Children's knowledge of vulnerability and resilience to bushfires

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I would have been about 12 or 13 years old when it happened. There was no warning. When we looked out our door, the sky was red and there were embers everywhere. It was just the most amazing thing I'd ever seen. We just looked out with this awe. My Mum and I went off in our car. We were intending to go to the Macedon Family Hotel but we didn't leave until about half ten or later and by that stage it was well and truly on us. In the end, we couldn't see where we were going at all because the smoke was so thick and we were driving into trees. We somehow got into somebody's backyard: we drove straight into their pond, nose first into it. It was quite deep and we just stayed there, in the car, in this sludge, down the bottom of the pond. I was like, "Right, that's it! I'm out of this car! I'm leaving and you're coming with me!" Mum had to try very hard to make me sit there and not move: she said "No, you cannot do that. We have to stay in the car. It's safer in the car. You must stay in the car". But I didn't know that as a 13 year old. All I could see was that I wanted to leave. We had some bedding inside our car, so we took the doona out of the car, we wet it and we put it over the car and sat inside and then, when it dried off, we got out again and wet it again and we stayed in the car. I guess that's what saved us from the radiant heat. I think as the hours went on, Mum started to panic a bit more because we were watching this fire go around us. We had a shed near us and things were exploding in the shed as they were catching on fire and there was a huge tree near us that was on fire and we were worried we were going to get flattened by this tree and so I said to Mum, "C'mon, we'll put the radio on. We'll listen to this". So, in a way, I think we kind of helped each other to keep it together.

- Mother and Ash Wednesday survivor (Macedon, 2009)

Declaration of Originality

This thesis contains no material which has been accepted for a degree or diploma by the University or any other institution, except by way of background information and duly acknowledged in the thesis, and to the best of my knowledge and belief no material previously published or written by another person except where due acknowledgement is made in the text of the thesis, nor does the thesis contain any material that infringes copyright.

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The research associated with this thesis abides by the international and Australian codes on human and animal experimentation, the guidelines by the Australian Government's Office of the Gene Regulator and the rulings of the Safety, Ethics, and Institutional Biosafety Committees of the University.

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Briony Clare Towers
31st May, 2012

ABSTRACT

Following the Black Saturday bushfire disaster in 2009, the Victorian Bushfires Royal Commission strongly recommended that bushfire education be incorporated in the national school curriculum. This recommendation, and its adoption by state governments around Australia, represents a unique opportunity to address the long neglected area of bushfire education for children. However, an extensive literature argues that the success of any hazards education program depends on the degree to which it accommodates the existing knowledge and perspectives of the learner. Yet, to date, there has been no research on children's knowledge of bushfire hazards and disasters or the actions that can be taken to mitigate or prevent their impacts.

To address this research gap, this thesis presents a detailed analysis and theoretical rendering of children's knowledge of bushfire hazards in south-eastern Australia, as studied from children's own perspectives. A constructivist grounded theory methodology and child-centred qualitative research techniques, such as focus groups, drawing and puppet play, were employed to examine children's knowledge of the conditions and processes that cause bushfire hazards and disasters and the conditions and processes that mitigate or prevent them. The role of environmental and socio-cultural context in the development of children's hazards knowledge was also examined in-depth.

The analyses of children's knowledge and perspectives culminated in the development of a substantive grounded theory titled Seeking Adaptation. The theory is comprised of three major components: the problem of perceiving vulnerability; the process of building resilience; and a set of contextual and modifying conditions which include direct experience with fire, the school, the family, and the research process itself. The theory of Seeking Adaptation identifies children as active participants in bushfire management who have the potential to make substantial contributions to household and community resilience. However, capitalising on this potential will require education programs that accommodate their perspectives and provide ample opportunities for genuine and purposeful engagement with the physical and social world.

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This thesis is dedicated to the children who lost their lives
on Black Saturday, February 7th, 2009.

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One cannot expect positive results from an educational programme which

fails to respect the particular view of the world held by the people.

- Paulo Freire (1970, 95)

1.1   Introduction

On Friday the 6th of February 2009, Premier John Brumby instructed Victorians to cancel their plans for the following day and take whatever steps necessary to prepare for what he believed was going to be 'the worst day in the history of the State' (Moncrief, 2009). With forecast temperatures in the mid to high 40s and wind speeds in excess of 100km/h, weather conditions were going to be worse than those that accompanied the devastating bushfires[1] of both Black Friday in 1939 and Ash Wednesday in 1983 (Karoly, 2009). By mid-afternoon on the following day, hot north-westerly winds were blowing at 125km/h, temperatures had peaked at 46.4˚C, several large fires had jumped their containment lines, and for a number of communities around the state, disaster was imminent. By that evening, bushfires of an unprecedented intensity had killed 173 people (including 23 children) and destroyed 2,133 homes (Teague, Macleod & Pascoe, 2010). Not accounting for the intangible costs of lives lost and emotional suffering, the damage bill was estimated at $AU4 billion (Teague et al., 2010).

In the immediate aftermath of what is now commonly referred to as 'Black Saturday', the Victorian Government announced the establishment of the 2009 Victorian Bushfires Royal Commission, which was tasked with conducting a full and detailed investigation of the disaster (Austin, 2009). Over a period of about a year, the Commission heard ample evidence of communities who did not think they would be affected by bushfire and of people whose lack of bushfire knowledge and preparedness had cost them their homes and/or their lives (Teague et al., 2010). In its final report, the Commission explicitly identified bushfire education for children as the most effective means by which to rectify this fundamental lack of knowledge in the community:

> The Commission is of the view that educating children about the history of fire in Australia and about safety in the event of a bushfire will probably influence not only the children but also their parents, siblings and extended family and community. A concerted education program remains the most effective approach to instilling the necessary knowledge in Australian families (Teague et al., 2010, p.55).

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[1] Also known as wildfires, wildland fires or forest fires.

Moreover, the Commission made the official recommendation that bushfire education be made a formal part of the national school curriculum:

> Recommendation 6: Victoria [should] lead an initiative of the Ministerial Council for Education, Early Childhood Development and Youth Affairs to ensure that the national curriculum incorporates the history of bushfire in Australia and that existing curriculum areas, such as geography, science and environmental studies include elements of bushfire education (Teague et al., 2010, p.2).

In making this recommendation, the Commission lamented that despite being made in bushfire commissions and inquiries dating back to 1939, it had never been fully implemented (see Table 1.1).

Table 1.1: Previous recommendations for bushfire education in Australian schools

Report/Inquiry	Recommendation
Report of the Royal Commission (Stretton 1939).	"Probably the best means of prevention and protection is that of education, both of adults and children….It is suggested that in every school (the education of city children is as important as that of country children), fire prevention be made a real part of the curriculum and that the lessons in that behalf be given at the commencement of the summer season" (p.25).
Report of the Bushfire Review Committee (Miller, Carter & Stephens, 1984).	"More emphasis should be placed on programs in schools, particularly because these carry long-term dividends; special briefings should be given to school students prior to the fire season" (p.66).
National Inquiry on Bushfire Mitigation and Management (Ellis, Kanowski & Whelan, 2004).	"State and territory governments and the Australian Government [should] jointly develop and implement national and regionally relevant education programs about bushfire, to be delivered to all Australian children as a basic life skill" (p.xxi).

Nevertheless, by formally adopting Recommendation 6 of the Victorian Bushfires Royal Commission, the Victorian Government has made a solid commitment to delivering bushfire education in its public school system:

> To guard against the risk of growing complacency as memories of the 2009 fires fade, the State is committed to introducing bushfire history and safety into the school curriculum (Victorian Government, 2010, p.6).

This level of commitment to children's bushfire education is unprecedented and provides a valuable opportunity to capitalise on children's increasingly demonstrated, though often overlooked, capacities for reducing the impacts of hazards and disasters on their homes, their schools, and their communities (Anderson, 2005; Benson & Bugge, 2007; Peek, 2008; Haynes, Lassa, & Towers, 2010; Mitchell, Tanner

& Haynes, 2008; Ronan & Johnston, 2005; Wisner, 2006). Importantly, however, the success of any hazards education program depends on the degree to which people's existing knowledge and perspectives on hazards and disasters are accommodated in the education process (Handmer & Dovers, 2007; Haynes, Barclay & Pidgeon, 2008; Perry & Mushkatel, 1986; Wisner, Blaikie, Cannon & Davis, 2004; Twigg, 2004). For several decades, scholars in the hazards field have argued that when education programmes are designed without regard for how different groups conceptualise and experience different hazards, they fail to achieve the kind of learning that facilitates protective action (Handmer, 1985; Handmer & Penning-Rowsell, 1990; Hewitt, 1997; Perry & Mushkatel, 1986; Watts, 1983; Waddell, 1977). Respecting and accommodating the knowledge and experience of the learner is also the central tenet of several foundational theories in developmental psychology and education (Bruner, 1977, 1986, 1996; Donaldson, 1978; Freire, 1972, 1990; Freire & Freire, 1990; Rogoff, 1990, 2003; Rogoff et al., 1993; Vygotsky, 1962, 1978, 1981, 1998). Thus, accommodating children's perspectives on bushfire hazards and disasters should be viewed as fundamental to the development and delivery of effective school-based bushfire education.

