the time of the flood are unlikely, or not at all

likely, to make changes following the flood (56.6% c.f. 36.8% who have made, or are likely to make changes). Surprisingly, however, of those people who owned their home, there was a very significant difference between those who are unlikely, or not at all likely, to make changes following the flood (63.0%) compared to those who have made, or are likely to make changes (27.5%). Again, this could relate to the fact that many people wanted to build back better instead of more resilient or they lived in slab-on-ground constructions and did not think improvements were possible.

#### **8.4 Similarities and differences inherent within each case study**

Overall, Emerald residents were more proactive in their attempts to reduce their risk to flood than Brisbane and Donald residents (Table 8.1), which could relate to good leadership and communication during the event and / or their recent experience. Emerald residents not only had more flood experience (51.6%) than Brisbane (26.2%) and Donald residents (32.1%), but many of them had experienced flood in December 2008. Although Donald flooded in September 2010, this event was only minor compared to the January 2011 flood and very few residents acknowledged this as past experience (see Table D1-Appendix).

Table 8.1 Comparisons between adjustments made to help protect family and home prior to and during the flood

	Brisbane	Donald	Emerald
Devised an evacuation plan	23	13	26
Prepared an evacuation kit	13	2	25
Followed warning advice on radio / television / internet	42	17	57
Sandbagged house	13	32	40
Built temporary flood barriers around property	-	11	12
Kept drainage clear of debris	8	15	20
Raised household items up off floor	65	17	64
Moved household items to a safe place	61	9	40

Brisbane and Emerald residents suffered more damage within and around the home compared to Donald residents, whereas slightly more businesses were affected in Donald (Table 8.2). However, this is most likely a reflection of the survey methods since businesses were not specifically targeted in the study.

Table 8.2 Comparisons between estimated impacts and level of recovery

Percent of:	Brisbane	Donald	Emerald
- respondents who evacuated	77	27	81
- respondents who perceived <i>some</i> damage to home contents	73	29	74
- respondents who perceived <i>some</i> damage to building structure	85	35	76
- respondents who perceived <i>some</i> damage to property / yard	93	56	87
- respondents who perceived <i>some</i> damage to own business	37	41	23
- respondents whose flood repairs are complete	31	10	58
- respondents whose flood repairs are ongoing	44	20	38
- respondents whose flood repairs have not started	12	-	5
- evacuated respondents who have <i>not</i> returned home on a permanent basis	15	16	15
- female respondents who suffered <i>some</i> negative impacts	63	36	63
- male respondents who suffered <i>some</i> negative impacts	56	52	41

More residents in Emerald reported that their flood repairs were complete. On the other hand, more Brisbane residents reported that their repairs were ongoing or had not yet begun. Nevertheless, a similar amount of respondents from each location stated that they had not returned to their home on a permanent basis.

Most interestingly, there is a significant difference between the numbers of female respondents who suffered *some* negative impact to at least one of the following: relationships with family / friends, financial status, physical health, mental health and general happiness. That is, 36% of female Donald respondents reported some negative impact compared to 63% in both Brisbane and Emerald. Moreover, there is a significant difference between male and female respondents within Donald. That is, more male respondents (52%) reported negative impacts than female (36%), which is different to the situation recorded in Brisbane and Emerald.

These anomalies could relate to the many years of hardship experienced in Donald during the drought and the complexity of issues that were compounding its effects. For example, Kiem et al (2010) found that farmers around Donald and Mildura felt that they could deal with the drought, but other factors were exacerbating the situation, such as: the closure of the Australian Wheat Board; lower international agricultural commodity prices; and, issues surrounding irrigation and water trading policies associated with the Murray River. It is therefore possible that the much anticipated but untimely arrival of the rain at harvesting time brought further disappointment and stress to male respondents.

On the other hand, Kiem et al (2010) noted that rural women had taken secondary employment during the drought in order to ensure the financial stability of their family. Although the rain caused crop damage at harvest time, farmers were better off now than they were during the drought. It is therefore possible that female respondents perceived the rain as a positive since it had improved their financial situation.

As previously noted though, this result contradicts observations by social workers who reported an increase in women suffering from depression and we cannot offer a viable reason for this anomaly without further investigation. Various factors to consider are whether or not men: have a stronger emotional connection to the land; are more or less affected by the financial stress of farming than women; or, are more reluctant than women to present themselves for counselling but are comfortable discussing such matters anonymously.

The result that many more respondents in Emerald knew their insurance covered them for all types of flood is not surprising since many had experienced flood in 2008 (Fig 8.1). Similarly, the result that less Emerald respondents knew they were not covered or covered for storm flood only is also expected when considering recent experiences. It is, however, surprising that more Emerald respondents *thought* they were covered for all types of flood when compared to Brisbane and Donald respondents.

From the available data, it is difficult to draw any conclusions about those likely to know or not know about their type of coverage in Brisbane. However, the result that more Donald respondents knew they did not have any insurance cover at the time of the flood could relate to the fact that they knew they are not vulnerable to flood. It is also possible that these respondents could not afford insurance since all had a household income of less than \$50,000.

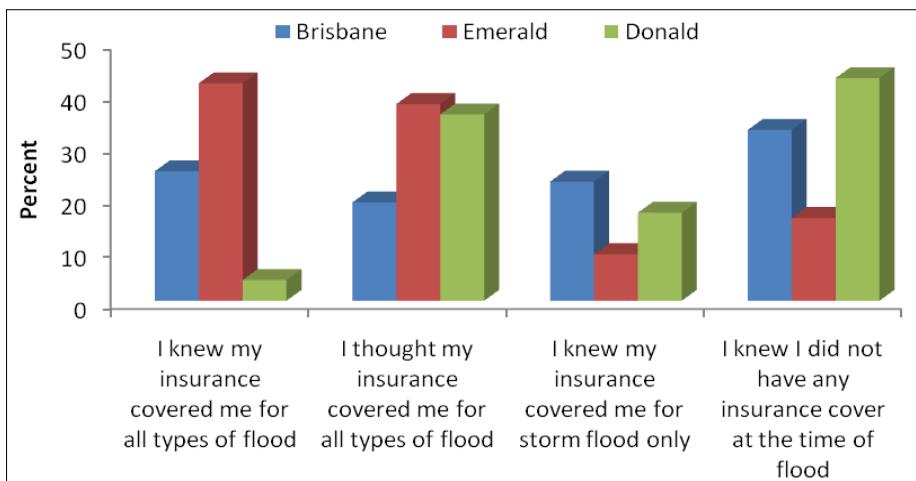


Figure 8.1. Comparisons between insurance knowledge

Due to the transient nature of the Emerald community, it is not surprising to learn that Emerald residents were the least likely to be living at the same place in the years to come (Table 8.3). In comparison, the result that most Donald respondents planned to be in the same place in years to come was expected. However, when the question was framed in terms of reducing flood vulnerability, fewer Emerald residents were likely to move to a flood safe location. This result is most probably related to the fact that there is little available housing outside of the flood zones.

Table 8.3 Comparisons between intentions to relocate

	Brisbane	Donald	Emerald
I plan to live where I am for many years to come	62	85	49
I plan to move elsewhere in this town in the coming years	13	6	7
I plan to move to another town in the coming years	8	2	17
Undecided / don't know	10	6	16
Permanently move to a flood safe location (not at all likely & unlikely)	62	73	55

## **9. Synthesis and Policy Implications**

### **9.1 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).

#### *9.1.1 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.

#### *9.1.2 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.

#### *9.1.3 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.

#### *9.1.4 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.

#### *9.1.5 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](http://www.floodcommission.qld.gov.au/_data/assets/file/0005/6494/Insurance_Council_of_Australia_2.pdf) for details).

#### *9.1.6 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.

#### *9.1.7 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).

#### *9.1.8 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.

#### *9.1.9 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.

### *9.1.10 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](http://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](http://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.

## 9.2 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 range of policy areas that relate to these two approaches were summarised in table 2.3.

This summary table 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. Other issues that were mentioned have also been added to Table 9.1 below, with the case study location identified where these were relevant.

Table 9.1 Summary of climate change flood related issues

<b>Protect: measures and strategies that protect communities &amp; infrastructure</b>	<b>Issue identified in Household Surveys</b>
Risk transfer	
<ul style="list-style-type: none"> <li>social capital/community resilience, insurance and government disaster relief and recovery programs</li> </ul>	B D E
Physical measures	
<ul style="list-style-type: none"> <li>protective measures that reduce short-term risk but increase long-term vulnerability - levees and dams</li> </ul>	B E
Post disaster recovery	
<ul style="list-style-type: none"> <li>opportunity for reducing risks; in rebuilding housing and infrastructure and reducing vulnerability</li> <li>danger of disincentive to adaptation creating a false security</li> </ul>	B B E
Drainage engineering	B E
Highly developed urban areas with a long history of protection	B
Planning	
<ul style="list-style-type: none"> <li>inappropriate development in hazard prone areas</li> <li>housing styles</li> </ul>	B E B E D
<b>Accommodate: measures and strategies that facilitate adaptation, behavioural change &amp; community resilience</b>	
Vulnerability, Resilience & adaptation	
<ul style="list-style-type: none"> <li>vulnerability - social justice issues</li> <li>improvements in livelihood, equality and well-being have positive impacts on adaptive capacity</li> <li>increase speed for insurance settlement, re-building &amp; approvals</li> <li>vulnerable communities</li> <li>vulnerability reduction</li> </ul>	B D E B D E B D E D D B
Planning	
<ul style="list-style-type: none"> <li>elevated floors, increased setback</li> <li>evacuation plans</li> </ul>	B B
Governance	
<ul style="list-style-type: none"> <li>local participation &amp; hazard mitigation</li> <li>all levels of government</li> </ul>	B D B
Sustainability	
<ul style="list-style-type: none"> <li>sustainable development</li> </ul>	B
Communication	
<ul style="list-style-type: none"> <li>risk communication</li> <li>questioning of assumptions and paradigms</li> </ul>	B D E B

Health issues	B
Evacuation & temporary relocation	B D E
<b>Retreat: measures and strategies that remove people from locations at high risk</b>	
Planning	
• inappropriate settlement patterns	B E
• inappropriate development in hazard prone areas	B E
• planned or managed retreat	B E
• rezoning of land	B E
• relocation of structures within properties	B
• horizontal migration	B
• buyouts of properties	B
• financial constraints	B D E
Insurance	
• insurance incentives	B

Source: IPCC 2011, Department of Climate Change 2009, Household Surveys 2011

Issue identified in Household Surveys: B – Brisbane, D – Donald, E – Emerald

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. Some have been quoted in text boxes within the chapters, but the bulk of the answers are listed in text tables in Appendix 3. 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.

### **9.3 Conclusions**

Of all the potential policy implications identified by flood affected residents the most dominant set of responses concerns communication and information -- a responsibility that is demanded of insurance companies, local government, State and Federal government agencies and non-government organisations. It is worth observing that this same lack of information was not identified by the victims of Cyclone Yasi a few weeks later. Cyclone awareness, preparedness, warnings, response behaviour and recovery are clearly established routines that people in cyclone prone locations understand and follow. There is not the same kind of routine for dealing with severe floods. In raising flood awareness people need information that is highly specific to their own localities, to guide them in making decisions when flood warnings are announced, to inform them of appropriate and safe behaviour during the period of flooding, during the immediate aftermath of flooding and at various stages during the recovery and rebuilding phases. The means of communication and methods of information delivery need to be as varied as the options that are out there. As in all hazard awareness raising the communication and information must also be targeted to the social, demographic and cultural diversity of the population.

People also indicated a wide range of barriers to change and adapt to flood risk. Many of these are financial, but a lot of people also cited the type of house construction (brick and slab-on-ground construction) that constrained flood avoidance alterations. In the face of financial and construction constraints, relocation becomes an even more viable alternative. Relocation as a flood avoidance strategy is separately supported by widespread criticism of inappropriate planning decisions. Thus there needs to be both avoidance of planning new developments in flood prone areas as well as a process of rezoning existing hazard zones within the constraints of land and property security.

A dominant finding from the study is that a greater number of constraints inhibit adaptation than factors that enable adaptive change and behaviour. In part this could be a consequence of the questions that were asked, although they were not loaded towards negativity. It is inevitable that people who have recently endured a natural disaster will find much to be critical about. The timing of the survey also occurred at around eight months after the event when recovery reaches a low ebb – the excitement of the event has passed and the losses and difficulties dominate. However, this period of time after the disaster is a better time to reflect and assess the future than immediately after the event when disruption and absence of residents was extremely high.

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 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 – government and institutions.

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## APPENDIX 1



### **Briefing note 209** Briefing note 209: First Impressions of the Central QLD Flood Survey by Felipe Dimer de Oliveira January 2011

Upon reaching Emerald, QLD in the afternoon of the January 10th our first impressions were of normality, with few signs of the flood that hit Emerald and its surroundings in the days following Christmas. Thickets of dried grass stuck to the wire fences registering the peak water height. This impression did not last after having met a local resident, who kindly offered to show us the most affected areas of Emerald and introduce us to local residents who suffered from the floods.

The first apparent indication of the damage caused by floodwaters was the quantity of furniture and appliances in the streets, left to be removed by the local council (Figure 1). Well over a week after the flood waters peaked in Emerald (on the 29th of December) this sight still lingers in the streets, though on a smaller scale than reported by local residents and newspapers.

Our understanding of the scale of the damage and personal tragedy imposed on the local population came as we were given access to a home impacted by more than one metre of flood waters (as measured from the floor). Only about 2 inches of water entered this same home during the 2008 flood. Viewed from the outside, there were no major signs of damage. As we entered the living room we realized that damage had been severe: water had entered the gap between walls and made them bulge (Figure 2), doors – in this case hollow core doors – absorbed water and delaminated, becoming a soft watery paste. There was a strong stench of mud that rendered the home unfit to be inhabited. From what we could see, electrical systems could not be turned on without thorough inspection and possible re-fitting. Water trapped between walls, if not drained, will penetrate the timber frame causing permanent structural damage. For this property in particular, most of the damage appeared to be a consequence, not only of the height attained by the flood waters, but of the vulnerability of the materials used in the construction (Figure 3).

As for the family that occupied this home, who were moving out as we arrived, almost all their personal belongings were lost, including LCD TVs and children's toys. We chatted with the former occupant who has the option to default on his rental contract if the house became unfit for habitation. He and his family had decided to never return to live in this home. Following this disaster in Emerald, he believes that this house 300m from the Nogoa River is no place to raise his children. Through him we were told that rental prices in Emerald, an important mining city in central QLD, were high and scarce as a result of the sudden demand

surge. He told us that he had tried to buy contents flood insurance in the past unsuccessfully, apparently because of the propensity of the property to flood.

Several aspects regarding the effects of this event have come to light in chatting with local residents; not only the personal tragedy of losing most of their personal belongings and a place to live, but for some to have lost their source of income. Crops have been lost in the flood and the local Coles supermarket has lost all its merchandise and is set to be inactive for the next couple of months. Today, there is no milk, bread or potatoes available at Woolworths, the only remaining supermarket open.



**Figure 1:** Disposed contents waiting for the city council



**Figure 2:** Dr. Deanne Bird (Risk Frontiers) inspects swollen wall in Emerald. Bulging in the wall can be noticed by her shadow. The stained walls in this home are the only evidence that remains of the flood. The day before, the fire brigade hosed down the inside of this house and disinfected the floors in an effort to reduce the stench of rotting material and vegetation.



**Figure 3:** Damage to fittings and paint stripping from walls. Window frames have also buckled making it near impossible to open windows.



briefing note

**210**  
January 2011

# Risk Frontiers

## Briefing note 210: Day two in Emerald surveying the impacts of the 2010 Central QLD Flood

By Felipe Dimer de Oliveira and Deanne Bird, Risk Frontiers

The second day of surveying, on Tuesday, improved our understanding of the impact of the 2010 flood on building structures in Emerald. Inspection of several houses showed that despite extensive cleaning of floors and walls, and removal of all home contents, flood damage was still visible. We repeatedly witnessed light brown stains on interior walls indicating internal flood levels (Figure 1), bulging of walls, broken and separated plasterboard (causing paint to crack and peel), paint bubbling and peeling in room corners and irreversible damage to hollow-core doors. There was somewhat less damage to solid timber doors and aluminium doors and window frames did not appear to be affected. Kitchen units seemed to be in reasonable order with slight, but probably acceptable, swelling, however, some damaged kitchen unit doors had already been removed. In most cases, flood affected plasterboard will need to be removed to allow cleaning, airing and drying of the walls and frames, and then replaced with new plasterboard. This removal will also provide an opportunity to inspect in-wall electrical cables. So far, there seems to be no sign of structural damage to the homes.