Yet, accommodating children's perspectives in bushfire education is severely hampered by a distinct lack of research on how children conceptualise bushfire hazards and disasters, or hazards and disasters more broadly. Indeed, notwithstanding a growing body of essential research on their post-disaster mental health (cf. Kar, 2009), children have been largely excluded from the hazards and disasters research agenda (Anderson, 2005; Peek, 2008). Anderson (2005) contends that disaster research on children has lagged because of their status in society: children do not set the research agenda; they do not carry out research; and they are not in policy making or relevant professional positions where they might see the need for such research and advocate for it. He argues that this lack of political and professional voice has resulted in a knowledge base so thin that studies relating to children are needed across the entire hazards and disasters spectrum - from prevention, mitigation and preparedness through to response and recovery.

In recognition of the need for a deeper understanding of how children conceptualise bushfire hazards and disasters, as well as the need for research on children and disasters at a more general level, this thesis presents a substantive theory of bushfire hazards and disasters as conceived by children in one of the most bushfire prone regions in the world. In doing so, the thesis represents a starting point for the development and delivery of bushfire education programmes that fulfil the fundamental requirement of accommodating and capitalising on children's ways of knowing. It also shines a light on children's frequently overlooked capacities for reducing bushfire risk in their homes, schools, and communities.

This chapter provides a brief introduction to the value and importance of children's hazards education. It then offers a more detailed rationale for understanding children's existing knowledge of bushfire hazards and disasters and identifies the absence of research in this area as a major gap. The chapter concludes with a statement of research aims, an overview of major findings, and an outline of thesis structure.

1.2 The need for children's bushfire education

Each new generation must be properly prepared for living in an environment that is hazardous. Engendering in school children an understanding of bushfire and the attendant risks should be seen to be as important as ensuring that all Australian children learn to swim.

- Teague et al. (2010, p.54)

As Wisner and colleagues (2004) argue, public education, knowledge and awareness are critical to building capacities for reducing the impacts of extreme hazard events when they do inevitably occur. Handmer and Penning-Rowsell (1990) agree that knowledge and awareness of hazards and disasters, followed by informed action, is a fundamental requirement for reducing vulnerability and developing resilient households and communities. Public education for natural hazards is also strongly advocated by the United Nations International Strategy for Disaster Reduction (UNISDR), which states that 'disasters can be substantially reduced if people are well informed and motivated towards a culture of disaster prevention and resilience' (UN-ISDR, 2005a, p.9).

The need to educate communities about local hazards can be found in most national hazard and disaster management plans (Wisner et al., 2004), including those developed by Australian fire agencies (AFAC, 2010; Handmer & Haynes, 2008). Historically, however, disaster managers and policy makers have rarely identified children's education or participation as a key priority (Tanner, 2010; Mitchell, Tanner & Haynes, 2009). Even the Victorian Bushfires Royal Commission, which explicitly recognised the importance of bushfire education for children, failed to make it a priority in the Commission hearings, stating that, 'the time constraints the Commission faced meant that little evidence was presented on fire education in schools' (Teague et al., 2010, p.54). Amongst the limited evidence that was presented, was a report from the Australian Curriculum, Assessment and Reporting Authority, which definitively stated that:

> Beyond reference to the causes of major natural events in the science curriculum, bushfire is likely to receive minimal attention in the K–10 Australian curriculum that is at present under development (cited in Teague et al., 2010, p.54).

The lack of bushfire education in Australian schools reflects a broader lack of hazards education for children internationally. Notwithstanding the comprehensive programmes developed by the American Red Cross (2007) and the New Zealand Department of Civil Defence (2009), investment in children's hazards education has generally been limited to the standard inclusion of child-oriented games and basic resources on emergency management websites (Gill, Gulsvig, & Peek, 2008). Moreover, with only a few notable exceptions, hazards education is yet to be incorporated into the national curricula of most nations, including Australia (Wisner, 2006). It could be fairly argued then, that compared with levels of investment in adult-centred hazards education, children represent a highly marginalised and under resourced group.

However, the typically low level of resourcing for children's hazards education is highly disproportionate to their well-documented vulnerability to the impacts of hazards and disasters: along with women, the elderly, the disabled, and ethnic minorities, children are commonly identified as one of the most vulnerable demographic groups (Cutter, 1996; Hewitt, 1997; Peek, 2008; Wisner, et al., 2004). Whilst analyses detailing the precise nature and extent of this vulnerability are lacking (Anderson, 2005; Peek, 2008; Seballos, Tanner, Tarazona & Gallegos, 2011), an accumulating literature suggests that children are disproportionately affected by both the physical and psycho-social impacts of disasters (Ikeda, 1995; La Greca, Silverman, Vernberg & Roberts, 2002; Madalakas, Torjesen, & Olness, 1999; Nishikiori et al., 2006; Norris et al., 2002; Penrose & Tataki, 2006; Pynoos et al., 1993; Vogel & Vernberg, 1993), including those precipitated by bushfire hazards (Valent, 1984; Clayer, Bookless-Pratz & McFarlane, 1985; McDermott & Palmer, 1999; McDermott, Lee, Judd & Gibbon, 2005; McFarlane, 1987; McFarlane, Policansky, Irwin, 1987; Yelland et al., 2010)[2]. A key strategy for reducing this vulnerability involves providing children with the requisite knowledge for mitigating and preventing their exposure to natural hazards and for responding effectively when extreme events do occur (Handmer & Penning-Rowsell, 1990; Twigg, 2004; Wisner, 2006; Wisner et al., 2004).

Recognising that it is often the most vulnerable who are the least likely to receive adequate resources for information and education, the UN-ISDR (2005a) strongly promotes equal access to appropriate training and educational opportunities for women and other vulnerable constituencies, including children:

> The inclusion of disaster risk reduction knowledge in relevant sections of school curricula at all levels and the use of other formal and informal channels to reach youth and children with information (p. 10).

Thus, by adopting Recommendation 6 of the Victorian Bushfires Royal Commission, the Victorian Government has aligned current policy with the international standards promoted by the UN-ISDR. Moreover, the Australian Government (2010) and fire agencies in other high bushfire risk states (Montoya, 2010) have also renewed their commitment to improving the development and delivery of bushfire education for children. This level of commitment to bushfire education is to be commended. However, as several authors have argued, hazards education should not be viewed as optional because access to knowledge and information about hazards and disasters is intrinsic to children's basic rights (Mitchell, Tanner & Haynes, 2009; Haynes, Lassa & Towers, 2010).

1.3   Children's rights to bushfire education

In light of children's heightened vulnerability to disaster impacts, several advocates of children's hazards education have drawn on the international child rights literature and architecture to argue that current legal frameworks support children's rights to hazards education (Mitchell et al., 2009; Benson & Bugge,

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[2] For a more detailed review of the psycho-social and physical impacts of disasters on children, see Appendix 1.1

2007; Haynes et al., 2010; Nikku et al., 2006). The main legally-binding international instrument that deals specifically with children's rights is the Convention of the Rights of the Child (CRC) (United Nations High Commissioner for Human Rights, 1989). Built on varied legal systems and cultural traditions, the CRC is a near-universally ratified set of standards and obligations that set minimum entitlements and freedoms that should be respected by its signatory governments, of which Australia is one (United Nations High Commissioner for Human Rights, 1989). By agreeing to undertake the obligations of the CRC, the Australian Government has committed itself to 'protecting and ensuring children's rights and is obliged to develop and undertake all actions and policies in the light of the best interests of the child' (United Nations High Commissioner for Human Rights, 1989).

Traditionally, the CRC has predominantly been applied to the protection of children's rights in political, legal, and community development contexts. However, as Mitchell et al. (2008) point out, it also deals with matters of particular relevance to children's rights to protection from hazards and disasters. For example, Article 3 of the CRC requires signatory states to 'ensure the child such protection and care as necessary for his or her well-being…and to this end should take all appropriate legislative and administrative measures'. As noted earlier, the experience of disaster can affect children in a way that severely undermines their physical and psycho-social well-being. As such, signatory states are required to take all appropriate measures to ensure their protection from extreme natural events and to provide adequate relief when a disaster does occur. There are also provisions in the CRC that protect a child's right to access information about hazards and disasters. Article 13.1, for instance, relates to a child's right to freedom of expression which includes 'the right to seek, receive, and impart information and ideas of all kinds, regardless of frontiers, either orally, in writing or in print, in the form of art, or through any other media of the child's choice'. Additionally, Article 12.1 requires that signatory states will 'assure to the child who is capable of forming his or her own views the right to express those views freely in all matters affecting the child, the views of the child being given due weight in accordance with the age and maturity of the child'. Thus, the CRC not only assures a child's right to protection from disaster by requiring that signatory states take all necessary steps to mitigate or prevent natural hazards and disasters, it also assures a child's right to access information regarding hazards and disasters and to participate in disaster related decision-making that affects them.