A kindergarten staffed by 15 employees was inundated by approximately 1m of flood water (Figure 2). Today's inspection revealed that repair work was already underway and that builders had already removed nearly all the contents (Figure 3), stripped lower segments of gyprock walls (Figure 4) and dismantled kitchen appliances and bathroom fittings. The builders said that they were doing everything they could to get the kindergarten operational, so that the staff and children could return as soon as possible.

The flood has also had a major impact on the agriculture and the coal mining industry. Today we saw significant damage to cotton crops and a citrus orchard's packing and refrigeration facilities (Figure 5). According to the orchard farmer's estimates it will be four weeks before their facilities are up and running.

We also witnessed considerable effects on the transport network. Railway lines have been undermined and buckled, bitumen has lifted off roads and segments of roadways have washed away, rendering it impossible for the mining industry to transport coal for shipping.

The quality of information provided to residents prior to the event was perceived by many as excellent. Residents received flood warnings via recorded messages to their landlines and SMS messaging to their mobile phones. The Mayor of Emerald even emailed flood warning messages to local residents which included his own personal mobile phone number. Through a collaborative effort by the Emerald Council's own hydrologist and the Bureau of

Meteorology, Emerald predicted a worst-case-scenario to be a flood reaching 16.2m. The last major flood to impact Emerald had reached 15.7m in January 2008. Due to the potential severity of the 2010 situation, officials communicated the new predicted levels to residents. The flood that impacted Emerald on 31<sup>st</sup> December 2010 reached a peak height of 16.05m.

The pattern of flooding in 2010 differed to some degree from that in 2008. Although most people evacuated when told, some decided to stay to protect their homes and properties. Some people reasoned that since the January 2008 flood did not impact their homes they would not be vulnerable to flooding during this event. The 2010 flood however, behaved differently. Some areas that flooded in 2008 were not affected in 2010. While others that weren't flooded in 2008 were flooded in 2010.

A factor making this flood different from the 2008 event was the capacity of the Fairbairn Dam prior to the 2010 event. Prior to the 2008 event, the Fairburn dam was at about 35% capacity, due to drought, but reportedly reached 156% capacity and a depth of 3.5m over the spillway by 20 January 2008. However, heavy rainfall during the final months of 2010 ensured that the dam was near full capacity before the 2010 event. We were informed that at midnight on the 30<sup>th</sup> December 2010, Fairbairn Dam reached 176% capacity. Following this, the depth of the water pouring over the spill way peaked at 5.56m. Today the depth of the torrent of water flooding over the spillway was little more than 1m (Figure 6).

Since the flood waters subsided, Emerald residents have been helping each other recover, with some residents helping others before attending to their own devastation. Businesses which weren't flood affected are sending their employees to help those that were. Residents have also informed us that the Central Highlands Regional Council has operated smoothly and efficiently in assisting the community to clean-up.



**Figure 1.** Brown stains on internal walls clearly show the flood water level in this home to have been 174cm.



**Figure 2.** Removal of the plasterboard panels at the local kindergarten has exposed the water mark levels of the 2008 flood at 18cm and the 2010 flood at 85cm. Also noted was the intermediate mark at 58cm indicating the rising damp from the 2008 flood. Levels are taken from finished floor levels.



**Figure 3.** Salvaged contents of kindergarten.



**Figure 4.** Plasterboard removed from lower levels during the rebuilding of kindergarten.



**Figure 5.** Floodwater in this citrus orchard packing shed reached approximately 40cm. The two large refrigerators at the rear of the building are not operational due to flood damage.



**Figure 6.** The ~1m flood over the spillway at the Fairbairn Dam on 11<sup>th</sup> January 2011. During the peak of the December 2010 event the floodwater over this spillway reached 5.56m.



## Briefing note 211: Impact on businesses and their responses

On Wednesday, day three, we set out to learn how the central Queensland floods affected regional businesses and how they responded in order to defend themselves from the flood and then continued to operate given the difficulties imposed. For most of the businesses we surveyed, the time taken to recover their ability to trade will usually be measured in weeks; one to two given the flood levels experienced in Emerald. Some of the surveyed sites were able to quickly replace furniture, but are taking longer to recover office infrastructure.

Our first surveyed site was an auto-parts store that experienced close to 130 cm of water at the peak of the flood event. The owner reported that they had sufficient warning and therefore time to lift merchandise and trading equipment onto trestle tables; however, this was not high enough to avoid losses, which were estimated to be in the order of \$250,000 in lost merchandise. This estimate, provided by the owner, did not consider additional business interruption losses; the business had closed from the 28<sup>th</sup> December until the 10<sup>th</sup> January. Nor did the estimated loss include the time spent recovering and cleaning business infrastructure (computers, desks, EFTPOS machines, etc.). This business was not insured for business interruption, only for loss of stock.

We also conducted our survey at a car dealership, which experienced 60 cm of water above the finished ground floor. As with the previous firm, they were warned in time to carry out some defence efforts, which included lifting their mainframe computer (a high value asset vital for their business) but were unable to move their cars to high enough ground and lost 58 of their cars to flood damage (Figure 1). Therefore this business took a similar amount of time to clean up and replace their infrastructure – in their case mostly furniture – and return to operations, reopening on 10<sup>th</sup> January. The local manager reported that they were insured for business interruption as well as for the vehicles lost, but also told us that the nature of his trade impedes his ability to operate efficiently until his insurance claims are fully processed.

Many businesses were operating from aluminium and steel clad, steel framed sheds that, over the years, had acquired in-built office infrastructure. These buildings are not usually insured for flood. Such was the case of an auto-electric service, whose situation was aggravated by the owners and managers being away on holidays and thus not able to defend their business premises. As a result, they had experienced extensive loss of office infrastructure and tools of trade. However, it was still possible for this business to operate in some capacity under these conditions. The owners reported at least one repair trade customer a day – usually cars in need of electrical repair for damage caused by the same floods.

Other businesses surveyed included a dry cleaner – which sustained approximately \$30,000 damage according to the owner and, once again, had been unable to lift its equipment high enough to prevent flood damage, having experienced a water level of 46 cm above the finished ground floor. This firm was able to open fairly quickly on 6<sup>th</sup> January. Of the five

businesses we visited only one was relatively unscathed and was able to open on January 4<sup>th</sup>, after the Christmas/New Year break as had been expected before the floods.

From this small sample of businesses, it seems straightforward to conclude that being able to lift equipment sufficiently high above ground was an issue, with only one out of five having lifted equipment and goods high enough to be completely clear of the flood waters. This situation was common amongst residents as well. In some cases, this defensive action seemed to have been learnt from the experiences of the 2008 floods, which, according to four of the interviewees, barely affected their businesses back then.

Difficulties with state transportation arteries also affected business recovery capabilities, as with the example of railway track and road damage described yesterday. Nevertheless, these business owners have responded entrepreneurially in the best way they could to the current situation and, on average, took from one to two weeks to be back in operation, even if somewhat precariously.

One of the managers had shown foresight in flood proofing his store by installing metal shelves, after losing wooden ones in a previous event. Another business owner had to find an alternative way to trade by keeping the store open and allowing customers to pick merchandise they needed on a trust and confidence basis; the customers self reporting what was taken, for later payment.

There are trade businesses in Emerald that are necessary for effective clean-up efforts, such as cleaning equipment hire, at which the local manager reported having to perform equipment checks while coping with high demand for hire equipment at the same time.

Businesses can count on grants of up to \$25,000 from the Department of Employment, Economic Development and Innovation; this certainly will be a relief for these small businesses.

### **Further notes from a residents' perspective**

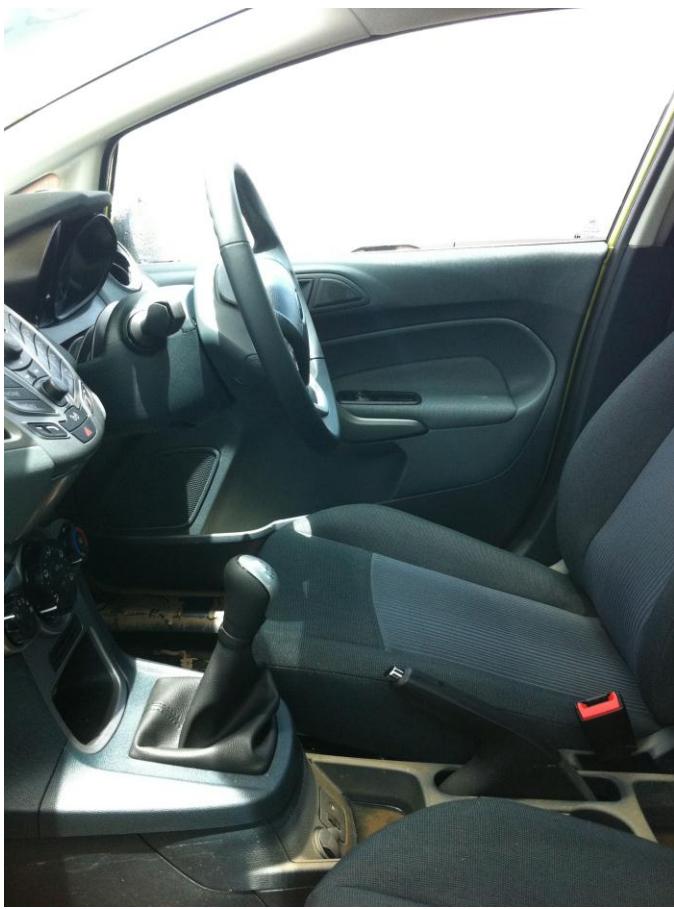
Some residents, who had entered their homes or businesses immediately after the flood water had resided, began hosing, scrubbing and disinfecting their surroundings and this effort proved to be effective in preventing further damage. Although water had reached just under a metre in several of these residences, the plasterboard walls showed very minimal signs of bulging. In comparison, other homes, where residents had not returned immediately to clean the premises, had sustained extensive damage to plasterboard walls.

A few Emerald residents expressed great concern regarding housing developments in low-lying areas that are vulnerable to flooding. Residents' apprehension about these developments is nothing new. A 2008 survey (available on the council's website), that examined community perceptions and opinions, revealed that residents commonly mentioned that they were dissatisfied with the council's approach to town planning in flood prone areas. One resident explained to us that these developments are still apparently continuing.

In yesterday's briefing note (#210), we mentioned that many residents perceived the quality of information provided to them to be excellent. In line with this, members of the council informed us that the ABC media had also been exceptional during the Emerald flood event. The ABC set-up a remote media centre within the council chambers, sometimes operating from the mayor's office, and the ABC staff were always welcome to attend official meetings. It was not perceived that such a privilege could be extended to commercial media organisations.

We learnt, after visiting Woolworths at 1pm, that each customer was restricted to 2 cartons of milk and 2 loaves of bread. However, there was no fresh milk available, only 4 loaves of bread and a limited supply of long-life milk. There were also no eggs and no meat, accept for one small rack of lamb and one packet of lamb kidneys. The frozen vegetable section was completely empty and the fresh fruit and vegetable section was not much better. The vegetable shelves were largely empty accept for 2 swedes, 3 beetroot and many bunches of shallots. While there were still some avocadoes, nectarines, apples, oranges and lemons, the only other fruit were 4 bananas and 4 rockmelons which were beginning to spoil. Other products in short supply include butter/margarine, cheese, fruit juice, yoghurt, flour, rice, vinegar and toilet paper.

On a positive note, the recovery centre (Figure 2) was a hive of helpful activity. Queensland Government representatives from the Department of Communities were running the centre with additional help from the Red Cross, Lifeline, Centrelink, and the Department of Employment, Economic Development and Innovation. Save the Children Foundation staff were operating a makeshift crèche in the corner in order to give parents the opportunity to talk openly to officials. In the first few days of operation, the centre was processing 300-400 claims per day. Today the number had dropped to around 280 claims.



**Figure 1:** interior of a brand new car, possibly written off as water penetrated its interior.



**Figure 2:** Recovery centre set up in Emerald by the QLD State Government



briefing note

**212**  
January 2011

## Briefing note 212: Day 4 - Surveying the Queensland flood – Brisbane

By Deanne Bird

While surveying in Emerald this week, we have listened to the flood disaster unfold in southeast Queensland, the rising flood threat to Brisbane city and to the horrific events of flash flooding in the Lockyer Valley. Although Emerald residents have experienced their own disaster, they were repeatedly thankful that no one in their community was fatally injured and their hearts were going out to their fellow countrymen to the east and south.

As scheduled, we took our departing flight from Emerald to Brisbane. Before departing Emerald, we were relieved to hear that the Brisbane floodwaters did not reach the expected height above the 1974 peak.

There was noticeably little traffic on the roads in Brisbane and the city was quiet. Much quieter, I imagine, than a Sunday afternoon. While parts of the city looked as if nothing had happened – people had power and were going about with their business – other communities were not so lucky. Yeronga was one suburb that was hit fairly hard. According to one resident, a stormwater drain in Fehlberg Park had become blocked and started backing-up on Tuesday, 11<sup>th</sup> January. Looking north from where we stood, it appeared that Hyde Rd all the way to the Brisbane Corso was underwater (Figure 1). Also in other suburbs, roads were closed, houses were submerged (Figure 2) and businesses were inundated (Figure 3). However, floodwaters were continuing to recede (Figure 4) at a much faster rate than some residents were experiencing in other regions of Queensland, such as Rockhampton.

### Further notes from Emerald

On day three we discovered that although aluminium and steel clad, steel-framed sheds allow water to penetrate the shed's interior through recurring gaps between the walls and concrete floor, they also allow water to escape avoiding further damage from trapped water (Figure 5). Fibrous cement (fibro) panels withstood flooding much better than plasterboard panels. We also noticed that fibro panels worked well as a substrate for wall-mounted tiles with no visible damage evident to tiled walls of this kind. Power outlets in commercial sheds, positioned at eye-height on walls were not subjected to flood damage. Some water exposed power outlets, which were positioned closer to the floor, were deemed operational after extensive drying but were often replaced due to safety reasons. Data plugs for telephone and internet connections however, were replaced as a result of irreversible damage from silt penetration.

In Emerald, there were many dead fish, frogs, crabs and worms found within buildings and scattered over roads and pathways. Although the smell left in the wake of the floodwater was easing, it was still noticeable. In addition to the damage to infrastructure, homes and businesses, these are other factors that southeast Queensland residents will have to deal with in the coming weeks.

In conclusion, we would like to thank all the residents of Emerald for their time and effort in showing us around and discussing their experience of the December 2010 flood. In particular, we would like to thank Jacques and Elsie. Jacques showed us around his home, community and surrounding area during the first two days of surveying. We would not have been able to achieve what we did without his efforts.



**Figure 1.** Flood waters receding from a home in Yeronga.



**Figure 2.** A house submerged near Rocklea Station, Brisbane.



**Figure 3.** Vehicles submerged in commercial premises near Rocklea Station, Brisbane.



**Figure 4.** On Friday morning, 14<sup>th</sup> January 2010, in the suburb of Toowong, the floodwaters are continuing to recede. At 8:30am the floodwater reached the telegraph pole seen in the top centre of the image, behind the corner house. The light brown mark on the road (bottom left) and on the garage door (centre left) indicates the peak height of the flood at 4am on Thursday, 13<sup>th</sup> January. Under the muddy water in the top left background of the image is Perin Park.