As Archard (2009) points out, however, signatory states often pay little more than lip service to the CRC, because they are only required to take these measures 'to the maximum extent of their available resources' (United Nations High Commissioner for Human Rights, 1989). It is by way of this clause that children's rights to hazards education and participation in disaster risk reduction might be undermined because governments can use the excuse that they do not have the resources necessary to comply with the rights stipulated in the CRC (Mitchell et al., 2009). However, there is increasing evidence that children have a unique capacity for reducing disaster risk in their homes, their schools and their communities (Bensen & Bugge, 2007; Haynes et al., 2010; Mitchell et al., 2009; Nikku et al., 2007). Given that

disasters represent one of the biggest threats to both economic and human development (Twigg, 2004; Baez, de la Fuente & Santos, 2010), governments have much to gain by assuring a child's right to both learn about and participate in disaster risk reduction.

1.4   Recognising children's agency

Children really have a heart to help. Adults may want to do it themselves; they may think we don't have the capacity – that we can't do it. But actually, if given a chance and some guiding directions, we children can do anything.

- Thai child (cited in Benson & Bugge, 2007, 8).

On Boxing Day 2004, 10-year-old English schoolgirl Tilly Smith was holidaying with her family at Maikhoa Beach on the island of Phuket. As she played with her younger sister by the shore, she noticed that on the surface of the water 'was the exact same froth, like you get on a beer' (UN-ISDR, 2006). Just two weeks earlier, back in England, her geography teacher had taught her that this is an early warning sign for a tsunami. Realising what was happening, Tilly tried to warn parents, but they didn't know what a tsunami was and quickly dismissed her concerns. However, Tilly persisted and eventually convinced her father to tell the resort staff, who disseminated a warning that enabled over one hundred people to evacuate to higher ground before the first wave hit. Tilly's resort on Maikhoa beach was one of the few locations in the disaster affected region with no reported casualties (Owen, 2005; UN-ISDR, 2006).

That same day, on the small Indonesian island of Simelue, 11-year-old Anto Suryanto was playing football on the beach with his friends. When he felt the ground shake beneath his feet, he immediately stopped the game to monitor the tide. In accordance with local traditions, his grandmother had taught him that if the ground shakes and the tide is low, a 'smong' (tsunami) is coming and he must run to higher ground[3]. When he saw the shoreline receding, Anto ran to a nearby hillside and watched on as a 15 metre wave consumed his village (UN-ISDR, 2005b). Although most of the homes, schools, and basic infrastructure on Simelue were destroyed, all but seven of the 78,128 residents survived (United Nations Information Management Service, 2005). By way of comparison, the death toll in the neighbouring mainland province of Aceh exceeded 163,000 (UN-ISDR, 2005c). When McAdoo and colleagues (2006) interviewed the survivors on Simelue, each of them described how their grandparents had taught them about the smong, just as Anto's grandmother had taught him.

In the weeks and months that followed the Boxing Day tsunami, the stories of Tilly and Anto were covered widely by the international media (Owen, 2005; Randall & Berger, 2005; UNESCO, 2006) and both children received extensive praise from the UN-ISDR for their actions on the day (UN-ISDR, 2005b; UN-ISDR, 2006). Whilst Tilly and Anto might be the most widely recognised agents of what is now

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[3] In 1907, a powerful earthquake and tsunami struck the Indonesian island of Simelue, killing up to 70 percent of the population (McAdoo, 2006). Since then, there has been an oral tradition of grandparents teaching their grandchildren about tsunami emergency response through various stories and songs (McAdoo, 2006).

commonly referred to as 'child-led disaster risk reduction', they are not the only ones. As Anderson (2005, p.168) has argued,

> Children and youths are not just passive in the face of disasters. They are not merely victims and dependent observers of the scene, having everything done for them both before and after an event. Even though lacking the authority of adults, children and adolescent youths can still take certain protective actions.

In support of this statement, an increasing number of anecdotal field reports (Benson & Bugge, 2007; Mitchell et al*.,* 2008; Nikku et al., 2006; Save the Children, 2006; Vanaspong, Ratanachena, & Rattanaphan, 2007) and action research studies (Mitchell et al., 2008; Haynes, Lassa, & Towers, 2010) are providing powerful evidence that when children have the requisite knowledge and understanding, they exert agency across all phases of the disaster reduction cycle from basic preparedness and response through to mitigation and prevention.

In a recent review of child-led disaster risk reduction programmes in South America and the Philippines, Mitchell et al. (2009) provide several compelling examples which challenge the standard characterisation of children as passive victims of disasters. In the Phillipino village of Santa Paz, for instance, the Mines and Geosciences Bureau (MGB) identified the local school as being highly exposed to landslide hazards and recommended that it be relocated to a safer location in a neighbouring village. Although the children at the school supported the relocation, many adults in the village were against it: parents were concerned that the children would have to travel further to school; local shop owners were worried about losing the student lunch trade; and some political figures were concerned that some of the political power associated with having a school in the village would be lost. To resolve the disagreement, the headmaster held a community wide referendum in which the children were also granted voting rights. Several adults in the village launched a campaign opposing the relocation, recasting the assessments of the MGB as unreliable and subject to interpretation. In response, the children launched a counter-campaign aimed at educating the community about landslide hazards. The referendum was decided in favour of relocation and many parents acknowledged that their vote had been swayed by the passionate and informed campaigning of their children.

Mitchell and colleagues (2009) provide another exceptional case of child-led disaster risk reduction from Petapa in El Salvador, where the children of the 'Petapa Emergency Committee' identified how everyday littering was blocking waterways, thereby increasing the risk of flooding, disease, and pollution. They subsequently instigated several community wide clean-up campaigns and promoted the adoption of more sustainable waste disposal methods. These children also recognised that the un-regulated quarrying of rocks and sand from the river was exacerbating erosion and increasing the exposure of nearby houses to floods and landslides: so, they launched a campaign of direct action - blockading roads to the river,

pleading with lorry drivers to consider the impact of their activities on environment and the community, erecting signs warning of the dangers, lobbying parents to speak out on the issue, and encouraging local authorities to enforce regulations against illegal rock extraction. The children succeeded in their efforts and quarrying along high risk stretches of the river bank was stopped.

Anecdotal field reports also suggest that children taking part in Save the Children's child-led disaster risk reduction programs have made significant contributions to minimising disaster risks in their communities (Benson & Bugge, 2007). In Thailand, for example, children have constructed hazard maps detailing tsunami and sea surge risks and presented them to disaster management officials. In one case, the official showed the children his official hazard map which the children then used to improve their own. Importantly, the official also gained something from this exchange. He told program facilitators, "Actually, I'd love to have many groups of kids come, talk, get advice...if they come regularly it'd be good because I've learnt from *them*" (Benson & Bugge, 2007, p.35, emphasis added). In India, children have been trained on media usage for effective information dissemination and are delivering lectures, plays, and songs they've written via the community radio station. Also in India, the formation of children's clubs have seen older children teaching younger children about various aspects of individual and family preparedness including how to respond to a hazard event, how to make a survival kit, and how to care for vulnerable family members. Meanwhile, in Sri Lanka, children have been given rain gauges to monitor rainfall and are providing the data they collect to the regional disaster management centre to help facilitate early warnings of potential floods.

At a more local level, there is anecdotal evidence of Australian children and young people taking action to reduce disaster risk, particularly in the context of bushfire and flood. In Gippsland in eastern Victoria, for example, four year nine students used their first hand experience of the 2006 bushfires and 2007 floods to develop 'Teenagers in Emergencies', a booklet about disaster preparedness with messages specifically tailored to meet the needs of young people (Bedgood, Foster, Liddell & Montague, 2008). To help tailor their messages, the students surveyed their peers to better understand the current levels of disaster knowledge and experience within their school. They also undertook fundraising and obtained sponsorship from local businesses to pay for printing and distribution (Australian Red Cross, 2011). The Australian Red Cross (2011) has also documented the active roles taken by young people in response to hazard events: they have helped to actively defend their properties from fire, sandbagged valuable assets to protect them from flood, taken care of younger siblings and animals, and provided emotional support to family and friends. Young people have also played an important role in the clean up and reconstruction phases in the aftermath of disasters. Following Black Saturday, for example, young people from the rural town of Benalla in north-eastern Victoria, established their own volunteer youth group that travelled to heavily impacted areas to assist rural landowners fix damaged fences. Many of the young volunteers were from farming properties themselves and had specialised skills that were highly valued by the landowners during the reconstruction process (Bruce, 2010).