**Figure 5.** In Emerald, an aluminium and steel clad, steel-framed shed which allows the water to penetrate into, and escape from, the interior of the shed through gaps between the walls and concrete floor. The toilet block in the left-hand side of the image and the office area at the far end of the image are made of fibro and withstood damage during the flood. The only physical structure that sustained irreparable damaged was a toilet door which was dislodged from its hinges.



briefing note  
**213**  
January 2011

## Briefing note 212: Day 5 and 6 – The clean-up begins in Brisbane

By Deanne Bird and Katharine Haynes

On Friday, 14<sup>th</sup> January 2011, many Brisbane residents returned to their flood damaged homes to inspect the damage and begin the clean-up. Two living opposite Perrin Park, Toowong (Figure 1) invited us into their homes as they were re-entering for the first time since the flood peaked at 4am on Thursday, 13<sup>th</sup> January. The first home (House A) is a two storey, brand new, architecturally designed home that was only finished 2½ months ago. There are 3 bedrooms, 3 bathrooms, 1 study and an open plan kitchen, dining room and living area upstairs and a rumpus room, bathroom and laundry downstairs. Downstairs is a double garage and large storage area. The construction of this house consisted of a slab on ground with reinforced concrete block walls. The second floor was of lightweight construction including a timber frame and fibro clad, with timber batten detail and a Colorbond roof.

The owner of House A informed us that his architect researched the 1974 floods and designed the new house 80cm above the 1974 flood level. The architect had built the house with a number of features to make it more resilient to floods including painted, reinforced concrete block walls, aluminium door frames, hardwood timber doors, frames and flooring (Figure 2), and large sump drains for rapid surface water drainage. The property was surrounded by a concrete wall to physically block the water out but unfortunately, sandbagging around the front gate was not high enough, nor was the concrete wall.

On Wednesday 12<sup>th</sup> January, the owner realised that this flood would penetrate the top floor of his home. He and a friend got a tinny (aluminium tin boat) and rowed through the floodwater in his neighbour's yard, over his back concrete wall (Figure 3) and up to the verandah so he could enter his home and lift the furniture higher off the ground. Although House A is made of resilient materials, it still sustained damage. In the downstairs rooms, plasterboard from the collapsed ceiling was 'lining' the floor and the insulation and light fittings were hanging from the roof (Figure 4).

The second home (House B) is an old, two storey Queenslander. There are 2 bedrooms, 1 bathroom, 1 kitchen and a lounge room upstairs and 3 bedrooms, 1 bathroom, laundry and kitchenette with living area downstairs. The exterior walls consist of weatherboard cladding on timber frame with a concrete tiled roof and the internal walls were all plasterboard. The owner of House B informed us that the family had lived in the house about 13 years ago but it is now a rental property. When purchased, the house was on stilts and consisted of only one floor. The current owners further elevated the house to be above what they thought was the 1974 flood level and closed the downstairs area to create additional bedrooms and a kitchenette.

Prior to the 2011 floods, House B was rented as a share house to 5 people in their early 20's. These occupants had moved the majority of their belongings to the top floor of the

house anticipating that there they would not be vulnerable to flooding. Several of the housemates returned early on the 14<sup>th</sup> January to find that the floodwater had reached 3.3m from ground level (Figure 5) or approximately 40cm over the top floor, and nearly all of their possessions were flood damaged. House B had also sustained damage to the upstairs and downstairs interior: wall lining, kitchenette, staircase, insulation and floor coverings (Figure 6).

The occupants had contacted the rental agency in order to find out if they could remove saturated carpets and furniture belonging to the owner. The agency told them that they were too busy to assist and they were not given the owner's details to contact them themselves. The rental occupants then concentrated on removing all their own flood soaked possessions from the upstairs and a swag of volunteers turned up to help. Due to extensive damage, the occupants and volunteers were not able to start the clean-up downstairs until the owners had been contacted.

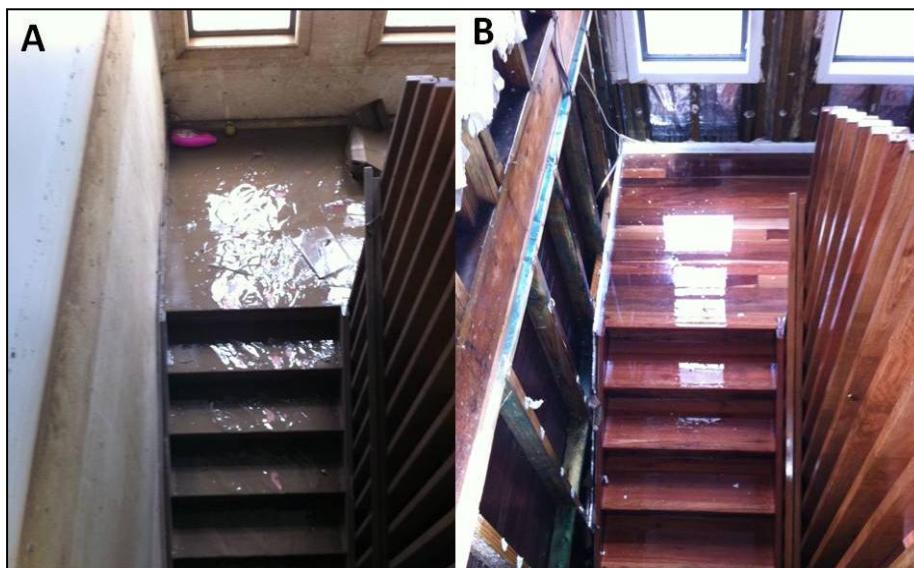
When the owner's arrived on Saturday, the house was once again filled with volunteers cleaning up, most of whom were unknown to their family. All the plasterboard, insulation and carpets were removed and most of the mud hosed out.

All people impacted by the flood seemed overwhelmed with the support they had received. People were wandering the streets, handing out food and drinks (Figure 7) and offering to lend a hand. It was remarkable how quickly neighbourhoods were being stripped and cleaned (Figure 8).

While surveying people's homes however, we cannot help but wonder about the number of personal injuries sustained during the clean-up phase. In Emerald, a shop owner slipped and split his head open after entering his shop when the floodwater had resided. The shop owner was taken to hospital where he received five stitches. Today in Brisbane we witnessed volunteers, who were wearing thongs or no shoes at all, help carry damaged furniture down muddy, slippery stairs. Personal injury will not be limited to slip and fall accidents. Many volunteers were carrying heavy, water laden furniture, sand bags and appliances such as refrigerators and televisions. We estimate that there will be many aching bodies in the coming days.



**Figure 1.** Perrin Park, location of House A and B, southwest of Brisbane CBD.



**Figure 2.** A. Internal hard wood timber staircase covered in mud in House A – image taken at 12:48 on Friday 14<sup>th</sup> January, 2011. Dirty walls mark the maximum flood level inside. B. Internal staircase after cleaning – image taken at 16:29 on Friday 14<sup>th</sup> January, 2011. The stained plasterboard walls have been removed.



**Figure 3.** View from the back verandah of the House A. The owner's came to inspect their home during the flood by rowing their tinny over the concrete wall running behind the swimming pool. The maximum flood height is marked by the light, brown line on the next door neighbour's red shed roof.



**Figure 4.** A. Ground floor rumpus room of House A, opposite Perrin Park. Image taken at 12:38 on Friday 14<sup>th</sup> January, 2011. In this image you can see the plasterboard, from the ceiling, lining the floor and laying across the top of the timber cupboard. The insulation and light fittings are hanging from the roof but the ceiling fan remains in place. B. Image taken at 17:15 on Saturday 15<sup>th</sup> January, 2011.



**Figure 5.** House B opposite Perrin Park, Toowong. This image shows the 3.3m flood mark on the timber baluster. The change table hanging from the rafters floated from the next door neighbour's laundry with the sneakers still in place.



**Figure 6.** Damaged walls were stripped from House B on Saturday 15<sup>th</sup> January, 2011.



**Figure 7.** Two girls and a ute offering free drinks to flood victims and volunteers working to clean the aftermath of the 2011 Brisbane floods. We were informed that the driver of this vehicle had lost the contents of her home in Gympie due to flooding but wanted to help other people who were suffering.



**Figure 8.** Plasterboard and insulation removed from inside the ground level of House A. Image taken at 16:23 on Friday 14<sup>th</sup> January, 2011. Note the clean road – several people with gurneys turned up, unannounced and unknown, to help in the clean-up.

## **APPENDIX 2**

The following section contains the questionnaires used in each case study location. The same instrument was used in Brisbane and Emerald and a slightly modified version was used in Donald. This is because additional questions were added to questionnaire and hence the Queensland locations after the Donald survey had been implemented. Please note: the questionnaires are reproduced below without the formatting that existed in the original survey instrument design.

### **Brisbane and Emerald questionnaire**

We're conducting a survey to gain an understanding about the factors that enable and inhibit your ability to reduce the impact of floods to you and your home. This research project is being conducted by Risk Frontiers, Macquarie University and James Cook University, Townsville and is funded by the National Climate Change Adaptation Research Facility (NCCARF [www.nccarf.edu.au](http://www.nccarf.edu.au)). The survey will take approximately 10-15 minutes to complete and we would greatly appreciate it if you provide us with your views and opinions. Participation is voluntary and all information or personal details gathered in the course of the study are confidential. No individual will be identified in any publication of the results. If you decide to participate, you are free to withdraw from further participation in the research at any time without having to give a reason and without consequence. If you have any questions or comments about the research, please email [riskfrontiers@mq.edu.au](mailto:riskfrontiers@mq.edu.au) or call 02 9850 9683.

### **Demographic questions**

1. Please indicate your gender

Male    Female

2. Please indicate which age group you belong to

18-24

25-34

35-44

45-54

55-59

60-64

65-74

75+

3. Is English the main language spoken in your home?              Yes              No

If no, what is the main language spoken in your home?

4. Please indicate your HIGHEST educational attainment

No formal qualifications

Higher School Certificate or interstate equivalent

Vocational qualifications e.g. diploma, trade certificate

Bachelor degree or equivalent

Postgraduate qualification – Masters or PhD

None of the above

5. Please indicate your working status (tick all that apply):

Working Full time (30+ hrs)

Part-time (9-29 hrs)

Unemployed

Not working retired

Looking after house / children / others

Invalid / disabled

Student

Other

6. What is your annual household income?

Under \$25,000

\$25,000 \$ - 50,000

\$50,000 \$ - 75,000

\$75,000 \$ - 100,000

\$100,000 \$ - 150,000

\$150,000 \$ - 200,000

More than \$200,000

Don't know

Do not want to answer

7. What is your postcode?

8. What is the composition of your household?

Couple with children or other dependents

One adult with children or other dependents

Couple without children or other dependents

One person household

Shared house with other adults

Other (please specify)

9. Do you, or anyone else in your household, require assistance due to disability or long-term injury or illness? Yes No

Please provide details if needed:

10. At the time of the floods, were you or your family working as a paid or volunteer member of any emergency services group, community group, council or local government organisation? (please tick all that apply)

Yes, emergency services volunteer

Yes, emergency services employee

Yes, community group (e.g. Rotary, Lions, CWA, etc)

Yes, local council

Yes, local government organisation

No, none of these

Other (please specify)

Questions about previous flood experience

11. Have you previously experienced flooding in any location where you have lived? Yes No If yes, please give details:

12. Please indicate which of the following most accurately describes your current situation since the 2010 or 2011 flood:

I plan to live where I am for many years  
 I plan to move elsewhere in this town in the coming years  
 I plan to move to another town in the coming years  
 Undecided / Don't know  
 Other (please specify)

### **Questions about your wellbeing**

13. How would you describe your relationships with family / friends?

before the flood	very bad	bad	neither good or bad	good	very good	N/A
now	very bad	bad	neither good or bad	good	very good	N/A

14. How would you describe your financial status?

before the flood	very bad	bad	neither good or bad	good	very good	N/A
now	very bad	bad	neither good or bad	good	very good	N/A

15. In general, how would you describe your physical health?

before the flood	very bad	bad	neither good or bad	good	very good	N/A
now	very bad	bad	neither good or bad	good	very good	N/A

16. In general, how would you describe your mental health?

before the flood	very bad	bad	neither good or bad	good	very good	N/A
now	very bad	bad	neither good or bad	good	very good	N/A

17. How would you describe your general happiness?

before the flood	very bad	bad	neither good or bad	good	very good	N/A
now	very bad	bad	neither good or bad	good	very good	N/A

18. Do you think the flood has had an impact on your (please tick all that apply):

Relationships with family / friends

Financial status

Health

General happiness

Please provide details if needed:

### **Questions about your home at the time of the flood**

19. At the time of the flood, how long had you lived at that address?

0 < 6 months

6 months < 1 yr

1 < 2 yrs

2 < 3 yrs

3 < 5 yrs

5 < 10 yrs

10 < 20 yrs

20+ yrs

20. At the time of the flood, how long had you lived within this region (e.g. Brisbane City Council, Central Highlands Regional Council or Buloke Shire Council)?

0 < 6 months

6 months < 1 yr

1 < 2 yrs

2 < 3 yrs

3 < 5 yrs

5 < 10 yrs

10 < 20 yrs

20+ yrs

#### **Questions about knowledge of insurance**

21. Please indicate which of the following most accurately describes your knowledge of your insurance cover prior to the 2010 or 2011 flood events:

I knew my insurance covered me for all types of flood

I thought my insurance covered me for all types of flood

I knew my insurance covered me for storm flood only

I knew I did not have any insurance cover at the time of flood

Please provide details if needed:

22. If you had insurance cover, what is the outcome of your claim (e.g. were you underinsured, are you still waiting for an outcome, did your insurer reject your claim, etc)?

23. If you did not have insurance prior to the 2010/2011 flood events, why?

Too expensive

I thought I had insurance

Didn't think I needed it

I thought it was not available

It was not available

Other (please specify)

24. Since the 2010/11 flood events, have you updated or purchased an insurance policy for all types of flood?

Yes      No      Please provide details:

#### **Questions about your home at the time of the flood**

25. Please indicate from the options below which best fits your housing status at the time of the flood?

Owned / Mortgage

Renting

Living in work funded accommodation

Living in government funded accommodation

Living with family / friends

Other (please specify)

26. At the time of the flood, were you living in a single storey home, multiple storey home, unit or duplex?

Single storey house (not raised on stumps / stilts)

Single storey house (raised on stumps / stilts)

Multiple storey house

Unit ground floor

Unit first floor or higher  
Single storey duplex  
Multiple storey duplex  
Other (please specify)

27. When you purchased / started living in your home were you aware it was vulnerable to flood?

Yes I was aware (go to question 28)  
No I was not aware (go to question 29)  
My house is not vulnerable to flood (go to question 30)

28. If you answered 'yes' to question 27, which ONE of the following, if any, provided the most valuable source of information about the risk of flood around your home?

Local government  
Emergency services  
Friends / family / neighbours  
Community groups  
Media  
Personal experience  
Other, please provide details:

29. If you answered 'no' to question 27, would you have bought or moved there if you knew?

Yes      No      N/A

### **Questions on the impact of the flood**

30. To what extent did the flood impact your:

House            not impacted 0 -10 cm 10-20 cm 20-50cm 50-100cm 100-200cm 200+ cm  
Property/yard    not impacted 0 -10 cm 10-20 cm 20-50cm 50-100cm 100-200cm 200+cm

31. To what degree did the flood impact on your:

House contents  
Building structure (e.g. house, garage)  
Property / yard  
Own business  
not impacted/ minor impacts/ moderate impacts/ major impacts/ completely destroyed/ N/A

### **Questions on personal preparedness for flood**

32. Did you do anything to help protect your family and / or home from flood prior to the 2010 or 2011 flood events? Tick all that apply.

Chose to live in a house that was out of the flood hazard zone  
Chose / built / modified a house / property that was more resistant to flood  
Devised an evacuation plan  
Prepared an evacuation kit  
Followed warning advice on radio / television / internet  
Evacuated to a safe house or centre  
Sandbagged house  
Built temporary flood barriers around property  
Kept drainage clear of debris  
Raised household items up off floor

Moved household items to a safe place  
Other (please specify)

33. Did anything prevent you from adopting the above measures?  
Yes      No      If yes, please give detail:

#### **Questions about the impact of the flood on you**

34. If you evacuated your home, have you been able to return on a permanent basis?  
Yes      No      I did not evacuate  
If yes, please indicate how long you were evacuated. If no, please indicate when you expect to return to your home.

35. If your house sustained damage during the flood, have the repairs been completed?  
Yes, they are complete  
No, they are ongoing  
No, they haven't started yet  
Not applicable

36. Did the flood affect your ability to earn an income?  
Yes      No      If yes, why and for how long?

#### **Questions on flood adjustments**

37. Have you, or how likely are you, to make the following changes as a result of the 2010 or 2011 flood?  
Permanently move to a flood safe location  
Raise level of home  
Change exterior and / or interior design e.g. use flood proof materials  
Move electricity outlets / meter box higher  
Move air-conditioning unit higher  
Anchor water tanks to the ground  
Improve garden drainage  
Build permanent flood barriers around property  
Modify insurance policy  
Other (please specify)  
not at all likely   unlikely       undecided       likely     very likely       already done    N/A

38. In comparison to other people in your community, do you think you are more or less able to make changes to reduce your risk from flood?  
significantly more able  
more able  
about the same  
less able  
significantly less able

39. What do you think, if any, are the main factors that prevent you from making changes to reduce the impact of future flood to your home/property?

40. What do you think, if any, are the main factors that encourage you to make changes to reduce the impact of future flood to your home / property?

**Questions about flood preparedness/mitigation**

41. What are the three main things you think can be done from a council perspective to help reduce your risk from future flood?

42. What are the three main things you think can be done from an emergency services (e.g.SES) perspective to help reduce your risk from future flood?

43. Overall, what do you think are the three best measures or strategies to help reduce your risk from future flood?

**Final questions!**

44. How likely do you think there will be a flood that causes damage to homes and properties in your area in the next: 1 year, 10 years, 50 years, 100 years

not at all likely    unlikely    undecided    likely    very likely

45. What information would you like to be available on flood risk in your area? (please tick all that apply)

Flood maps

Flood studies

Brochures

Media campaigns (e.g. newspaper or television advertising)

Flood/disaster page on council website

Council newsletter

Other, please provide details:

This is the end of the survey. Thank you for taking the time to provide us with your views and opinions. We hope that this information will help reduce the impact of floods in your community in the future. If you are interested in taking part in an interview or focus group to discuss the issues raised through our questionnaires, please provide your email address or contact number below:

## **Donald questionnaire**

We're conducting a survey to gain an understanding about the factors that enable and inhibit your ability to reduce the impact of floods to you and your home. This research project is being conducted by Risk Frontiers, Macquarie University and James Cook University, Townsville and is funded by the National Climate Change Adaptation Research Facility (NCCARF [www.nccarf.edu.au](http://www.nccarf.edu.au)). The survey will take approximately 10-15 minutes to complete and we would greatly appreciate it if you provide us with your views and opinions. Participation is voluntary and all information or personal details gathered in the course of the study are confidential. No individual will be identified in any publication of the results. If you decide to participate, you are free to withdraw from further participation in the research at any time without having to give a reason and without consequence. If you have any questions or comments about the research, please email [riskfrontiers@mq.edu.au](mailto:riskfrontiers@mq.edu.au) or call 02 9850 9683.

### **Demographic questions**

1. Please indicate your gender

Male    Female

2. Please indicate which age group you belong to

18-24

25-34

35-44

45-54

55-59

60-64

65-74

75+

3. Is English the main language spoken in your home? Yes                          No

If no, what is the main language spoken in your home?

4. Please indicate your HIGHEST educational attainment

No formal qualifications

Higher School Certificate or interstate equivalent

Vocational qualifications e.g. diploma, trade certificate

Bachelor degree or equivalent

Postgraduate qualification – Masters or PhD

None of the above

5. Please indicate your working status (tick all that apply):

Working Full time (30+ hrs)

Parttime (9-29 hrs)

Unemployed

Not working retired

Looking after house / children / others

Invalid / disabled

Student

Other

6. What is your annual household income?

- Under \$25,000
- \$25,000 \$ - 50,000
- \$50,000 \$ - 75,000
- \$75,000 \$ - 100,000
- \$100,000 \$ - 150,000
- \$150,000 \$ - 200,000
- More than \$200,000
- Don't know
- Do not want to answer

7. What is your postcode?

8. What is the composition of your household?

- Couple with children or other dependents
- One adult with children or other dependents
- Couple without children or other dependents
- One person household
- Shared house with other adults
- Other (please specify)

9. Do you, or anyone else in your household, require assistance due to disability or longterm injury or illness? Yes No

Please provide details if needed:

10. At the time of the floods, were you or your family working as a paid or volunteer member of any emergency services group, community group, council or local government organisation? (please tick all that apply)

- Yes, emergency services volunteer
- Yes, emergency services employee
- Yes, community group (e.g. Rotary, Lions, CWA, etc)
- Yes, local council
- Yes, local government organisation
- No, none of these
- Other (please specify)

#### **Questions about previous flood experience**

11. Have you previously experienced flooding in any location where you have lived?

Yes      No      If yes, please give details:

12. Please indicate which of the following most accurately describes your current situation since the 2010 or 2011 flood:

- I plan to live where I am for many years
- I plan to move elsewhere in this town in the coming years
- I plan to move to another town in the coming years
- Undecided / Don't know
- Other (please specify)

#### **Questions about your wellbeing**

13. How would you describe your relationships with family / friends?

before the flood	very bad	bad	neither good or bad	good	very good	N/A
now	very bad	bad	neither good or bad	good	very good	N/A

14. How would you describe your financial status?

before the flood	very bad	bad	neither good or bad	good	very good	N/A
now	very bad	bad	neither good or bad	good	very good	N/A

15. In general, how would you describe your physical health?

before the flood	very bad	bad	neither good or bad	good	very good	N/A
now	very bad	bad	neither good or bad	good	very good	N/A

16. In general, how would you describe your mental health?

before the flood	very bad	bad	neither good or bad	good	very good	N/A
now	very bad	bad	neither good or bad	good	very good	N/A

17. How would you describe your general happiness?

before the flood	very bad	bad	neither good or bad	good	very good	N/A
now	very bad	bad	neither good or bad	good	very good	N/A

18. Do you think the flood has had an impact on your (please tick all that apply):

Relationships with family / friends

Financial status

Health

General happiness

Please provide details if needed:

### **Questions about your home at the time of the flood**

19. At the time of the flood, how long had you lived at that address?

0 < 6 months

6 months < 1 yr

1 < 2 yrs

2 < 3 yrs

3 < 5 yrs

5 < 10 yrs

10 < 20 yrs

20+ yrs

20. At the time of the flood, how long had you lived within this region (e.g. Brisbane City Council, Central Highlands Regional Council or Buleoke Shire Council)?

0 < 6 months

6 months < 1 yr

1 < 2 yrs

2 < 3 yrs

3 < 5 yrs

5 < 10 yrs

10 < 20 yrs

20+ yrs

### **Questions about knowledge of insurance**

21. Please indicate which of the following most accurately describes your knowledge of your insurance cover prior to the 2010 or 2011 flood events:

- I knew my insurance covered me for all types of flood
- I thought my insurance covered me for all types of flood
- I knew my insurance covered me for storm flood only
- I knew I did not have any insurance cover at the time of flood

Please provide details if needed:

22. If you had insurance cover, what is the outcome of your claim (e.g. were you underinsured, are you still waiting for an outcome, did your insurer reject your claim, etc)?

23. If you did not have insurance prior to the 2010/2011 flood events, why?

- Too expensive
- I thought I had insurance
- Didn't think I needed it
- I thought it was not available
- It was not available
- Other (please specify)

24. Since the 2010/11 flood events, have you updated or purchased an insurance policy for all types of flood?

Yes      No      Please provide details:

### **Questions about your home at the time of the flood**

25. Please indicate from the options below which best fits your housing status at the time of the flood?

- Owned / Mortgage
- Renting
- Living in work funded accommodation
- Living in government funded accommodation
- Living with family / friends
- Other (please specify)

26. At the time of the flood, were you living in a single storey home, multiple storey home, unit or duplex?

- Single storey house (not raised on stumps / stilts)
- Single storey house (raised on stumps / stilts)
- Multiple storey house
- Unit ground floor
- Unit first floor or higher
- Single storey duplex
- Multiple storey duplex
- Other (please specify)

27. When you purchased / started living in your home were you aware it was vulnerable to flood?

- Yes I was aware (go to question 28)
- No I was not aware (go to question 29)

My house is not vulnerable to flood (go to question 30)

Questions on the impact of the flood

28. To what extent did the flood impact your:

House

Property / yard

It was not impacted      0-10cm 10-20cm 20-50cm 50-100cm 100-200cm 200+ cm

29. To what degree did the flood impact on your:

House contents

Building structure (e.g. house, garage)

Property / yard

Own business

not impacted minor impacts      moderate impacts      major impacts      completely destroyed      N/A

### **Questions on personal preparedness for flood**

30. Did you do anything to help protect your family and / or home from flood prior to the 2010 or 2011 flood events? Tick all that apply.

Chose to live in a house that was out of the flood hazard zone

Chose / built / modified a house / property that was more resistant to flood

Devised an evacuation plan

Prepared an evacuation kit

Followed warning advice on radio / television / internet

Evacuated to a safe house or centre

Sandbagged house

Built temporary flood barriers around property

Kept drainage clear of debris

Raised household items up off floor

Moved household items to a safe place

Other (please specify)

31. Did anything prevent you from adopting the above measures?

Yes      No      If yes, please give detail:

### **Questions about the impact of the flood on you**

32. If you evacuated your home, have you been able to return on a permanent basis?

Yes      No      I did not evacuate

If yes, please indicate how long you were evacuated. If no, please indicate when you expect to return to your home.

33. If your house sustained damage during the flood, have the repairs been completed?

Yes, they are complete

No, they are ongoing

No, they haven't started yet

Not applicable

34. Did the flood affect your ability to earn an income?

Yes      No      If yes, why and for how long?

### **Questions on flood adjustments**

35. Have you, or how likely are you, to make the following changes as a result of the 2010 or 2011 flood?

not at all likely   unlikely   undecided   likely   very likely   already done   N/A

Permanently move to a flood safe location

Raise level of home

Change exterior and / or interior design e.g. use flood proof materials

Move electricity outlets / meter box higher

Move air-conditioning unit higher

Anchor water tanks to the ground

Improve garden drainage

Build permanent flood barriers around property

Modify insurance policy

Other (please specify)

36. In comparison to other people in your community, do you think you are more or less able to make changes to reduce your risk from flood?

significantly more able; more able; about the same; less able; significantly less able

37. What do you think, if any, are the main factors that prevent you from making changes to reduce the impact of future flood to your home / property?

38. What do you think, if any, are the main factors that encourage you to make changes to reduce the impact of future flood to your home / property?

### **Questions about flood preparedness/mitigation**

39. What are the three main things you think can be done from a council perspective to help reduce your risk from future flood?

40. What are the three main things you think can be done from an emergency services (e.g. SES) perspective to help reduce your risk from future flood?

41. Overall, what do you think are the three best measures or strategies to help reduce your risk from future flood?

### **Final question!**

42. How likely do you think there will be a flood that causes damage to homes and properties in your area in the next: 10 years, 25 years, 50 years, 100 years

not at all likely   unlikely   undecided   likely   very likely

This is the end of the survey. Thank you for taking the time to provide us with your views and opinions. We hope that this information will help reduce the impact of floods in your community in the future. If you are interested in taking part in an interview or focus group to discuss the issues raised through our questionnaires, please provide your email address or contact number below:

## **APPENDIX 3**

All questionnaires were completed by the respondent and as such, open ended responses represent direct quotations. These open ended questions provide a rich source of information, from which some direct quotations have been used in text boxes in the chapters, but the whole frequency tables are otherwise too long to include in the main text. Due to these reasons, we have chosen to present all the responses given to a select few questions, which we consider critical to the research. Minor spelling errors have been corrected, and where several people gave much the same response, these have been aggregated to reduce the length of the tables.

The qualitative data presented in the tables in each of the following sections, i.e. Brisbane, Donald and Emerald, are as follows and are labelled Table B1, D1 or E1 according to the case study location:

Table 1	Have you experienced flooding in any location where you have lived?
Table 2	Do you think the flood has had an impact on your relationships with family / friends; financial status; health; general happiness?
Table 3	Did you do anything to help protect your family and / or home from flood prior to the 2010 or 2011 flood events?
Table 4	Did anything prevent you from adopting the above measures (e.g. chose to live in a house that was out of the flood hazard zone; chose / built / modified a house / property that was more resistant to flood; devised an evacuation plan; prepared an evacuation kit; followed warning advice on radio / television / internet; evacuated to a safe house or centre; sandbagged house; built temporary flood barriers around property; kept drainage clear of debris; raised household items up off floor; moved household items to a safe place)?
Table 5	What do you think, if any, are the main factors that prevent you from making changes to reduce the impact of future flood to your home / property?
Table 6	What do you think, if any, are main factors that encourage you to make changes to reduce the impact of future flood to your home / property?
Table 7	What are the three main things you think can be done from a council perspective to help reduce your risk from future flood?
Table 8	What are the three main things you think can be done from an emergency services (e.g. SES) perspective to help reduce your risk from future flood?
Table 9	Overall, what do you think are the three best measures or strategies to help reduce your risk from future flood?

## Brisbane – open ended response tables

Table B1. Have you experienced flooding in any location where you have lived?

	Frequency
1974 - Brisbane River flooding	1
1974 - Tennyson	1
1974 Brisbane	1
1974 floods	1
Born and raised in NQ	1
But my wife as a child did.	1
Cooroy 1974 Charleville	1
Flood in 1974 and lesser flooding 2011	1
Full house got flooded. Lost contents and no insurance. 2011 floods.	1
I was in Brisbane for the 74 floods.	1
Kooralbyn Valley	1
lived in flooding area, very dirty and now become pure	1
Minor outside flooding in Buderim. No water entered house.	1
My rumpus room, two garages, my caravan and all my furniture, household and appliances went under water during the flood.	1
Same address in 1974	1

Table B2. Do you think the flood has had an impact on your relationships with family / friends; financial status; health; general happiness?

	Frequency
A lot of stress and uncertainty	1
Closer	1
Developed respiratory problems. Have been sick most of this year with flu also. Spent a lot of money moving in and out of residence, replacing furniture, whitegoods, etc.	1
I am generally fine after the flood. We have a 13 week old baby when it happened but were able to live with my parents whilst we fixed our home. I am somewhat holding some resentment towards our insurance company for not helping us, after we had our home and contents with them since we bought our house, plus 2 vehicles. We didn't even receive a phone call to say sorry, nothing. So in general, I am happy with my family and friends and life, but still harbour resentment (which isn't good)	1
My wife and I have dealt with the flood and its effects and got on with life. However, it would have been better not to have the experience. The volunteers that helped really opened our eyes to how selfless many people are.	1
Not happy about the decline in property values as we had planned to sell this year.	1
Nothing has changed except that I have to repair the house.	1
People want to talk about and we don't. People that haven't been through it do not understand the feelings and emotions you go through.	1
Short term effects	1
Short term, for the month or so after the floods.	1
View to take flood insurance which will attract very high premiums - will impact financial long term.	1
We have become very close to some of our neighbours who were also flooded.	1
We moved 4 weeks before the floods, moving was very stressful for us, then the floods increased our anxiety. My younger son has found it hardest to adjust, he is seven.	1
What's good about something like this - might have made those unaffected think it was great to see people getting in and helping but personally it's been crap and would rather not have had some engineer follow the manual and flood the city because they weren't allowed to use common sense earlier	1
While overall the only thing that was really hurt us has been the financial costs, there have definitely been moments of frustration over the past 8 months. whether it be dealing with an insurance company that smiled and said things would be alright when they never planned to	1

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cover us and then subjected us to a terrible waste of time, following up time and time again on a decision we already knew would be negative, or dealing with tradies who promise a lot but then need to be reminded about every little thing, or having to listen to people criticise people for living in flood prone areas not having adequate insurance and then benefitting from the generosity of others. So yes, there have been times when tempers have flared and mental health, happiness and relationships have had ups and downs but overall, eight months on things are finally getting back to normal.