Taken together, these local and international child-led initiatives serve to demonstrate that children are not passive victims devoid of agency in the face of hazards and disasters. Rather, when they are afforded the opportunity to learn about hazards and disasters and are instilled with the confidence and motivation to mobilise themselves, they are able to take decisive action to reduce disaster risk, not just within their own households but within the broader community. Despite the accumulating evidence of children's capacities for disaster reduction, however, very little is known about how children understand hazards and disasters on a conceptual level and to date, there have been no in-depth studies of children's knowledge in this domain. Given the importance of accommodating children's knowledge and perspectives in hazards education, this represents a major research gap that must be addressed if education programmes are to lead to the kind of decisive and informed action observed in the examples presented above.

1.5   Studying children's knowledge from their own perspectives

I spent that first day picking holes in paper, then went home in a smouldering temper.
'What's the matter love? Didn't you like it at school then?'
'They never gave me the present.'
'Present? What present?'
'They said they'd give me a present.'
'Well, now, I'm sure they didn't.'
'They did! They said: "You're Laurie Lee, aren't you? Well just you sit there for the present". I sat there all day but I never got it and I ain't goin' back there again.'

- Margaret Donaldson (1978, 17)

Historically, children's knowledge and experience of the world has not ranked highly as a research priority (Christensen & James, 2000; Jenks 1996). Furthermore, the limited research that *has* sought to understand children's knowledge and experience has done so primarily from the perspectives of adults and, in this sense, research has been conducted *on* or *about* children, rather than *with* them (Alderson, 2001; James & Prout, 1990, 2005; Hill, 2005). As a consequence of this adult-centred approach, children have become what anthropologist Charlotte Hardman (1973, p. 85) refers to as a 'muted group'. The dominance of adult voices in the study of children stems from a long held assumption that children are unreliable or incompetent informants of their own knowledge and experience (James & Prout, 2005; Jenks, 1996; Scott, 2008). This has lead to an overreliance on research methodologies and methods that privilege the perspectives of adults, including analyses of proxy information obtained from children's caretakers or other people 'close' to them, adult observations of children's behaviours, and quantitative surveys and controlled experiments investigating variables that are predetermined by adults (Alderson, 2001; Christensen & James, 2000; Hill, 2005; James & Prout, 2005; Jenks 1996; Scott, 2008).

The perils of seeking to understand children's knowledge and experience from an adult-centred perspective were first recognised by the 18th century philosopher Jean-Jacques Rousseau (1957) when he argued that 'childhood has its own way of seeing, thinking and feeling, and nothing is more foolish than to try and substitute ours for theirs' (p.52). Over two centuries later, the foolishness of ignoring children's

perspectives was demonstrated empirically in the pioneering work of Margaret Donaldson and James McGarrigle, who found that when Jean Piaget's classic tests of cognitive ability were transfigured to accommodate children's perspectives and experience, children's manifest competence was dramatically enhanced (Donaldson, 1978; Donaldson & McGarrigle, 1974). It is only in the last decade, however, that the importance of understanding children's own perspectives has entered the mainstream and owing to several cogent critiques, it is now widely accepted amongst scholars of childhood that delimiting the emergence of children's own knowledge and perspectives through the use of adult-centred positivistic methodologies not only creates a false picture of children's knowledge and the meanings that they attribute to things, but serves to underestimate their competence and agency (Boyden, 2008; Donaldson, 1978; Rogoff, 2003; Walkerdine, 1993; Woodhead & Faulkner, 2000).

The emergent recognition of the fundamental importance of understanding children's knowledge and experience from their own perspectives has lead to an increase in the adoption of inductive, hermeneutical and interpretive methodologies that privilege the perspectives of children over those of the researcher and allow for the emergence of alternative viewpoints (James & Prout, 2005; Woodhead & Faulkner, 2000). As Christensen and James (2000, p.7) have argued:

> It is only by listening and hearing what children say and paying attention to ways in which they communicate with us will progress be made towards conducting research with, rather than on, children.

This shift in the approach to studying children's knowledge and experience is complemented by a parallel shift in hazards and disasters research, which has begun to demonstrate the importance of understanding hazards and disasters from the perspectives of the people who experience them as a part of everyday life, as opposed to the perspectives of hazards researchers, policy makers, and emergency managers (Hewitt, 1997; Mercer, 2010; Mercer et al., 2008; Wisner et al., 2004). This emergent approach to studying hazards and disasters also favours the use of inductive, hermeneutical methodologies that privilege the perspectives of participants, the value of which has been described most eloquently by veteran scholar of hazards and disasters, Kenneth Hewitt (1998, p.42):

> To listen, to value, and to try to understand the plight of ordinary people in everyday settings, presupposes a concern with who they are and where their experiences take place. To pay close attention to what they say, their story and their concerns, gives them direct entry into the concepts and discussions of disaster research.

From this discussion, it follows that the best informants of children's knowledge and experience of hazards and disasters are children themselves, and research must seek to employ methodologies that allow children's own ways of looking at the world to emerge from the research process. It is only by adopting such an approach that the foolishness of which Rousseau warned so long ago can be avoided and education programmes can fulfil the fundamental requirement of accommodating children's perspectives.

1.6 The current research

Given the increased commitment to delivering bushfire education in Australian schools and the importance of accommodating children's knowledge and experience in this process, this thesis aims to develop a theory that increases understanding of how children living in south-eastern Australia conceptualise bushfire hazards and disasters. It employs a constructivist grounded theory methodology to examine children's knowledge of the causes of bushfire hazards and disasters (Chapter 4) and the actions that people can take to reduce their impacts (Chapter 5). It also seeks to understand the social contexts in which children develop their knowledge and the factors that both facilitate and constrain their knowledge development (Chapter 6). The thesis then raises the study of children's knowledge of bushfire hazards and disasters to a theoretical level by proposing the substantive grounded theory of 'Seeking Adaptation' (Chapter 7).

It is hoped that this research will provide a conceptual and theoretical framework that can inform the development of hazards education programs that not only accommodate children's knowledge and perspectives but capitalise on the existing social and cultural contexts of their everyday lives. Furthermore, by listening to and valuing children's perspectives and concerns, the research seeks to give children's voices direct entry into the concepts and discussions of hazards and disasters research, thereby filling a critical gap in the global hazards literature.

Through the use of a constructivist grounded theory methodology, this research has sought to privilege the perspectives of participants, and throughout the thesis I have made every attempt to let the children articulate their own meanings and understandings in their own words (Charmaz, 2006; James & Prout, 1990, 2005). Nevertheless, it is fully acknowledged that giving unmediated voice to children's perspectives is highly problematic because all grounded theory research is deeply mediated by the researcher (Clarke 2005; Charmaz, 2006). For this, as well as any errors in fact, I accept full responsibility.

1.7 Aim of the research

The aim of this research is to develop a substantive theory that increases understanding of children's knowledge of bushfire hazards and disasters. Specifically, it aims to increase understanding of a) children's knowledge of the conditions and processes that cause bushfire hazards and disasters, b) children's knowledge of the conditions and processes that mitigate or prevent bushfire hazards and disasters, and c) the role of environmental and socio-cultural context in the development of children's hazard knowledge.

1.8 Outline of the thesis

The thesis is comprised of eight chapters. Chapter 2 critically evaluates the divergent conceptual, theoretical, and methodological traditions that have characterised hazards and disasters research over the

last half century. In doing so, it is able to identify a suitable conceptual, theoretical, and methodological framework upon which an in-depth study of children's knowledge of bushfire hazards and disasters can be based. The 'vulnerability perspective' emerges as the most appropriate choice because it recognises the importance of understanding hazards and disasters from the perspectives of those who live with them, particularly those who belong to vulnerable groups.

Chapter 3 presents the paradigm of inquiry within which the research was conducted. It outlines the constructivist and social constructionist philosophies that underpin the research, presents the theoretical perspectives that guided the research process, and introduces the adopted methodology of constructivist grounded theory. Chapter 4 outlines the qualitative, interpretive methods that were employed to collect and analyse the data and charts the progression of theory development from the construction of a conceptual framework through to the creation a substantive grounded theory that resembles children's knowledge and experience as closely as possible.