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Table B3. Did you do anything to help protect your family and / or home from flood prior to the 2010 or 2011 flood events?

	Frequency
Build 50cm above Q100	1
Extensive work securing pontoons & gangways for myself and neighbours as the waters flooded up Oxley creek and again as it flowed back out.	1
Flood levels kept changing so we wasted time sandbagging an area that was totally submerged - built house to Q100- what a waste of time given we had over 700 mm inside living area.	1
House was being rented. Tenants were overseas. Friends of tenants removed most of their belongings prior to the flood. Tenants lost larger items - fridge, lounge suite.	1
initially tried to move key items on very limited information (until 3pm on Tuesday 11 Jan radio reports were advising of 9 properties to be affected in Graceville and they'd been notified - however at about 3:30pm this went to 1m over '74 levels which meant >4mts thus know point trying to move anything higher. End result was 20 cm into 2nd storey which if known could have saved much more. Internet was useless as kept crashing though "leaders" kept telling us to go there for details.	1
Moved some items upstairs	1
Moved some items upstairs and evacuated to a family friends house with 3 cars loaded with some of our stuff.	1
Moved whitegoods and household items from downstairs to upstairs.	1
Sandbagged potential sewage outlets (toilets, bathroom/laundry floor wastes etc).	1
there was not any clear information or warnings given to people - there were about 4 houses in Graceville ave that got their things out of the house i was one of them. we had a plan in place when we moved to the region	1
Too late	1
Totally unprepared	1
Was away at time of flood. Back in house 2 days after.	1
We knew the water was coming, I evacuated with my baby on Tuesday morning, 11th January and my husband stayed to protect the house, when he knew it was coming higher, a friend came and they moved all they could out of our house, i.e. our clothes, wall hangings, jewellery, tv's, stereo's, personal effects, computers, our babies belongings. Besides those few things they could carry and in fit in the car, all was lost.	1

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Table B4. Did anything prevent you from adopting the above measures (e.g. chose to live in a house that was out of the flood hazard zone; chose / built / modified a house / property that was more resistant to flood; devised an evacuation plan; prepared an evacuation kit; followed warning advice on radio / television / internet; evacuated to a safe house or centre; sandbagged house; built temporary flood barriers around property; kept drainage clear of debris; raised household items up off floor; moved household items to a safe place)?

	Frequency
A lack of warning time access to trailers was difficult. Also it wasn't until the afternoon on 11 January that it was reported that the flood would affect our property. by the night of the 11th - 9 pm there was water over the road between our 'safe house' and our home. at 5am on the 12th we were cut off from our home even though our property was still out of the water.	1
Because we are both old, it is too hard for us to lift everything and we only have very little time to prepare.	1

---

Changing flood levels being advised. Lack of warning. We were inundated early hours of Wednesday 12 January.	1
Could only manage about 40 sandbags as BCC depots seemed completely surprised by imminent flood.	1
during the clean up there were so many people in the way of the clean up site seeing	1
Had nowhere to store large items such as furniture, fridge, washing machine, dryer, bicycles, etc.	1
Also had no packing materials on hand, which made it difficult to remove most clothing, kitchen goods, homewares, etc.	
Huge demand for storage space and transport made plans hard to execute	1
Lack of early warning information Manpower to move items	1
Lack of time and fatigue.	1
Predicted flood level kept changing.	1
Shockingly poor information - did not get told that at 10:30pm on the Tuesday night that dam would be opened to full open. Someone must have known days earlier this was going to occur so WHY WEREN'T WE TOLD !	1
Speed of inundation. My two lots were like an island while nearby was inundated.	1
Time, knowledge, fear	1
Was told that because of the dam the flood water would be no higher than 6 inches in this area and seeing as we are the highest point it would not reach us.	1

Table B5. What do you think, if any, are the main factors that prevent you from making changes to reduce the impact of future flood to your home / property?

Constraining factors	Frequency
50 year old brick building.	1
availability of funds	1
Brick home	2
Cannot change style of house as it is a two storey brick veneer with an inground pool. Future flooding would have the same, if not worse impact.	1
Cost, planning rules, land devaluation due to floods.	2
Design and construction of the house - rendered brick.	1
Design of house limits this.	1
design of house. you would have to knock house down and start again.	1
Expense - would need to raise highset house - is possible however very very costly. Would also need to change the existing lower timber frames to better brick - again very expensive.	1
Financial situation	1
Finding a rental property which will not charge more than we pay now in an area that we like and is close to work, school, etc.	1
Flood mitigation work to the mouth of Oxley creek needs to be done by Government. It can't be done by individuals.	1
House raising not an option for our style of house and the house had been re-stumped and renovated already. Not prepared to spend more before selling. If we buy again in a flood zone, we will raise the house accordingly before renovating.	1
How much higher to go on stumps	1
I am now renting	1
I cannot do any changes to reduce impact of future flood to my property. My house is a two storey brick house and I cannot raise it.	1
I feel the council needs to look at changing our area.	1
I think to reduce the impact of future flood to my house and my property, the Australian Government us (sic) to repair the damage.	1
Inability to run my business at home where income is impossible have to resort into other areas.	1
Living in a rental home means making changes to the house is difficult.	1
Living on the River.	1
Location	1
Location of house. Brick home - can't raise. Aesthetics of home.	1
Location of property. Up to city council to improve drainage. Better dam management.	1

masonry structure	1
MONEY	1
Money and somewhere to live while we raise the house. We have a baby and I work from home, makes it difficult.	1
none - we are renting. the house is already quite high.	3
none. our house is fairly well positioned. we would just consider flood impacts if we were to renovate our house in future.	1
not really	1
other then moving out every thing or putting all the houses 20m up in the air there is nothing that can really be done to stop flooding. All that can be done that is cost effective in this area is buy out all the house	1
Our home was built on a concrete slab 1 metre above the Q100 water line. It is not feasible to lift a concrete slab home above the new water line.	1
Oxley Creek - mouth of creek faces upstream. All the water surged up the creek with much force a groin sort at the mouth of the creek would stem such force.	1
Prohibitive cost v's value of property	1
Property is low-set on a slab.	1
Rental property	1
The BCC have 5 stormwater drains within 20m of my house. If these do not get a 1 way valve on them, we will cop it again in a big flood.	1
The building design cannot be raised. Not sure what flood barriers are exactly but doesn't sound pretty or cheap.	1
The main factor we lack cash	1
There is not much I can do - other than move valuables away in time. I am not interested in raising my house as I will soon be too old to climb stairs.	1
To what level??? Why do we think next time will be same as this time?? House is a 70's brick thus would need to spend \$100k+ just to raise it 1mtr and even then no guarantee that next time this would be suffice	1
Too old and changes would be too expensive.	1
Too old, also unlikely to occur in lifetime.	1
We live on the river.	1
When you are residing on the River edge you have to 'go with the flow' so to speak.	1

Table B6. What do you think, if any, are main factors that encourage you to make changes to reduce the impact of future flood to your home / property?

Frequency
1. Building more drainage. 2. Inform people in advance what is happening.
All I can do is raise furniture onto bricks to keep it out of water.
all ready had a plan for flooding
As above
As property cannot be changed, insurance to cover potential damage will be taken out.
As stated previously, cannot make any changes. Just have to hope it doesn't happen again and if it does that Wivenhoe Dam levels are kept right down. Also creeks and rivers need to be cleared and maintained.
Avoid similar problems in future
Avoid the mud next time. chance to get an ethical insurer, have to build a new house anyway.
Better drainage around property.
der
Don't want to live the nightmare so many people lived/living through.
Ensuring that I have correct insurance.
Faith Friends and family Support of the community
Lifting things with the reno & using flood proof materials.
Like the house the way it is
Love our suburb. It is a great suburb/ area.
Money is the main factor.

More information about available options. I cant think of much we can do to protect ourselves, except to get power generator and boat.	1
move out	1
n/a & renting	5
none	3
Not much one can do.	1
Not wanting to go through the experience again.	1
Possible repeat of loss and damage	1
Reduce stress and anxiety. To keep family together during a crisis.	1
reduce water damage and improve drainage	1
Safety and keep the property value	1
Stress of rebuilding.	1
To feel safe.	1
To reduce the damage and impact.	1
Voting for proper leadership and becoming more politically active to ensure in future residents are treated like adults and given proper information and that specialists are encouraged and empowered to act with common sense not mange to a clearly flawed policy. Seriously Someone must have know at least the week before that they'd left it to late and that if it kept raining that there would be a big problem - thus why no formal warning. How else could I stop 3+mttrs of Water	1
We are in the process of removing the existing house on the property to a new build	1

Table B7. What are the three main things you think can be done from a council perspective to help reduce your risk from future flood?

	Frequency
1. More drainage. 2. Release water in the Dam little by little. 3. Inform people what to do through TV and radio	1
1. Provide backflow valves on stormwater outlets to stop early entry of water into various areas.	1
2. Manage water storage facilities in a realistic manner. 3. Never forget what has just happened.	1
1. regular and documented maintenance of drainage infrastructure 2. re-look at the neighbourhood plan for higher density living in our area and reduce the numbers and DA approval rates for higher density living and subdivisions 3. Look at installing back flow vales in the area	1
1.Keep the creeks free of vegetation and rubbish to allow the water to disgorge into the Brisbane River. 2.Look at ways Oxley Ck and its tributaries can be managed - flood gates?? This was the direction of local flooding, not the Brisbane River.	1
Accurate advice on how high the water is becoming in my immediate area. ask good to make it not happen again. Graceville region is always going to flood	1
Be more informed on dam levels Be more precise of rising water levels	1
Better drainage. No more building. Dam management.	1
Better management of dams. subsidise those who wish to raise their house. Project likelihood of flooding in new housing developments.	1
better management of flood mitigation measures earlier warning better information on potential levels in respect to the local areas	1
Better water management	1
Build a better dam. Better management of dam water levels.	1
Change the waterway. We were dammed in by new buildings e.g. Bunnings.	1
Clean up the drains on green space/Royal Brisbane Golf Course. Look at mouth of (Oxley) creek - widen it if possible. Relocate new bus depot at Sherwood Rd - not raise it.	1
Clear and concise warnings to enable sandbagging? I don't know what else. How do you stop water from rising? Maybe a question for the engineers responsible?	1
Dam management. Early warning. Keep storm water drains clear	1
Early warning. Less water storage in Wivenhoe Dam.	1
For our situation i believe valves on the drainage system to stop water coming up would help.	1
Other than that, i believe the Oxley creek entrance into the Brisbane river needs to be looked	

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at. Currently Oxley creek empties into the river against the flow i.e. the water from Oxley creek is forced out against the river. During the flood, Oxley creek could not empty into the river because the river higher and was running up into Oxley creek. this then forced Oxley creek to back up and flood Tennyson, Graceville, Rocklea etc! and the third thing, would be for the council to make regular check of drainage systems, creek banks etc to remove rubbish etc so that water will flow and not be obstructed during high rainfall etc.

Give clear communication on wet weather and how the dam is being managed. We only flooded because of the water was released too quickly, I firmly believe this regardless of what the council/media have said to people. 1

Give serious and adequate warnings of the dangers before they occur. Ensure the dam has enough space to contain the extra water. 1

Inform the people early when flood is coming. Educate people how to build house better in flood zone area. 1

Keep drains clear, 1

Keep large street drains cleared. 1

Keep waterways dredged. Clear overgrown vegetation along river/creek banks. Keep storm water drains clear. 1

Maintain dam levels Clear Oxley Creek Flood warnings  
manage dam levels/releases in a more logical way. 1 1

Manage dam releases. Give plenty of warning. 1

Manage the dam Build water storage for drinking water 1

Manage the dam better, Build more dams and actually have proper drought mitigation strategies so that Dams built to stop flooding can be used to stop flooding and Water storage and salt water conversion plants be used for drought mitigation. Probably be good if Salt water conversion plants used proper grade metals that weren't corrosive thus forcing gov't to use a flood mitigation dam as a water storage dam

Manage the dam levels in as sensible manner Appoint competent people to manage it Draw conclusions from the recent events 1

Manage Wivenhoe as a flood mitigation dam not a water use dam 1

Monitor dam levels 1

None that I can see that are possible 1

Not allow development on flood plain areas. Commercial buildings, bus depot, unit development, playing fields where ground has been built up for development displaces areas water would have been. Groin at Oxley creek mouth. Correct management of Wivenhoe. Revisit Traverston dam around Tambourine as alt water supply.

not sure - I think they did a good job. 1

Open dam sooner. Clean drains. 1

Our property was impacted as a result of water flowing up Oxley Creek - would be excellent if this could be mitigated via investigation into modifications of the Oxley Crk outflow, levy Oxley creek etc then hundreds of homes and businesses through the Chelmer, Graceville, Sherwood and Rocklea area would be protected. 1

Oxley Creek - Build a groin to stop Bris River flowing straight up the creek. Dredge the creek (especially the silted up mouth) Put non return valves on the storm water outlets. 1

Oxley creek is the problem for our area. Drainage to be improved. The mouth of the creek when it meets the river to be widened. Earlier warnings from the council. Council to supply sand bags to our area. 1

Prevent population growth in Brisbane. Lower dam levels. Remove planning restrictions for flooded properties. 1

Responsible management of flood mitigation by careful control of dam levels after rainfall in catchment areas. 1

Review the flood levels and drainage across Brisbane... We built our home 3 years ago to council standard. Our garage slab is ABOVE the '74 flood line, council states that the recent floods did not get as high as the '74 floods, however our house still was flooded???? 1

Should have released Dam sooner. Should have lifted those water restrictions when clearly there was no need for them. 1

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Storm drains 1 way valve	1
To ensure no major dam release at higher tides.	1
Unsure - maybe inform people where flood free areas are.	1
Use the dam as it was intended. Use flood information when designing their roads and infrastructure. Make sure that the people know what they're doing.	1
Water barriers around creeks or water sources	1
Water releases in timely fashion	1
Wivenhoe Dam Levels need to be kept low. Creeks and rivers to be cleaned and maintained.	1
Council needs to ban further development on land that was seriously flooded.	

Table B8. What are the three main things you think can be done from an emergency services (e.g. SES) perspective to help reduce your risk from future flood?

	Frequency
1. Early warning system - media, sms	1
active policy of removing asbestos from houses in flood areas (and all other areas) this will reduce the risk of after affects of flooding and make a clear statement that asbestos is bad.	1
Don't tell people that it is ok if it is wet. council and state government knew that it was going to flood since 1974 and before that as it has flooded in these areas. total lack of planning and preparation, just greed from council wanting to get rates. training the people in how to deal with flooding and send them out with the right gear or some gear. giving volunteers (that come through the councils) information of what they need to where and how to manage and work with the people that live there	1
Actually advise earlier - at NO stage were residents in our street advised that our street was flooding nor were we advised that more would have to come as dam was released etc. SMS messaging did not work, Internet was crashed, no SES in neighbourhood until after water went down	1
As above. (inform the people early when flood is coming, educate people how to build house better in flood zone area)	1
As per 41. I found it very hard to get advice on where the water height was locally and how fast it was rising.	2
Better advance warning. More accurate advance warning.	1
Better advance warnings and more accurate warnings.	1
Better traffic management.	1
By sending signal #1 - prepare signal #2 - be aware signal #3 - serious and evacuate	1
Clear drains and ensure free flowing water ways.	1
Early warning. Household flood plan. Check that the storm water drains are clear	1
Emergency services should be required after dam level management has lost control. So they need to monitor risk to be on hand.	1
Emergency services were good.	1
Have a flood plan. Disaster Managers. Better communication.	1
I don't know to be honest, get more members onboard (god bless those people who dedicate their time to this), have regular meetings on how to behave and react to these situations.	1
I think the SES did all it could.	1
I though the emergency services did a very good job. Only things that would be improved would be an earlier assessment that the flood was going to reach the higher levels and also better access to sand bags etc.	1
Improve early warning systems	1
More resources, accessible information	1
More volunteers from community - or more branches and equipment (e.g. SES) along with marketing drive to bolster numbers. Incentives to become involved - incentive to get involved by general public was more reactive after the floods.	1
Need continued training.	1
Need to ensure ses, police etc are confined to areas of great danger before/during floods. Then they need to be in flooded areas after floods to stop looters and sight seers.	1
Nil, none	3

Not sure	1
Nothing they were brilliant.	2
Possibly educate more people to evacuate themselves early if possible.	1
Refer to above.	1
Sandbag creek banks or temp. levee banks on creek.	1
SES were great.	1
this is a flood-prone area. Either don't live here, or have the houses all raised. There is not too much you can do.	1
unsure	1

Table B9. Overall, what do you think are the three best measures or strategies to help reduce your risk from future flood?

	Frequency
1. Manage the water storage facilities using commonsense and just not what the book says x 3.	1
1. Manage Wivenhoe better x 3	1
1. Monitor and control of water levels and infrastructure related 2. On time information for the community 3. Action Plans with the necessary resources allocated	1
1. Probably raise the house 2. Better evacuation plan - i.e. believe it will happen	1
1. Raise homes to higher height. 2. Please inform people in advance and enough time to evacuate.	1
1. Wivenhoe dam 2. Re-orientating the mouth of Oxley creek to flow out into the Brisbane River 3. stop-valves on the suburbs storm water drains.	1
ABC Radio info.	1
As nos. 41 and 42	1
As per #41 (Maintain dam levels clear Oxley Creek Flood warnings)	1
As the house needs to stay as is because of its construction, I feel the best measure would be for the council to investigate flood mitigation for Oxley Creek and its tributaries.	1
better dam management	1
Better management of dams. Improved storm water systems	1
Better management of Wivenhoe Dam. Manage the waterways better. (dredging, clear overgrown vegetation etc)	1
Build a new highset house (not reasonable). Live on a Boat (even less reasonable). Pray to Jesus/Buddha/Allah (completely unreasonable).	1
buy back of houses in flooding regions better storm water drainage that are clear council taking responsibility and action years before the next flood YES the next flood as it will definitely happen again	1
c.f. Q41	1
communication from local govt. evacuate early. keep in contact with friends/family	1
Dam management. Dam management. Dam management	1
Dam management. Drainage maintenance/expansion. Limit further building/hard acre.	1
Dam operators to consider weather forecast Use the dam for flood mitigation Build other water storage facilities for drinking water	1
Do everything you can to protect your property - raise your house, etc, get appropriate insurance to protect yourself, always keep up to date with radio/tv announcements, and know when the wet weather months are, kept abreast of up-to-date information. OR, move to a known area clear of flooding.	1
Drainage - golf course did not have prior 90s golf buggy causeway - drains used not sufficient or maintained. Look at possible impact building or constructing might have on flood - bus depot an example - nobody wanted it here, there were other sites.	1
Early warning and better government planning for water needs	1
Educate people how to build or repair house in flood zone area. Easy access info about building better house either in brochure or website form.	1
Education.	1
For us to remove our existing home and rebuild to ensure we are above the flood level	1
get prepared, get notified really early, and inquire with insurance companies on their policy	1
Have the brains to realise Wivenhoe needed controlled releases well before Jan 11. Do you need to be	1

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a hydrologist to work this out?	
I do not think that there are any strategies to reduce the possibility of flooding in our area. We live near a major river and have accepted that fact before and after the flood (and take out appropriate insurance). Therefore, in our case the only way to lower mitigate flood risk is to move to another location. Note I used lower because there is no guarantee that any habitable location is free from the threat of flood (e.g. Toowoomba).	1
Insurance	1
Manage Water supplies better Leaders to treat residents like adults and give us proper information earlier Don't confuse water storage with flood mitigation	1
More notice!! - particularly for regional areas. Also, stronger/more accurate projections of when and where flooding will take place and height of floodwaters. Most of all I think closer monitoring of weather systems in areas that are subject to flooding - perhaps this could have given regional residents more notice to evacuate.	1
Move to a flood free zone.	1
Not sure.	1
People who know and can interpret historic flood information. Better forewarning. Realistic not political decisions.	1
raise your house. create better drainage.	1
Real Planning, maintenance, and action	1
Reduce population in Seq to sustainable level. Remove all big development in river or encroaching on RIVER. build Wolfendene dam. Build upper Bremer dam.	1
Refer to Q41	1
see question 41	1
Sell house. Move.	1
Sufficient warning to remove household contents.	1
The responsible release of rising dam waters as history of catchment rainfall predicts water levels at dam walls.	1
Use Wivenhoe Dam for flood mitigation.	1
Water outflow management at the Wivenhoe dam Oxley Creek Mitigations Modifications to our existing property - however can't afford.	1
Water releases in timely fashion.	1
Wivenhoe Dam Levels need to be kept low. Creeks and rivers to be cleaned and maintained. Council needs to ban further development on land that was seriously flooded.	1

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## Donald – open ended response tables

Table D1. Have you previously experienced flooding in any location where you have lived?

	Frequency
1981, 1983, 1996, 2010	1
70s,90 & 20s	1
At address I have lived all my life.	1
Experienced flooding but not to this extent	1
Kingston QLD	1
Lake overflow due to mismanagement inundated farm	1
minor flooding in Donald in previous years	1
Only September 2011 floods, but water didn't reach the inside of the house	1
Previous flood conditions in this town.	1
Smaller flooding of Richardson River	1
We lived on the north west shores of Lake Buloke from 1971 until 2003 and experienced several floods during that time. We usually lost 400 ha of cropping land; however our residence was never threatened.	1

Table D2. Do you think the flood has had an impact on your relationships with family / friends; financial status; health; general happiness?

	Frequency
A lot more pressure to meet the payments and expenses now that we had to pay for all our repairs since the insurance company didn't honour our insurance coverage.	1
A previous cancer from 20 years ago has returned and my young Grandchildren became very stressed by the flood and Gran being evacuated to their home.	1
Affected my wife by working 3 days only and looking after parents for the other 2 days	1
Being relocated after floods has made it difficult to keep up contact with family and friends.	1
Also having to live in a strange facility and with others I don't know has been difficult.	
Down in retail sales	1
Evacuated to another facility	1
Flood has made me sad	1
N/A & No	4
ongoing tiredness	1
sickness of partner ,more work, cost to repair and replace things that were flooded	1
Still waiting for the insurance company to give us a final decision. We have nothing in writing from the insurance company.	1
We lost approx 1/2 our crops to flood. However I feel the floods brought the community & friends closer together.	1

Table D3. Did you do anything to help protect your family and / or home from flood prior to the 2010 or 2011 flood events?

	Frequency
Evacuated and relocated by facility staff	1
Lifted tools in workshop	1
Moved cattle to higher ground.	1
No	1
Not enough positive advice. Telephone warning was received by all - some who were nowhere near the flood.	1
Plans for aged care facility	1
Was evacuated and relocated by facility staff	1
Was evacuated by staff	1
We completely emptied the moveable contents of the motel	1

Table D4. Did anything prevent you from adopting the above measures (e.g. chose to live in a house that was out of the flood hazard zone; chose / built / modified a house / property that was more resistant to flood;

devised an evacuation plan; prepared an evacuation kit; followed warning advice on radio / television / internet; evacuated to a safe house or centre; sandbagged house; built temporary flood barriers around property; kept drainage clear of debris; raised household items up off floor; moved household items to a safe place)?

	Frequency
Checked livestock but unable to move due to severity of flood	1
Not enough positive advice. As Christmas holiday time the CEO of retirement village was on holiday and the Mayor was also away. Both had to return immediately after the disaster.	1
Removed furniture	1

Table D5. What do you think, if any, are the main factors that prevent you from making changes to reduce the impact of future flood to your home / property?

	Frequency
1. The Greenies 2. Shire + GWM water regulation 3. DPI etc.	1
Aged care facility run by a board of management	1
Area not flood zone	1
As above	1
Because the river runs right behind our house there is not much we can do to prevent it happening	1
Being aged and a resident of an aged care facility	1
Cost	1
Do not believe my home will get flooded	1
Financial, Renting property so can't make any change I like.	1
I don't own the property	1
Laws and rules	1
Laws that prevent levee building Water mismanagement by GWM water	1
Legal issues of blocking or moving barriers & channels for water drainage.	1
Live in aged care facility	1
Live on river and the will flood again. Hopefully not as high	1
n/a	7
No need as flood didn't come into our yard and only reached our back fence line	1
No need to make any changes	1
None	1
Physical limitations	1
Red tape preventing the river from being cleaned	1
River frontage farm on the edge of Lake Buloke. Richardson River flows into Lake Buloke on our property.	1
Shire drainage system	1
Should any future flood be significantly higher the whole main street would go under. I do not see how it would be possible for an individual to prevent this.	1
The main factor is that the flood waters came at us from 4 sides. The barriers we are erecting will stop a flood of the level of Sept 2010, but not the flood of Jan 2011.	1
The retirement village are in control	1
The shire tells us that we can't put levee banks up as it will disrupt the natural flow of the water.	1
Unable to raise house In future we will block toilet, shower to stop backflow of sewerage more sandbags	1
Unable to stop the water rising from the river in exceptional circumstances. The impact on our business comes from our clients being impacted	1
Unlike urban property the options for change are less.	1

Table D6. What do you think, if any, are the main factors that encourage you to make changes to reduce the impact of future flood to your home/property?

	Frequency
As above	3

As this was a once in a 100 year flood and it didn't come into our yard it isn't likely to happen again - we hope	1
Better drainage	1
cleaner drains and culverts	1
Correct management of water would prevent flooding	1
Levee banks clean out river monitoring river levels	1
n/a	10
none	1
Property I am in now more at risk of flood than where I was living at the time of the flood.	1
reduce property loss	1
same as above	1
Saves Valuables	1
The fact that the Jan 2011 flood came from all sides and it's impossible to defend such a huge circumference. It would mean erecting a barrier 1.25 m high across our driveway, which is not feasible.	1
The retirement village are planning a garden bank. Clean out river drainage in order better communication if a 1-100 event occurs again	1
Threat of more flooding.	1
Would hate to go through the whole process again of rebuilding and the inconvenience of it all again. Has taken a good 8 months and still there are some things not back to normal.	1

Table D7. What are the three main things you think can be done from a council perspective to help reduce your risk from future flood?

	Frequency
- Put in place revised levee bank in flood prone areas - Improve river flow under highway (Sunraysia) and railway line	1
- Service & maintain drains, gutters, storm water pipes etc. - Service & maintain roadside table drains. - Back up power supply for motors controlling pump stations	1
1-check the water flow areas and see where water can be diverted. 2-put some pump stations in some areas to pump water away from the town areas. 3-clean out the river and deepen it to hold more water or have more water storage to run into.	1
1. Clean out the waterways immediately. 2. Richardson River needs flood warning system. 3. Hydrologist's report re. water flow through town - incl. bridges.	1
1. Maintain road + culverts. 2. Maintain channel bridges etc. 3. Shire to allow tree etc to be cleared in water.	1
1. Take interest in locality 2. Council seek better water management 3. Try and convince GWM water to correct mismanagement	1
1) Levee around the Johnson Goodwin village aged care facility 2) Same for Byrne St Donald as motel and shop's back yards were flooded.	1
A levee	1
Allow locals with knowledge to organise flood & evacuation procedures. Ensure clear waterways & use old channel systems if possible. Evaluate water pathways.	1
as above	1
Barriers Sand Bags Better Drainage	1
Build a levee around the river or widen teh river to allow quicker flow out to the lake.	1
Clean out river near bridges Levee banks to protect low lying residents	1
Clean out river, improve water running under the bridge, build a levee bank	1
Clean out river, put up levee bank	1
clean out the river and ensure that the bridges over the river do not continue to restrict river flow	1
Clean out the river. Build a levee bank along the walking track in Byrne St. Have meters installed upstream so we know exactly at what height the water is going to peak	1
Clean river Allow channels to be used and local (with underline) knowledge to be used	1
clean rubbish in rivers inform residents act earlier	1
clean up the river improve clearances under bridges allow levee banks	1
Develop a Community Response Plan to Flood (Natural Disasters) Develop in conjunction with	1

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local water authorities a flood warning device upstream of the river to alert the appropriate response teams of water levels. Identify low flood areas and generate levies or barriers	
Difficult to answer as floods in flat country take differing courses from year to year	1
Dig out the river or build levee banks	1
Flood warning system build a bank around the Goodwin retirement village	1
Get and emergency action/evacuation plan, because more should have been done much (with an underline) earlier. Warnings, levee banks, this council is too dysfunctional.	1
Improve the street drainage	1
Levee banks clean rivers	1
Levee banks cleaning river beds better monitoring of river levels	1
Levee banks reduce riverbed debris better river level monitoring	1
Levee banks - provided the water is not pushed on to someone else A safe area to care for flood evacuation Volunteers were marvellous	1
Levee banks. Allocating flood recovery finances where they are necessary	1
Levee banks	1
Levee banks, better drainage, more workers during flood.	1
Look at water channel system & impacts on farmers.	1
maintenance of drainage system	1
Make sure there are many sandbags available. Introduce levy banks and have heavy duty vehicles on call.	1
Monitor water levels upstream	1
Nothing water will go where it wants	1
Previous stock channels be completely filled in	1
Stop the amount of water flowing into river More drainage at the bridges on highway	1
The ability of the river to flow under the highway should be improved...perhaps by increasing the size of the exit pipes/areas under the two bridges.	1
Vegetate upper catchment to slow water coming down and to hold water in the catchment	1
Monitor river height to inform people downstream what flood water is coming	

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Table D8. What are the three main things you think can be done from an emergency services (e.g. SES) perspective to help reduce your risk from future flood?

	Frequency
1. Take notice of local people	1
1. They need to listen to advice from people with local knowledge. 2. Better flood plans, incl. communications. 3. Larger numbers available.	1
1) Send qualified personnel from the Red Cross 2) Train more people - local and other red cross	1
3) Need qualified electricians or SES with multiple expertise	1
Accurate (with underline) measuring of flood well before it reaches town. Allow locals to sandbag where they think it is necessary.	1
Alert all in a more formalised manner of risk	1
Allow locals to do the transfer of water.	1
as above	3
Better information of flood ... (word cannot be read) Better knowledge of area Talk to effected residents	1
better monitoring of river levels	1
Better warning of water level height is essential. Sandbagging as necessary.	1
Conduct regular workshops on the appropriate manner in laying sandbags Liasse with local authorities, eg Shire in monitoring water levels. Notify people in low areas of rising flood in plenty of time to enable early evacuation.	1
Council needs to have a flood action plan for other services such as Vpol, CFA & local shire to refer to in the event that SES are unavailable at the time.	1
Earlier warnings	1
flood experience required structured volunteer help based on pre planning warnings	1
Get an emergency plan into place that every agency (with underline) works to not against each other or overlaps	1

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Get more information on how much water is coming down so we know how high its going to get	1
Get the correct information out, which is monitoring river height all properties on river to be alerted of river levels by SMS	1
Have the Richardson River gazetted as an actual river so that we can receive river heights and flood warnings	1
I don't know	1
I'm not sure its the obligation for emergency services to try and prevent flooding i think it is the shires responsibility to protect rate payers.	1
Let us know what is happening make sure plenty of sandbags available	1
Make sure the older generation can be evacuated easily and caringly, along with the disabled and children.	1
more on-ground presence more liaison with local emergency services	1
N/A Not applicable - home on high ground	1
none	1
not in flood risk situation	1
Not much.	1
Nothing.	1
On a river nothing	1
river level monitoring local knowledge as above	1
Sandbagging	3
To be in touch further down river An authority to notify adequately more control of river water	1

Table D9. Overall, what do you think are the three best measures or strategies to help reduce your risk from future flood?