Chapters 5, 6 and 7 present the core elements of the conceptual framework that emerged from the grounded theory analysis. These were the social psychological problem of *perceiving vulnerability* (Chapter 5), the core social-psychological process of *building resilience* (Chapter 6), and the contextual and modifying conditions that influenced children's knowledge in each of these conceptual domains (Chapter 7). In Chapter 8, the conceptual framework is elevated to a more abstract, theoretical plane by proposing the substantive grounded theory of 'Seeking Adaptation' and it is in this context that the research findings are interpreted in relation to extant empirical and theoretical work. The thesis concludes in Chapter 9 with a summary of the major findings and the general implications for the development and delivery of children's bushfire education in Australia.

CHAPTER 2: PERSPECTIVES ON
DISASTER RISK REDUCTION

More and more eternal laws of nature are turning into laws of history.

- Friedrich Engels (cited in Vygotsky, 1998, p.1)

2.1   Introduction

Since the mid-1970's a large proportion of environmental hazards and disasters research has been criticised for its conceptual flaws, theoretical poverty and methodological limitations (Ball, 1975; Hewitt, 1983a, 1983b; Waddell, 1977; Watts, 1983; O'Keefe, Westgate & Wisner, 1976). In this thesis the goal of the literature review is to critically locate the study of children's knowledge of bushfire hazards and disasters in the socio-historical context of the environmental hazards and disasters literature. In doing so, the thesis seeks to identify an appropriate conceptual, theoretical and methodological foundation upon which a study of children's knowledge of bushfire hazards can be based, thereby avoiding, to the greatest extent possible, some of the criticisms that have been cast upon previous research in the field.

This chapter begins by defining the concepts of hazard, disaster, and disaster risk reduction (DRR). It then critically evaluates the divergent conceptual, theoretical, and methodological traditions that have characterised hazards and disasters research over the last half century. This evaluation is then used as a basis upon which to explore contemporary approaches to bushfire risk reduction in an Australian socio-ecological context. Taken together, these discussions inform the selection of 'the vulnerability perspective' as an appropriate framework within which to conduct a study of children's knowledge of bushfire hazards; namely, because it recognises the importance of understanding hazards and disasters from the perspectives of those who live them, particularly those who belong to vulnerable groups, such as children. The chapter concludes by restating the aims of the research.

2.2   Environmental hazards and disasters

Environmental hazards and disasters are widespread and numerous in both developed and less developed countries, where they are responsible for extensive loss of life, property, assets, and infrastructure (Twigg, 2004). According to the Centre for Research on the Epidemiology of Disasters (CRED), over the last decade, approximately 2871 disasters have killed more than 1 million people, affected more than 1 billion others and caused more than US$1 trillion in economic damages (Guha-Sapir, Vos, Below & Ponserre, 2011; Hoyois, Below, Scheuren & Guhar-Sapir, 2007; Scheuren, le Polain de Waroux, Below, Guha-Sapir & Ponserre, 2008). In 2010 alone, 373 natural disasters killed over 296,800 people and wrought damages in excess of US$109 billion, making it one of the deadliest, most economically damaging years in decades (Guhar-Sapir et al., 2011; UN-ISDR, 2011).

Whilst the terms hazard and disaster are part of the everyday vernacular, providing a clear explication of these concepts as they are applied in research and policy is critical to any scholarly discussion of them. As Perry (2007) notes, such explications are not only a crucial component of sound theory and methodology, they also contribute to a clearer vision of the field, help to explain apparent anomalies in research findings, and provide a framework for the progression from basic description toward the social scientific endeavours of explanation, understanding, prediction, and control. Nevertheless, it must be noted from the outset that consensus definitions on what constitutes a hazard or disaster have not been forthcoming and within the academic community, there is intensive debate as to what kinds of events these terms should be used to connote (cf. Cutter, 2005; Handmer & Dovers, 2007; Perry, 2007; Perry & Quarantelli, 2005; Twigg, 2004; Rodriquez, Quarantelli & Dynes, 2007).

Recognising this lack of consensus and the confusion it can create amongst researchers, policy-makers and practitioners alike, the UN-ISDR (2009) has developed and disseminated a set of basic definitions with a view to promoting a common understanding on the subject. Such an exercise is not intended to nullify the more esoteric philosophical and theoretical debates about what constitutes a hazard or a disaster (cf. Bankoff, 2001, 2003). Rather, its aim is to provide a common parlance for use in the development of frameworks, institutions, operations, research, training curricula and public education programs. According to the UN-ISDR (2009, p.17) terminology, an environmental hazard is defined as:

> A dangerous phenomenon, substance, human activity or condition that may cause
> loss of life, injury or other health impacts, property damage, loss of livelihoods
> and services, social and economic disruption, or environmental damage[1].

Essential to this definition is that to be considered a hazard, an event must pose a potential threat to human lives, livelihoods, assets or infrastructure. Thus, the hazard is not inherent in the event itself, but in its potential to harm those things that are valued by people. By way of example, the greatest extent of bushfires in Australia in any one year is in the vast savannahs of the far north: yet, because these fires occur in remote areas, they can burn for weeks or even months without ever posing a threat to people (Whelan et al., 2006). It is only when these fires encroach on human settlements that they represent a hazard. This distinction between the environmental event and the hazard is a fundamental tenet of basic hazards theory (White, 1945; Burton, Kates & White, 2003; Hewitt, 1997)[2].

Environmental hazards can be characterised in a number of different ways and along several different dimensions. Firstly, a basic distinction can be made between *natural hazards* and *technological*

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[1] It is important to recognise that that the natural processes that create hazards can also create amenities and resources. This is explored in detail in section 2.3.
[2] In the literature, not all authors make the explicit distinction between the environmental event and the hazard. For example, in Wisner et al.'s (2004) pressure and release model, these two concepts are conceived as synonymous. However, for the purpose of this thesis, the earlier definition of hazard has been adopted because it acknowledges that environmental events can interact with human systems to create both hazards and resources.

hazards (Below, Wirtz & Guhar-Supir, 2009; O'Brien, O'Keefe, Rose & Wisner, 2006; Twigg, 2004; UN- ISDR, 2009). Natural hazards arise from a variety of geophysical, meteorological, hydrological, climatological, and biological processes (Twigg, 2004; UN- ISDR, 2009). Technological hazards by contrast derive from human activities and include technological and industrial accidents, infrastructure failures, and toxic spills or leaks (Twigg, 2004; UN- ISDR, 2009).

Hazards can also be described in terms of their *magnitude, intensity, speed of onset, duration*, and *aerial extent* (Burton, Kates & White, 1978; Hewitt, 1997; Twigg, 2004). Earthquakes, for example, typically have a fast onset, a short duration, and affect a relatively small region. Droughts, on the other hand, have a slow onset, a long duration and often affect large regions at the same time (Twigg, 2004; UN-ISDR, 2009). Depending on weather conditions and fuel loads, bushfires can vary along any one of these dimensions, making them a highly unpredictable phenomenon (Tolhurst, 2009).

According to the UN-ISDR (2009, p.9), it is when the damage and loss caused by a hazard event exceeds a community's ability to cope using its own resources that a disaster can be said to have occurred:

> A [disaster is] serious disruption of the functioning of a community of society involving widespread human, material, economic, or environmental losses and impacts, which exceeds the ability of the affected community or society to cope using its own resources.

Wisner et al. (2004, p.50) define disaster in similar terms:

> A disaster occurs when a significant number of vulnerable people experience a hazard and suffer severe damage and/or disruption of their livelihood system in such a way that recovery is unlikely without external aid.

Whilst social constructionist definitions of disaster, such as those proposed in the discursive analyses of Greg Bankoff (2001, 2003)[3], are both accurate and valid, it has been convincingly argued that in the applied realm of DRR, they are of limited practical use (Wisner et al., 2004). Thus, this thesis takes the more pragmatic, 'weak constructionist' (Lupton, 1999) approach to defining disaster by adopting the definitions proposed by the UN-ISDR (2009) and Wisner et al. (2004).

2.3 Disaster risk reduction

On Friday the 11th of March 2011, a magnitude 9.0 undersea earthquake, 70km off Japan's Tōhoku coast, triggered a tsunami with waves that reached heights of 30 meters and travelled up to 10km inland (USGS, 2011; Fackler, 2010). This hazard event killed 15,703 people, decimated the villages,

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[3] Bankoff (2001) argues that the historical roots of the cultural discursive framework in which hazards and disasters are presented reflects particular cultural values concerning the way in which less developed countries are usually imagined. He argues that 'tropicality' (dangerous other), development and vulnerability all form part of the same generalising neo-colonial discourse that denigrates large regions of the world as disease-ridden, poverty stricken, and disaster prone.

towns, and cities that line the north-east coast, and ruptured critical infrastructure at Fukushima nuclear power plant, creating what is known as a 'complex emergency' (O'Brien, O'Keefe, Rose & Wisner et al., 2006). By anyone's definition, this was a disaster of epic proportions. In its coverage of the event, the international media emphasised the extraordinary magnitude and aerial extent of the hazard: it was the largest earthquake ever recorded in the region; the wave heights exceeded any in living memory; and the water travelled further inland than had ever been anticipated (Fackler, 2010). Many journalists reporting from the disaster zone asserted that there was nothing that the people there have could have done to protect themselves from an event of that scale.