	Frequency
- Correct management of water by G.W.M. water - Better warning of flood ... (word cannot be read) - More monitoring equipment on floodways	1
1- devise water storages to run excess water into before it gets to damage property. 2- levee banks. 3- utilise unused water storage as in Donald's case it could have pumped water into the unused reservoirs-this was an issue except GWM didn't want to take responsibility for it and nor did the shire.	1
1. Cleaning out the waterways. 2. Govt. funding to carry out above suggestions. 3. More action locally. Less bureaucratic interference.	1
accurate flood level maps accurate flood warning systems reduce infrastructure impeding river flows	1
All the above	7
as 39	1
better warnings: The Richardson River did not feature on any warnings (at Donald) cleaning out river and improving flow under bridges perhaps a couple of strategic levee banks	1
Block toilet, shower more sandbags plastic may be some help	1
Build levee banks	1
Clean out the river - silt Open up under main bridges to generate a great water flow Establish and maintain levy banks	1
clean up the river from trees and banks improve bridge clearances levee banks flood warnings	1
Early warning	1
Enlarging piping at crossings cleaner drains larger pipe in overflow outlet Donald caravan lake	1
Every possible means to increase the flow of the water under the bridges to prevent any 'back-up'. Ditto back-up from Lake Buloke. Levee banks must not be built upstream of these bridges as that would increase the pressure on the bridges and the main street - its businesses and property. The main street (Woods Street) is vital to the town and contains buildings of 100 years plus that have withstood all previous floods. It would be ludicrous to sacrifice these, the historical heart of the town.	1
I am not at risk	1
Improve storm water drainage within township Clean out silt in the river within the township	1
Clear debris from the river from town boundary to Lake Buloke	

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Levee banks improve authorities knowledge of water levels	1
Levy bank placement, more sandbags available	1
Look at crops sown on lower ground.	1
Maintain local structures eg bridges channels etc.	1
Maintain natural water courses. Plan early. Have adequate (no plastic!!) sand bags available!!	1
Moving to less flood prone area. Better flood warning systems. Be proactive when a flood is imminent.	1
N/A	2
Nature sometimes wins Common sense Take notice of an older generations Prayer	1
No control over the amount of rain that falls in the Grampians and flows into the Richardson River.	1
Plan ahead. Get organised early eg. emergency services, centre etc. Keep updating, training key people.	1
Proper communications between all parties, more levy banks, clean rivers and creeks from all debris so water can run freely.	1
Put in flood indicators in the Avon Richardson river to monitor flood levels	1
River warnings at flood times Clean the river so it will flow better And levee banks to reduce flooding	1
See previous answer.	1
Stop the river flowing	1
The best measure is to build a levee alongside the river	1
This was an exceptional circumstance A widening or deepening of the river through town or a levee bank within the town area.	1

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## Emerald – open ended response tables

Table E1. Have you experienced flooding in any location where you have lived?

	Frequency
2008	5
2008 Emerald	8
2008 flood at my present address	1
2008 Flood in same areas as 2010/11 flood	1
2008 floods, we had water up to our deck not in the house, but in our shed & backyard.	1
2008 property was inundated, but not the house	1
2008 water did not enter house lapped at doorways	1
2008 water was 2 cm below slab	1
At 6 Ibell Court Emerald in January 2008	1
Came close in 2008, water did not enter dwelling. 2011 - 700mm of water through the house	1
Emerald 4720 in 2008	1
Emerald flooded in January 2008. The water surrounded our home but did not inundate.	1
Gemfields 2008 water came down the hill	1
Gemfields in 2008	1
Grafton, NSW	1
Had approximately 150mm through my house.	1
have lived here 35yrs & have experienced flooding several times but 2010/11 obviously the worst.	1
Here at Emerald	1
In Philippines it's always has floods when there is cyclone/typhoon	1
last time was not as high (2008)	1
Mount Isa - 1997 Emerald - 2008	1
On our cattle properties in 1949, 1950, 1954, 1956 etc. No house inundation	1
Once in Emerald in 2008 flood Victoria flood 1998	1
Only came to front gate and back fence 2008	1
Rockhampton 1991 Grafton 2001	1
South Africa, Thabazimbi 2006	1
We experienced flooding in the same house in 2008	1
We flooded in 2008 approx 200-300ml	1
When we flooded in 2008	1

Table E2. Do you think the flood has had an impact on your relationships with family / friends; financial status; health; general happiness?

	Frequency
Brought family closer even though we are a close knit family First 3 months are emotionally hard and seem to be made worse by extra burden of trades people etc	1
Cost over \$100,000 to flood proof our house	1
Due to drain that does not work	1
During flood become stressed but not as stressed as the 2008 event. I believe I had some stress and health related issues to the stress possibly up 3-4 months after the flood but am fine now.	1
Flooding property, also stress around financial, but keep a good outlook. The property is in Rockhampton.	1
I was undergoing treatment for cancer at the time of the flood but am well now	1
Have to replace something all the time. Small or big. Not bad now only need to buy wardrobes for clothing.	1
Having panic attacks and go through stages of depression	1
Insecurities that it will happen again	1
Living in the ""unknown"" world as to what will happen in the future in regards to your home flooding, if the Government built gates at our dam and could control the water during the wet season, then you wouldn't be living on tender hooks wondering if this was all going to happen again.	1

My relationship with my husband is at times strained, due mostly to the fact that we have been unable to sleep in the same bed since March 2011. He finds the bed in the emergency accommodation we are in, very uncomfortable for his back, so he sleeps on the lounge. I sometimes feel that we are not as close because we lack a physical closeness. We suffer/ed financially due the fact that our adult daughter, who lived with us prior to the flood, has moved away and my husband has found it difficult to maintain employment. This has, of course, affected our health and general happiness.	1
No, none, None of the above, indifferent	4
Reduced value of residence	1
Relationships can be strained at some times. Most people do not understand the stress involved of dealing with insurance companies or rebuilding after the flood unless they themselves have experienced it. My whole family's health has suffered since the flood. I am on long term medication from a medical condition that could be caused from stress.	1
Still not having repairs complete means a social dis-fragmentation for us. We are socially isolated as our friends have moved home and we are not there. This is our community. I feel incredible sadness at times and also frustration at the slow pace of repairs.	1
Stress, spreading illnesses, Run down, Tired, Hurt back and required surgery	4
We are not in our residential home and feel displaced. We were not ready to take on a major task in fixing up our house.	1
We are self employed and it took nearly 3 months to recover.	1
We moved in with family which has affected our relationship with them. There are more than 10 people in the 1 house Our insurance company would not cover flood, so we are paying for the repairs ourselves. We are looking at around \$100,000 in total by the time we finish. Health - we are all worn out, tired and exhausted. We are working our jobs (a variety of day / night shift) and then working at the house when we knock off. We get roughly 5 hrs sleep a night, which is broken as we have 2 kids including a baby. Before the flood we were a happy family. Now we are stressed and tired all the time.	1
When it floods our earthmoving business is held up for several months. That combined with having no insurance has put the expenses way up and the income way down. We had to resort to selling some assets to get through.	1

Table E3. Did you do anything to help protect your family and / or home from flood prior to the 2010 or 2011 flood events?

	Frequency
Assisted friends with most of the above - sandbagging, moving items, storing items, had friends evacuate TO us.	1
away at the time in another state.	1
Could not do much. Holidaying in Sunshine Coast when impacted. Could not return home, roads closed 2 weeks:(	1
Filled car and caravan with photos, private papers etc plus some belongings of other family members (3 other families in all)	1
got 2 hours notice to leave and go to the ag college. Put some stuff up, took my car and bolted.	1
Had a plan that once the water reached a certain level we would self evacuate to our neighbours 2 story home. Our children and pets were already there before we self evacuated.	1
Lifted air-conditioning unit	1
Lifted furniture above previous 2008 level - unfortunately	1
Made a clear decision to lift all items to a level which was 1 metre above the peak of the 2008 flood. Choose a line in the sand which we thought was adequate - minimal personal items were impacted	1
Move vehicles and pets evacuated early	1
Moved chemicals away from waterway	1
No	1
Shifted everything on, 2 days prior to flooding to a high shed 1 mile away	1
Stayed with family while house flooded	1
Was not in town, were not allowed to return	1

We were isolated at another city, unable to return home	1
We were on holiday at the time	1
Younger children and I moved to friends on higher ground and oldest son and husband stayed in case flood reached floor and needed to raise more of household items	1

Table E4. Did anything prevent you from adopting the above measures (e.g. chose to live in a house that was out of the flood hazard zone; chose / built / modified a house / property that was more resistant to flood; devised an evacuation plan; prepared an evacuation kit; followed warning advice on radio / television / internet; evacuated to a safe house or centre; sandbagged house; built temporary flood barriers around property; kept drainage clear of debris; raised household items up off floor; moved household items to a safe place)?

	Frequency
At first we couldn't get any sand bags! We had to get some from friends. Went to main roads as they had lots but were told we could only get them after they gave them to their own staff...	1
Could not lift the heavy items up, ie fridge. Could not move the heavy items up.	2
Could not get enough sand bags SES wouldn't let us get any more and would not deliver	1
Thanks to emerald council they were great we managed to save our house from getting flooded and what water we did have come in we were able to clean up and stop from destroying any carpets and furniture.	
Did not have time or assistance to shift the heavy items. Flood was higher than originally predicted. Road closed to our house and we were unable to return to move items higher. distance away over Christmas roads were cut unable to return home.	1
I was away on holidays, had to get friends to go to my house and lift furniture.	1
I was in Victoria - so had to rely on daughter and friends	1
Information on the forecast peak was incorrect by 500 mm	1
Lack of accurate prediction of water level	1
Lack of Council knowing what was going on.	1
Lack of info	1
Lack of provision of sand bags and accurate information about the impending water levels.	1
Evacuated first, when available information said flood was to be 2008 levels. The became apparent after evacuation it was going to be way higher. Nothing could then be done	
My hubby was out helping others through work so I had to do all of what was done by myself	1
Not at home when flood hit	1
Not enough sandbags were available to use. We would have used more if we could of.	1
Not enough time to prepare and not enough emergency services available.	1
Not in town and the area had not previously flooded	1
only got 2 hours notice	1
Stuck in Brisbane	1
Town ran out of sand bags and sand	1
Unable to return home before or during the flood event	1
Was not in town, were not allowed to return	1
Were on holiday and tried to return home but the town was cut off	1
were on holiday. unable to do anything	1
When you are a renter, you have very little choice about where you live. You are only able to live in the property you are told you can afford and that you are accepted to live in, or you live on the street. If we had been able to wait for a different house to become available, we would NOT have moved into the one we were flooded out of. Had we not been required to move from the house we were in three weeks before the flood, we would have suffered no damage to our belongings, because our previous residence was out of the flood zone.	1

Table E5. What do you think, if any, are the main factors that prevent you from making changes to reduce the impact of future flood to your home / property?

	Frequency
- cost - logistics - low high of flood level	1

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- Lowset brick home - Location and size of nearby drains	1
- slab house	1
\$ and time	1
As we don't own property, we will always be at the mercy of the person who does own the house we live in, and as a result will have to just accept whatever happens in the future, because it will always be beyond our control :(	1
As were are a highset home I don't think we can do anymore. Only little things like moving air con units.	1
Cannot raise the house as it is on a concrete slab.	1
cannot afford to raise house onto stilts	1
Cost of change	5
Council planning, assistance and forward planning from Council- still no improvements to their land or the land and drains of Sun Water	1
Finances and lack of suitable properties available	1
Financially impossible	1
Generally not necessary considering the record nature of this flood. Financially prohibitive to raise house further at the moment.	1
Geography	1
Have just brought and have no money trying to get business back and go from there.	1
Home is located close to Nogoa River not a lot can do to prevent water	1
House design - slab	1
House is built on the ground so cannot raise it.	1
House is on cement slab and is brick veneer (too costly to raise on stumps etc)	1
I can't really raise the height of the house as it is a single story brick home.	1
I only rent the unit	1
I'm not God	1
Influence govt departments to make the changes necessary	1
It's a community housing house so not up to me to make the changes	1
lack of resources	1
Let water out of the dam before the wet season.	1
Living in flood prone area. Looking at building a levy around house to protect from future events	1
location	1
money physical ability property is built on a slab and unable to put on stumps	1
new 3 month old duplex that did not flood in 2008. Do no or have not been advised of any changes that could be made.	1
none	1
Not being home or able to get home if floods again to put contents up out of water	1
not my property	1
Not my property	1
Not owning the property	1
Not required	1
Nothing	1
Nothing at my home - unnecessary. Financial constraints at business.	1
Nothing it's up to Mother Nature	1
Nothing we can do on a personal level. Something needs to be done by sunwater	1
Our home is a brick slab so we couldn't afford to raise it.	1
OUR home is built on concrete slab and therefore unable to raise Home is timber framed so any so called waterproof material would be useless	1
Our location of the property / land on which house is built	1
Part of the living area on a concrete slab	1
Property backs directly onto council drain and land	1
Q Build own the building (government)	1
Rental property	1
Rented property. Up to owners of the house	1
She'll be right. Have to be big flood	1

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Sunwater could release more water out of dam in wet season. IT stores x Sydney harbour. Losing 50% could help catch some flood water	1
The area in which our house is situated doesn't really give us much of a chance	1
The brick house we rent is low set on a slab. Sandbagging is a waste of time and energy. Water still came in through the brickwork.	1
The cost to lift raise the house up. Unlikely chance of a flood as big as the one we just got. Council making changes in the flood plain to get the water through the railway line	1
The cost, at this point, is the main factor but also just completed major renovations to house 1 week prior to floods and just not ready to have all the disruption again. I was 36 weeks pregnant in the floods so I have a baby which is another limiting factor. Also need to consider the value of our property and whether sinking more money into it is a viable option.	1
This is the way the water comes. We are nowhere near the river but the water follows storm water drains and old water courses to reach our area. Our home is on a concrete slab and is unable to be lifted.	1
Town drainage problems need to be resolved	1
town is built on a floodplain	1
Vote in a new mayor Emerald was built on a flood plain	1
We cannot take any more measure, as we flood from storm water drains not directly from the river.	1
We had made changes from 2008 flood and implemented them in 2010/2011 but the capacity of water was unbelievable.	1
We rent	1

Table E6. What do you think, if any, are main factors that encourage you to make changes to reduce the impact of future flood to your home / property?

	Frequency
- subsidies	1
2010/2011 flood as impacted on us majorly but we have design many things for ""WHAT IF OR WHEN IT HAPPENS AGAIN	1
Build gardens around house	1
cannot change any factors	1
Children and assets	1
Did not enter house	1
Even though we now have insurance the inconvenience and stress caused by having our house flooded is main factor to reduce flood impact. My husband has a plan to sand bag and pump the water out as it enters the sand bag area. Bags and pump have been purchased. Have a plan how to get sand as a flood approaches in the future.	1
financially out of my ability, cost	2
Flood wall up already	1
history	1
I really don't want to go through it again - twice is enough! We were eligible for a small grant through the Dept of Community which enabled me to get a new kitchen so that inspires me to repair other damaged parts of the house - at my own cost.	1
If she flooded, Possibility of being flooded	2
Impact and cost of damage	1
in case of reoccurring floods	1
Inconvenience	1
Location of the property	1
Make council build levee banks to discourage water leaving river	1
More alert Do a lot more earlier	1
No point. With the water levels in this street there is nothing that can be done to this property.	1
None	2
not allowed to do anything	1
Not Applicable	1
Not my home, not my property	2

Our financial status	1
Peace of mind. To save my assets	1
Personal motivation	1
Possibly build a 3 sided concrete wall around the house and then be able to sand bag the front.	1
Protect belongings	1
reducing property damage	1
The council should stop people changing natural water courses	1
The fact that it could happen again. We at least now know at what height our house will flood	1
The financial loss to us was extreme. 25 years worth of belongings... Gone..... Just like that! It has also been very stressful on an emotional level..... But once again..... It is all beyond our control.	1
The pain and heart ache that the floods have caused are a driving factor	1
To get advice, but from where?	1
To reduce stress and work involved in cleaning up. Time involved in preparing contents claim.	1
Up to owners	1
We took as much precaution after 2008 as possible	1
We will move all our stuff out next time	1
We will sandbag and erect temp flood fences to try to lessen height of water. This was unsuccessful this time due to the height of the water. We have to evacuate prior to water reaching our area and accurate flood heights are not available.	1
would move more items from sheds, houses if had chance	1

Table E7. What are the three main things you think can be done from a council perspective to help reduce your risk from future flood?

	Frequency
- build town levee - remove major wall at train bridge to stop backup of flood water	1
- Divert water course around town with levees - Knowledge of heights of water - not guess work -	1
More regular updates	
- Improve drainage system through town - Stop developments in flood prone areas - Release water from dam on regular basis	1
- Keep watch on major weather patterns - Keep dam at safe levels - Keep heavy silt out of cultivate catchment pipes clear - get council to survey land levels better, understand drains don't run up hill	1
- Lower dam level or raise capacity, i.e. height of dam wall - channel excess overflow around town	1
- Make people build according to flood level heights recorded - Don't approve buildings to be built in flood prone areas - Not allow walls and barriers to be positioned only makes water levels go higher on neighbours	1
- Manage water reserves in dam - Diversion drain around town - Build wall around dam (practicability)	1
- Management of the dam and spillway - Early warning and systems (begin December when council was having meetings to advise the community)	1
- releasing water from dam? - upgrade draining throughout town	1
- Resolved drainage problems with Emerald - Drop levels in Fairbairn Dam prior to wet season	1
1 - keep people better informed. 2 - listen to the locals (and property owners) who live on the river. Listen to the warning from them if they say its going to be a big flood, history has shown us that its true. 3 – don't lie and underestimate the seriousness of the event.	1
1. Give out accurate flood height information as soon as possible. 2. Provide more sandbags. 3. Maintain drains and channels to enable faster flowing water and lessen number of new developments in the area that build their land up causing water displacement.	1
1. Dam should never be allowed to go over 75% 2. Redirect the water 3. Ensure new builds are not built in flood zones, and are built above 2010/11 floods by law	1
1. Let more water out prior to continual heavy rain in catchments 2. Keep flood / drains maintained more regularly 3. Stop further development that hinders water flow	1
1. Listen to locals who know our area and their early warnings re flood coming 2. Stop development in known flood areas 3. Railway line (western) from station past ""Tyson Rd"" needs more pipes so water can flow instead of backing up and ""blowing out"" flooding us	1

1. Review water release strategy from Fairburn Dam	1
2. Improve drainage system behind my property	1
3. Investigate option of increasing dam holding capacity	
1. Stop approving development on flood plains.	1
2. If you are not going to listen to point 1.... At least only approve high set housing on flood plains.	1
3. Release dam water sooner. If there's so much water that there's going to be a flood..... Clearly keeping water in the dams for future use, is a stupid idea.	1
Address issues at the root of the problem. The dam spillway.	1
Better drain	1
Better drain management and planning. Clean up the drains. They were blocked. Widen and deepen the river. Ensure that the water is able to flow from one end of the town through to the other end. Those silly small drain pipes under the railway line did not allow the water to flow. Levies are being built. Has anyone stopped to check whether this will have an impact on the flow of the water. Better town planning. Building allowed in Blue Gums when it went under water in 2009. Should have changed the structure of the homes. High set.	1
Better drainage in the worst hit areas. Not allow housing to be built in flood affected areas.	1
better drainage, do not allow building in flood known areas, up grade roads.	1
better planning and approval processes of new developments to above flood levels. better design of structures in flood prone locations.	1
Better town drainage Stop developing in known flood areas Clear out obstructions in and around the Nogoa River	1
Build all housing on high stumps Tell new builders / owners of flood levels	1
build gates in front of the spill way of the dam to control the release of water in our wet season, therefore having none to little flooding if a big wet season ever happens again like 2010/2011.	1
There are only about two dams in Qld that don't have these gates and one of them is ours, if the Qld Government can spend millions improving Brisbane's roads/airport roads etc, then they can spend some millions in building gates to protect our Town and surrounding areas, as there is a lot of revenue made here in Central Qld and we should benefit from it.	1
Clean flood channels out to let the water get away quicker	1
clean our drains & river system manage dam levels more accurately	1
Clean out and enlarge the drain in Nth Emerald (L1N1) Create a diversion channel from Western Highway to drain further north of Emerald. Work with Sunwater to build another spillway Eastern side of Fairbairn Dam.	1
clean the river of silt	1
Clear drains Let out water from dam throughout the year Don't allow building in flood prone areas	1
correct road / rail construction - flood ways	1
Council are not god and can't stop a flood	1
Don't know, can anything be done about the river banks?	1
Ensure adequate drainage	1
Ensure waterways remain perfectly clear	1
fix drainage. Make people run their water to the road front not through neighbours. Provide sandbags and help people who need help to put them out - they are very heavy especially if you are aged or have a disability, not me but for others.	1
flood gates releasing water prior to wet season more SES support	1
Flood gates on fair burn dam Dropping level of dam due to forecasts Better monitoring and gathering of rain fall and river flows	1
gates on the dam to reduce water. fix ln1 drain.	1
I live right near the river - I guess if there is going to be a flood we will always be in the front line. I have heard people say that the river could do with dredging out as it is full of debris and that would enable better flow in times of flooding.	1
I think emerald council did a great job Thanks guys.	1
I thought they did what they could for us all Same as 2011 (???-DB)	1
If possible lower dam level in a year of known possible large rain fall. If possible divert some of the water into other water ways between dam and town.	1
Improve ability for water to follow its natural course from southern side of rail line to the	1

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northern side		
Improve town storm water drainage	Maintain existing flood channels, and levee banks	Careful
Fairbairn dam water management		1
Inform residence with factual information	We made a conscious decision to lift items by 1 metre above 2008 flood. Council should make recommendations to residence	A lot of people didn't realise they were in a flood area until they were asked to relocate from their homes, they had minimal time to move contents.
keep drain clear, raise drain walls, raise curb heights, add some kind of drainage facility to dam or bypass (flood gates).		1
Keep drainage clear	enlarge drains to allow water to escape	raise small bridge on highway
towards Capella	Put in large pipes	1
keep drains clear. They can't control mother nature		1
Keep the drain near our home free of debris. I don't think there is anything that the council could have done to reduce flood of the magnitude of the 1011 flood		1
Let more water out of the dam when there has been big rain fall in the catchment area	maintain drain system ,early warning system, ability to release water from dam	1
Make changes to the railway line to get water away from the southern end of town for example widen the area in under the main railway bridge and the second railway bridge on the western line. Keep drains clear		1
Manage dam levels e.g. reduce level in wet season	Levee banks divert water from town	1
mapping communication	not planning or approving developments in flood prone areas	1
More evacuation or food supply areas.		1
move the industrial estate	create a drain that moves away from our houses- to the northern end	1
of the industrial estate	liaise with Sun Water effectively about L1N1 Drain	Maintain and install larger pipes and change direction of water flow off
We are a long way from the river and were decimated as the water could not drain away		1
N/A		1
No, they did a brilliant job		1
Not have the dam at full capacity		1
Not sure		1
Nothing, as the dam is Sunwaters responsibility.		1
Open flood plain out to reduce blockages in low lying areas	Ensure future restrictions on flood plan developments	1
Release water through Selma and Weemah channels		1
preparation awareness		1
Raise walls of irrigation drain	Dredge under bridges	Issue earlier warnings
Reduce the amount of water in the Fairburn dam in summer months when rain is about	reduce the aount of water in Fairburn dam in summer months	1
Stop blokes building houses in the creek		1
stop building up the flood plains		1
To put more sand/sandbags in areas that get flooded first. Not in areas that don't get any flood water!		1
To stop farmers building dams in flood plains	Open the river back up by putting the rail bridge back to how it was first built	1
Wider drainage , and cleaning up and widening of the LN1 Drain		1

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Table E8. What are the three main things you think can be done from an emergency services (e.g. SES) perspective to help reduce your risk from future flood?

	Frequency
- Have good accurate knowledge - resource availability - boats etc - have good training	1
- Keep people informed	1
- Provide more sand and bags for sandbagging around house - Provide more plastic to help put a barrier up around house	1
- Target high risk areas - Communication - Volunteer drive	1
- they did well	1
levee bank, Early warning ,make shift barricades for river.	1

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?	1
1. Clear information on sandbags, etc. 2. Evacuate earlier 3. Allocate safety places, don't leave it to residents to find where to go	1
1. Continue sms earlier to allow better preparations 2. More shelter points for pets AFTER or during evacuations 3. They already do a wonderful job	1
1. Helping with sand bags.	1
Advise us all earlier if they can but I do think they did what they could have	1
are not god and can't stop a flood	1
Better evacuation plan for residents	1
Communication Earlier use of SES Call in Army	1
communications and notifications	1
Consult with locals in flood prone areas for an action plan	1
direct water, try to have dams and creeks low before the wet season - not sure how to do that??	1
Don't evacuate us too early....so enabling us more time to prepare.	1
don't know	1
don't rely as much on River ""data"" etc, follow common sense & expect ""worse case"" i.e.	1
2008 flood was end of drought, Dam was nearly empty, catchments dry & rainfall approx	
300-350mm , 2010 flood was after 2 good wets, dam was full or close to & rainfall 200+mm.	
Logic would say that flooding in 2010 would be much worse!	
Earlier warning More personnel	1
Educate yourself about how, where and why	1
Enable people to return to houses / homes sooner Had assistance hotline in place to help those who need assistance to move Otherwise they were EXCELLENT	1
Give me a longer warning of might be flood level	1
Government re-equip volunteer emergency services with more modern and greater quantity of equipment. They themselves do an enormous job already.	1
Have an earlier warning of estimated river height ie river gauges on other major water ways above the dam and more gauges on river.	1
I don't think there is anything that the SES could have done to reduce flood of the magnitude of the 1011 flood	1
I was happy with all the people I came in contact with	1
More accurate warnings assist elderly people to shift and raise furnishings prior to flood	1
More help sand bagging and move thing out of areas that go under first	1
more sandbags	1
More workers to allow shift changes and breaks. As well as more equipment for them to do their job. One rescue boat for the whole of Central Highlands does not work when 85% of the area is under flood and they cannot move between areas.	1
N/A	1
Nil	2
None.	1
Not sure	1
nothing	1
Nothing	3
Nothing - all being done and adequate	1
Nothing ~ adequate	1
Nothing. i think they do all they can.	1
Provision of containers and transport to move belongings sand bagging was a waste of time	1
better communication with outlying properties in the catchment listen to the local people who have an integrated community and communication	
Put pressure on council for dam level reduction (wet season). Levee banks	1
Radio, TV and internet up to date for our area on an hourly time	1
SES acted perfectly	1
SES and council did a good job Information flow and texts were 100% on 2008 floods	1
SES need better people doing the job the lady we dealt with was rude and thought she was king of the SES	1

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SES were amazing!	1
Sorry I think they can't do much more than they did	1
these organisations including council did an amazing job, you can't legislate for stupid people who bury their heads in the sand and don't prepare.	1
They were good. Doing the best they could. More sandbags available Big piles of sand, more machines needed.	1
This one is a little more difficult as emergency services tend to be called in to assist once an emergency has already happened. In Emerald they worked hard to assist with evacuation and warning tenants and home owners, and then assisted with the clean up.... Perhaps there could be a store of sandbags so that distribution could be carried out more quickly and to more homes.	1
More availability of large heavy duty tarps for tenants and home owners. Apart from that, I'm not sure.	
What can you do, you can't control Mother Nature and you can't stop the water from entering your home. Just be prepared to evacuate before the water reaches your home.	1

Table E9. Overall, what do you think are the three best measures or strategies to help reduce your risk from future flood?

Frequency
- be prepared - learn from past floods and history - don't stress it is nature
- early warning systems - risk cannot be reduced from a natural disaster but its how information is communicated that is the most important
- Have complete contents removed from Home. - Council to develop some flood proofing or reducing measures - Sunwater to develop flood mitigation measures.
- Improve drainage system through town - Stop developments in flood prone areas - Release water from dam on regular basis
- Lift building - Flood proof as much as possible - Awareness
- Move house
- remove wall - allow water to be released from dam and manage the dam
- Resolve drainage problems with Emerald - Drop levels in Fairbairn Dam prior to wet season
1 - monitoring river heights and rainfall 2 - listening to locals along the Nogoa
1 left more water out 2 more help for people that are flooded remember one side of town is cut from everyone else
1. Better town planning in low lying areas. 2. More high set housing (especially government housing for low income earning families) 3. Better forecasting of river levels, and potential flood levels.
1. Build fence around home - unlikely 2. Increase dam capacity - operate at lower level 3. Plan in place to reduce financial impact
1. Dam water management 2. Flood plan for property 3. Maintain insurance policy
1. Listen to locals who know our area and their early warnings re flood coming 2. Stop development in known flood areas 3. Railway line (western) from station past ""Tyson Rd"" needs more pipes so water can flow instead of backing up and ""blowing out"" flooding us
1. Prayer 2. Know that there are some things you can do anything about so worrying isn't going to help 3. Move as much contents up as high as possible
Ask Mother Nature to rain where it's so dry not wet to reduce future flooding ""No I'm not sick Awareness
Be prepared, evacuation plans and food supplies
Because it was so high I doubt anything could have been done. The Emerald council kept us informed but there was nothing else to be done.
Build flood gates on dam Release water at 75% Redirect the water
Clean out the river and let water out of dam before flooding Stop the mines blocking water courses down stream
communication
Consider controlling the water out of the Fairbairn dam by creating an additional spill way out the back of the dam or something to slow the flow of water out of the current spillway.
Could build levee around home

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dam water management	1
Don't waste time and energy sandbagging. We needed somewhere high and dry to store our household effects. Our daughter is still not in her home and our garage is now full of her furniture. The rest of her household effects are spread out all over the town.	1
Drop the water level in Fairburn Dam	1
Earlier warning with river height estimation so can sand bag in time. Divert some water from the Nogoa river above the town reduce the dam level in wet years if possible	1
Ensure property drains away correctly. Any water flow entry points can be diverted if possible.	1
Ensure flood plan current.	
fix up railway crossing west of town!!	1
household mitigation strategies prior to going away during wet season	1
I can't reduce my risk, only others can do that	1
Inform, communicate, ensure residents are aware of the potential inundation to expect with as much notice as possible.	1
infrastructure - rail / road access	1
Let some more water out of the dam.	1
Levee banks Dam levels (wet season) Concrete storm water drains, flood drains etc	1
Live on high ground	1
look after yourself don't rely on anyone to protect your property.	1
Maintenance of water ways such as drains, channels and rivers. Perhaps controlling water flow from dam prior to the wet season beginning. being totally open with expected river heights so proper planning can be done.	1
Management of water level Diversion of water Council to ensure build permit in flood free area	1
Move out of the town. Don't listen to council who kept saying that certain areas wouldn't flood.	1
Move the water run off to the north allow the water to flow freely and drain away widen, deepen L1N1 drain	1
Move to a safe location	1
Move to higher ground	1
N/A	1
N/A not impacted	1
not much I can do about it	1
Not sure	1
Nothing really we can do	1
Preparedness - basic kits water Evacuation plan Identify a safe place to move to during flood event	1
Raise our house even higher Flood proof as much of our property as possible - using building materials that can withstand the flooding etc.. As flooding is inevitable for where we live - have adequate insurance	1
Raise walls of irrigation drain Early warnings Temporary flood barriers around home	1
Raising the home, good electricity and phone lines and good road drains.	1
Reduce water level in Fairburn dam	1
Reduce water level in Fairburn dam in summer	1
Relocate to higher ground, outside the Nogoa flood area Relocate to another town or area outside the Nogoa flood area Assistance for people in flood prone areas to relocate	1
smart home planning smart council planning	1
Stupid question? If it rains it will	1
Text message Warning on radio, T.V. and door to door	1
Text messages warning you of what's happening. More products to protect your house / rental	1
They need a way to manage the water flow in a flood event, the reason the 2010/11 flood was so much more severe than '08 was because of all the residential building that happened in those 2 years, a lot of that area was water flow area in 08, but now it's all been built up for subdivisions. The water has to find an alternate route.	1
Use common sense rather than relying 100% on data Fairbairn dam doesn't have flood gates, flooding peaked in Emerald (2008 & 2010) days after the rainfall was received . maintenance of drains & raise heights of drains & road curbs	1

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