Scholars of hazards and disasters, however, have begged to differ (Lassa, 2011; Kawazoe, 2011). In a recent study investigating the impacts of the event, Kawazoe (2011) showed that amongst the great swathes of devastation, numerous villages had been spared. In Aichi prefecture, for example, the village of Yoshihama did not suffer a single fatality and damage to the built environment was minimal. The community's resilience to hazard impacts was attributed to good community-based urban planning. The residential areas of the village had been built outside of flooding areas and areas inside the tide embankment had been reserved for rice farming: the local people had been willing to accept damages to the rice fields but not to residential areas. Another example of community resilience comes from the village of Aneyoshi in Iwate prefecture (Fackler, 2011). Dotting the coastline of north-east Japan are hundreds of ancient stone tablets, some of which are estimated to be over 1000 years old. Carved into their weathered faces is a stark warning to residents: 'Do not build your homes below this point.' Heeding the injunction of their ancestors, the residents of Aneyoshi had built their homes on the hillside, well above the ancient stones. When the 30 meter waves pounded the Iwate coastline, not a single resident of this village was killed or injured and not a single home was lost (Fackler, 2011).

The Tōhoku earthquake and tsunami serves to demonstrate two crucial points about natural hazards and disasters. First, whilst it is widely recognised that natural hazards exert a disproportionate impact on less developed countries, wealthier and more technologically advanced countries are far from immune (Twigg, 2004). Second, whilst natural hazards represent a major threat to society, there is much that can be done to avoid or mitigate their impacts (Twigg, 2004; Wisner, Gaillard & Kelman, 2011; UN-ISDR, 2005a). In the hazards and disaster literature this latter concept is commonly referred to as 'disaster risk[4] reduction', which is most usefully defined as:

> The concept and practice of reducing disaster risks through systematic efforts to analyse and reduce the causal factors of disasters including through reduced exposure to hazards, lessened vulnerability of people and property, wise management of land and the environment, and improving preparedness for adverse events (UN-ISDR, 2009, p.11).

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[4] For the purpose of this thesis, risk is defined as the product of two estimates: an estimate of the odds of event occurring (how likely is the harmful event?) and an estimate of consequences if it was to occur (how much harm will it cause?) (Gilbert, 2011).

The demonstrated benefits of DRR are immense. Not only does it save lives and prevent injury, but cost-benefit analyses show that for every $1 invested in DRR, there is a saving of $4 to $7 when disaster strikes (World Bank, 2004). In this sense, DRR represents one of the most important strategies in the fight for sustainable development and a safer world (Baez et al., 2010; Chepertil, 2001).

2.3.1 Elements of disaster risk reduction

The overarching concept of DRR is comprised of three core elements: *mitigation, preparedness,* and *prevention*. Mitigation refers to any action taken to minimise the extent of a disaster or potential disaster (Twigg, 2004; UN-ISDR, 2009). Whilst, it can take place before, during or after a disaster, the term is most often used to refer to actions before potential disasters (Twigg, 2004). Mitigation measures can be structural (e.g. levees, dams, ocean wave barriers, earthquake resistant construction) or non-structural (e.g. building codes, land use planning laws and their enforcement, research and assessment, information resources, and public education campaigns) (Twigg, 2004; UN-ISDR, 2009). The aim of preparedness is to help communities and individuals effectively anticipate, respond to, and recover from, the impacts of likely, immanent or current hazard events (e.g contingency planning, reliable warning systems, stockpiling of equipment and supplies, the development of arrangements evacuation and public information, and associated training and field exercises) (Twigg, 2004; UN-ISDR, 2009). Prevention, by contrast, involves the outright avoidance of adverse impacts of hazards and related disasters (e.g. land-use regulations that prohibit settlement in high risk zones) (UN-ISDR, 2009). As Twigg (2004) points out, the complete avoidance of adverse impacts is rarely feasible. In most cases, therefore, the tasks of DRR are generally focussed on mitigation and preparedness.

For the last two decades, the practice of mitigation, preparedness and prevention has been supported by four major international resolutions and frameworks that have sought to facilitate effective disaster reduction by embodying the most current and accepted knowledge on the topic. Developed by the UN and implemented by signatory nations, these resolutions and frameworks include the 'International Decade of Natural Disaster Reduction' (UN-IDNDR, 1989), the 'Yokohama Strategy and Plan of Action for a Safer World' (UN-IDNDR, 1994), the 'International Strategy for Disaster Reduction' (UN-ISDR, 2002) and, most recently, the 'Hyogo Framework for Action (2005-2015)' (UN-ISDR, 2005). The conceptual foundations and practical implications of these resolutions and frameworks will now be discussed.

2.3.2 International frameworks for disaster risk reduction

In 1987 the UN General Assembly explicitly recognised 'the importance of reducing the impact of disasters for all people' (UN-IDNDR, 1989). It further recognised that:

> Scientific and technical understanding of the causes and impact of disasters and of ways to reduce both human and property losses has progressed to such an extent that a concerted effort to assemble, disseminate and apply this knowledge through national, regional and world-wide programs could have very positive effects in this regard, particularly for developing countries.

Subsequently, a resolution declaring the 1990's an 'International Decade for Natural Disaster Reduction' (IDNDR) was passed (UN-IDNDR, 1989). As laid out by the UN, the goals of the decade were characterised by a top-down, technocratic approach, emphasising activities such as:

i.   Improving the capacity of each country to mitigate the effects of natural disasters expeditiously and effectively, paying special attention to assisting developing countries in the establishment, when needed, of early warning systems.

ii.   Devising appropriate guidelines and strategies for applying existing knowledge.

iii. Fostering scientific and engineering endeavours aimed at closing critical knowledge gaps.

iv.   Developing measures for the assessment, prediction, prevention and mitigation of disasters through programs of technical assistance and technology transfer, demonstration projects, and education and training.

At the mid-decade IDNDR conference in Japan, however, there was growing dissatisfaction with this technocratic approach (Wisner et al., 2004; UN-IDNDR, 1994) and many conference delegates 'lamented the meagre results of an extraordinary opportunity given to the United Nations and its Member States' (Wisner et al., p.19). In an important watershed, the emergent Yokohama Strategy and Plan of Action for a Safer World recognised a need to 'develop a clear understanding of the cultural and organizational characteristics of each society as well as its behaviour and interactions with the physical and natural environment' (UN-IDNDR, 1994). The Yokohama Strategy recognised that this would require replacing the top-down, technocratic approaches of the UN-IDNDR with more participatory, community-based approaches that promoted the 'adoption of a policy of self-reliance in each vulnerable country and community, including capacity building as well as allocation and efficient use of resources' (UN-IDNDR, 1994, p.7).

In 1999, the UN-IDNDR was supplanted by the 'International Strategy for Disaster Reduction' (ISDR) which was aimed at 'building disaster resilient communities by promoting increased awareness of the importance of disaster reduction as an integral component of sustainable development, with the goal of reducing human, social, economic and environmental losses due to natural hazards and related technological and environmental disasters' (UN-ISDR, 2008). This emphasis on sustainable development has been carried through to the most recent international framework for DRR, is the UN endorsed 'Hyogo Framework for Action (2005-2015)' (UN-ISDR,

2005a). Adopted by 168 countries at the World International Conference on Disaster Reduction in 2005, this framework represents an international commitment to implement a global DRR agenda. Building on the frameworks preceding it, as well as the extant hazards and disasters literature, it represents a worldwide agreement that DRR is an essential part of sustainable human development, not a peripheral issue of arcane technical interest or concern (Wisner et al., 2004). With a major emphasis on public participation and engagement, it is organised around five main priorities for action:

i.   Ensure that disaster risk reduction is a national and local priority with a strong institutional basis for implementation.

ii. Identify, assess and monitor disaster risks and enhance early warning.

iii. Use knowledge, innovation and education to build a culture of safety and resilience at all levels.

iv. Reduce underlying risk factors.

v.   Strengthen disaster preparedness for effective response at all levels.

This shift from the technocratic doctrine of the IDNDR to the more grass-roots community-based participatory approaches of the Hyogo framework reflects a parallel shift in the scholarship of hazards and disasters. The earlier, more technocratic IDNDR framework was largely informed by research conducted in the tradition of the 'hazards perspective', whereas the more participatory approach embodied by the Hyogo Framework derives from research conducted in the tradition of the 'vulnerability perspective'. The following sections will review the divergent conceptual, theoretical, and methodological foundations of these perspectives and consider their implications for a study of children's knowledge of hazards and disasters.

2.4   The hazards perspective

2.4.1   Conceptual, theoretical and methodological foundations

The hazards perspective on DRR has its origins in the 1942 doctoral dissertation of eminent American geographer Gilbert F. White. Later published as 'Human adjustment to floods' (White, 1945), this pioneering piece of research on flood policies in the United States found that despite heavy federal investment in structural flood controls such as dams, channel improvements and levees, the total national losses from floods had actually increased. White (1945) argued that the narrow approach of structural controls had only served to limit other ways of reducing the flood hazard, such as land-use regulation, warning systems, building design, and insurance. Moreover, he found that structural controls had exacerbated the hazard by giving people a false sense of security, which had, in turn, encouraged further encroachment onto flood plains. This prompted White to propose a new way of dealing with flood losses that went beyond technological solutions and incorporated 'a range of adjustments'. White advocated an approach that 'considers all possible alternatives for reducing or preventing flood losses...takes account of all the relevant benefits and costs...analyses the factors

affecting the success of possible uses of a floodplain [and] seeks to find a use of the floodplain which yields maximum returns to society with minimum social costs and promotes that use' (White, 1945, cited in Kates & Burton, 1986, p.6).

By embedding hazards within the broader nature-society relationship, White (1945) challenged the prevailing environmentally deterministic conceptualisations which framed hazards solely in terms of the natural system and its geophysical extremes, implicating the human system only in so far as it was shaped and moulded by the forces of nature (cf. Huntington, 1924). Explicitly rejecting this view, White (1974, p.4) redefined hazards as follows:

> A hazard derives from an interaction between people and nature governed by the coexistent state of adjustment in the human use system and the state of nature in the natural events system. Extreme events which exceed the normal capacity of the human system to reflect, absorb, or buffer them are inherent in hazard.

Consistent with contemporary definitions of 'hazard', this definition makes the basic distinction between extreme events in nature, which are not necessarily hazardous to people and the characteristics of hazard events. It views the natural events system and its array of atmospheric, hydrological, geological, and biological processes as functioning independently of the social system; likewise, the social system is viewed as functioning independently of natural events (Burton, Kates & White, 1978). It is only through the interaction of these systems that hazards and resources are created and, most importantly, the nature of this interaction is actively determined by people:

> Natural systems are neither benevolent nor maliciously motivated toward their members: they are neutral, in the sense that they neither prescribe nor set powerful constraints on what can be done with them. It is *people* who transform the environment into resources and hazards by using natural features for economic, social and aesthetic purposes (Burton, Kates, & White, 1978, p.19, emphasis in original).

Throughout the 1960s and 70s, White and colleagues (White, 1974; Burton, Kates & White, 1978) embarked on an ambitious collaborative program of international research that sought to understand how the interaction of social and natural systems creates hazards that impact adversely upon households and communities. The objective of this research was summarised as follows:

> If the means of enabling individuals to take intelligent action or governments to design and carry out effective programs of assisting individuals are to be improved, it will be essential, along with further appraisal of both physical mechanisms and social accommodations, to gain greater knowledge of the processes by which people do, in fact, cope with hazards in nature (White, 1974, p.3).

Twenty six studies examined a variety of hazards including drought, flood, volcano, hurricane, and earthquake in a wide range of developed and less developed countries across Europe, North and South America, Africa, Asia, and the Pacific. Using a standardised interview schedule, each study sought to explain how people a) perceived extreme events and the resultant hazards, b) perceived the range of

available adjustments for dealing with them and c) chose from among the adjustments that seemed to them available (White, 1974; Burton, Kates & White, 1978). This choice of this approach was significant: the tripartite model of hazard perception, knowledge of adjustment and choice of response was to become the standard in hazards research over the next several decades (cf. Sims & Baumann, 1983; Solberg, Rosetto & Joffe, 2010).

The results that emerged from this research program were subsequently published in 'Natural Hazards: Local, National, Global' (White, 1974). In his introductory essay, White (1974) specified two major findings. First, people had shown a limited awareness of the potential adjustments for dealing with the hazards to which they were exposed, which prompted the following recommendation:

> ...if costly threats to life and property from the extremes of natural phenomena are to be minimised, there must be careful sharing of the skills, experience, and research capacity of the family of nations[5] (p.13).

Second, the research participants had not perceived hazards or chosen adjustments 'in what the policy maker [would] perceive to be an economically rational way' (Slovic, Kunreuther & White, 1974, p.187). The failure of lay people to engage in the probabilistic, cost-benefit analyses typically employed by experts was seen to have profound implications for public policy and policy makers were warned that enabling people to effectively manage risk would depend upon the extent to which these deficits were understood and accommodated. It is here that studies of risk perception and cognitive decision-making processes were elevated to priority status in hazards research:

> The need for an improved understanding of the decision making process is urgent, and is at the heart of systematic improvement in public policy (Slovic, Kunreuther, & White, 1974, p.187).

Classical decision making theory posits that under conditions of risk and uncertainty, the rational decision maker chooses on the basis of all available information and 'maximises the expected utility' of the decision (von Neumann & Morgenstern, 1947). By way of illustration, a rational decision-maker living in a high bushfire risk area will consider all available information relating to the probability of a bushfire, the consequences of a bushfire, the possible alternative actions that can be taken to prevent or mitigate those consequences and the probability that those alternative actions will have the desired outcome. Thus, the utility maximisation model involves probabilities, payoffs, and the merger of those factors - expectation (Slovic, Kunreuther, & White, 1974).

This notion that actual decision-makers engage in a normative process of utility maximisation was contested by Simon (1959), who argued for a model of decision-making that recognised people do not

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[5] The 'family of nations' to which White refers can be taken to mean the United Nations General Assembly (J. Handmer, personal communication, July, 2011).

always have complete sets of information about all possible alternatives and even if they did, they would not necessarily have the cognitive capacity to engage in the probabilistic task of determining the consequences of every possible alternative. To remedy the problems inherent in the maximisation model, Simon posited the 'theory of bounded rationality', which asserts that the cognitive limitations of the decision-maker force him or her to construct a simplified model of the world in order to cope with its uncertainties. The key principle of bounded rationality is 'satisficing', whereby a decision maker strives to attain some satisfactory, though not necessarily maximum level of utility. Simon (1959, p.129) conjectured that 'however adaptive the behaviour of organisms in learning and choice situations, this adaptiveness falls far short of the ideal of 'maximising' postulated in economic theory. Evidently organisms adapt well enough to 'satisfice'; they do not, in general, optimise'.

Tversky and Kahneman (1974) proposed that people construct this simpler model of the world by estimating probability and frequency through the use of intuitive strategies, or heuristics, which allow them to reduce difficult tasks to simple judgements. For example, the heuristic of negative recency, alternatively known as 'the gamblers fallacy', is used when trying to recognise or produce patterns of randomness: generally people fail to correctly recognise patterns as random and they cannot produce random patterns when they try (Cohen & Hansel, 1956). In a coin toss, for example, people commonly expect a tail to be more likely after a head, or a series of heads, and vice versa. Applying this heuristic to a hazards context, Burton, Kates and White (1978) reported a tendency for residents on a flood plain to perceive a lower likelihood of flood, if the area had flooded in the previous year.

As noted by Hewitt (1983a), this early hazards research was to give the strong sense that ordinary people - with their biased perceptions of risk, incomplete or imperfect knowledge of hazard adjustments, and fallible information processing capacities - could do little more than exacerbate the problem of environmental hazards by default. It is thus, argues Hewitt (1983a), that the problem of environmental hazards and disasters was laid firmly in the domain of the modern post-industrial technocracy: geophysicists, hydrologists, and meteorologists were tasked with improving methods of prediction and forecasting; engineers were urged to further develop and improve on the existing range of possible hazard adjustments; social scientists and cognitive psychologists were encouraged to focus their activities on human information processing with a view to helping people come as close as possible to an ideal conception of rational decision-making; and governments, primarily their military and paramilitary arms, were instructed to establish emergency response measures such as disaster plans and procedures for relief and recovery (White, 1974; Slovic, Kunreuther & White, 1974; Hewitt, 1983a; Burton, Kates & White, 1978). As several authors have argued (e.g. Hewitt, 1983a; Waddell, 1977; Watts, 1983), this technocratic model, or 'citadel of expertise' (Hewitt, 1983a, p.37), offered little opportunity for anybody but the experts to contribute to public policy or practice: the experts would speak *for* the people because there was little perceived value in having a dialogue *with* them, let alone in learning *from* them.

Accordingly, public education programs developed within the hazards model have tended to adopt a top-down process whereby the experts disseminate hazards information - usually in the form of brochures or television advertisements - under the explicit assumption that this will increase both public awareness and adjustment adoption (Sims & Baumann, 1983; Handmer, 1985). In the literature this process is most commonly referred to as 'risk communication' (e.g. Mileti et al., 2004). Given the fallibility of the lay-person's hazard perception and their propensity for irrational decision making, the risk communication literature stresses that communication with the public must adhere to the following principles: 'complicated phenomena must be explained in non-technical terms'; 'the information people receive should be consistent...and repeated frequently through many different media'; and 'information must tell people what they can do' (Nathe et al., 1999, p.3).

The language of discourse in the principles outlined above serves to highlight the one-way nature of public education as practiced from the hazards perspective: the experts provide the information - the public receive it - understand it - and then, presumably, do what they are supposed to do to protect themselves. In this sense, risk communication takes the form of monologue rather than dialogue; there is little opportunity for the public to participate in the communication process and people tend to be treated as passive receptacles of information (Freire, 1972; Wisner et al., 2004); Moreover, this approach to risk communication assumes a direct relationship between hazard awareness and adjustment, an assumption that has garnered little empirical support (Sims and Bauman, 1983; Solberg et al., 2010). On this basis, the top-down approach to public education has been the subject of a powerful critique, as has the hazards perspective more broadly. This critique will now be discussed.

2.4.2   Critiques of the hazards perspective

In an early review of 'Natural Hazards: Local, National, Global', Eric Waddell (1977), argued that although White had conceived hazards as deriving from the interaction of social and natural systems, the book had nevertheless 'presented them as being caused by natural phenomena, their gravity being attributed to 'man's imperfect knowledge of them' (Waddell, 1977, p.69). Waddell argued that to adopt such a view was to vest the active forces in nature and the passive in man, thereby invoking the environmentally deterministic view of hazards that White's (1945, 1974) earlier work had sought to subvert. Waddell (1977) also took exception to the way in which White's collaborators had employed the same research methodology across studies, regardless of cultural context. He argued that although questionnaires might suit literate people from the western post-industrial societies in which they were conceived, their credibility was severely diminished when applied to pre-industrial, rural communities in other cultures. From the vantage point of contemporary thought in cross-cultural psychology (c.f. Berry, Poortinga, & Pandi, 1997), the extent to which such an ethnocentric approach would have been capable of discerning effective traditional adaptive or coping strategies is open to question. Nevertheless, the finding that pre-industrial societies were deemed incapable of managing their own

environmental problems was to form the foundation stone of the technocratic approach to disaster reduction. Given the theoretical and methodological limitations of the research from which that finding emerged, this represents a major concern.

Another element of the hazards perspective that has drawn extensive criticism, and garnered little empirical support, is its preoccupation with hazard perceptions, knowledge of adjustments, and the explicit assumption of a link between these constructs and adjustment adoption (Watts, 1983; Sims & Bauman, 1985; Solberg et al., 2010). In their early review of hazards research, Sims and Bauman (1983, p.184) found little evidence to support this link, concluding that:

> Contrary to conventional wisdom, the fact than an individual is aware of the risk of a natural hazard and the range of damage mitigation measures is no guarantee that he or she will act on that information. Based on a review of the literature, the available evidence is weak on the relationship between awareness or knowledge and the consequent adoption of damage mitigation measures.

In a more recent review, focussed largely on seismic hazard research, Solberg and colleagues (2010, p.1668) came to a similar end, stating that 'It seems from existing studies that risk perception is only weakly related to seismic adjustment'. These authors found that social psychological variables such as trust, empowerment, and responsibility had far more explanatory power than hazard risk perceptions or knowledge of adjustments. More importantly, however, they identified societal factors, such as economic and political resources and issues of equity and power, as the fundamental contingencies in adjustment adoption:

> Household seismic adjustment, such as decisions to reinforce homes, make plans, learn skills and store basic material amenities, is ultimately a systemic consequence of factors ranging from the social psychological to the economic and political, from cultural dynamics of equity to issues of power (Solberg et al., 2010, p.1673).

In their conclusion, Solberg et al. (2010) take issue with the individualist, rationalist assumptions that have dominated natural hazards research for the last several decades. They argue that seeking to explain behaviour as if it were purely a product of rational (or irrational) decision making will never provide an adequate explanation of the complex relationship between individuals, societies and extreme natural processes. Consequently, they have urged hazard researchers to engage with broader systemic social processes and the ways in which persistent inequalities in access to resources and deficits in democratic participation affect risk.

The proposition that analyses of hazards and disasters must broaden their scope to include broader systemic social processes is not new. It was originally put forward in texts such as Kenneth Hewitt's (1983a) 'Interpretations of Calamity from the Viewpoint of Human Ecology' almost three decades ago. Unfortunately, however, the dominance of the hazards perspective has served to obscure it from view. At the heart of Hewitt's (1983a, 1983b) early critique was that the hazards perspective is unable to explain how individual decisions are affected or influenced by social or economic constraints. He

argued that in many political and economic contexts the majority of people are denied or prevented from exercising their capacities for hazard mitigation. For example, low income groups often have no choice but to settle in vulnerable locations, such as flood plains (Mustafa, 1998, 2002), or high bushfire risk areas (Collins, 2005, 2008, 2009; Collins & Bolin, 2009). Living in such places and failing to mitigate the hazard cannot automatically be attributed to a lack knowledge because the control of land by market forces sometimes prevents lower income groups from accessing safe building land, or the resources required for creating a safer environment. With its narrow focus on the tripartite model of hazard perceptions, knowledge of adjustments and adjustment adoption, the hazards perspective denies the importance of having the power to choose, a power that is often undermined by social, political and economic forces (Hewitt, 1983a).

A final criticism of the hazards perspective is one that has been levelled at many other domains of inquiry in the human and social sciences over the last century. It pertains to the almost exclusive use of hypothetico-deductive methodologies that derive propositional hypotheses from *a priori* theory and subject them to empirical test for verification or falsification (Kuhn, 1962). In this mode of inquiry, the goals are explanation, the establishment of cause and effect relationships and, ultimately, the control and prediction of phenomena (Guba & Lincoln, 1994). Accordingly, there is a methodological imperative to eliminate confounding factors with experimental manipulations and controls: a failure to do so would obscure 'the way things really are' (Guba & Lincoln, 1994). This methodological approach has dominated the natural sciences for centuries and, until very recently, the social sciences also. Many have argued, however, that in the pursuit of establishing cause and effect relationships, the hazards perspective has contributed little to our understanding of the meanings that people attribute to environmental hazards and disasters or how these phenomena manifest in people's everyday lives (Hewitt, 1983a; Waddell, 1977; Watts, 1983; Wisner et al., 2004). But despite these long running and well-founded criticisms, a large proportion of the empirical research on children's knowledge of hazards and disasters has been conducted in the tradition of the hazards perspective. The key approaches, major findings, and limitations of this research will now be discussed.

2.4.3   Research with children from the hazards perspective

To date, the bulk of empirical research on children's knowledge of hazards and disasters has been conducted from the hazards perspective. With the exception of one study in an earthquake prone region of Japan (Shiwaku & Shaw, 2008) and another in Nepal (Shiwaku et al., 2007), the majority of this research has been conducted in hazardous regions of New Zealand or the United States (Johnston & Houghton, 1995; Johnston, Paton, Driedger, Houghton & Ronan, 2001; Ronan & Johnston, 2001; Ronan & Johnston, 2003; Finnis, Johnston, Ronan & White, 2010; Finnis, Standring, Johnston, & Ronan, 2004; Ronan, Crellin & Johnston, 2010; Ronan, Johnston, Daly & Fairley, 2006). Consistent with the hazard perspective's basic preoccupation with hazard perceptions, knowledge of adjustments,

and choice of response, these studies have sought to examine how this tripartite model manifests in child populations. Hence, they are subject to the same critique outlined above.

In one of the early New Zealand studies, Johnston and Houghton (1995) employed quantitative, questionnaire-based methods to compare natural hazard perceptions of school students in four geographic regions of New Zealand. Based on the explicit assumption that 'how people respond to risk is determined by how they perceive risk' (p. 18) and the more tacit assumption that perceptions of risk are best represented in terms of probabilities, students in this study were asked to rate the likelihood of being personally affected by particular hazard events (e.g. earthquake, flood, volcanic eruption) and then rate the likelihood of loss of life if a particular hazard event was to occur. It was found that, relative to expert assessments of event probabilities, students tended to overestimate the likelihood of infrequent events, such as earthquakes and volcanic eruptions, and underestimate more frequent events, such as floods. The authors concluded that 'students must learn about probabilities and develop judgment in making decisions about the risks and uncertainties posed by these hazards' (p. 26). However, the benefits of such learning are questionable in light of the early decision-making research which highlighted the difficulties that people have in thinking about hazards in terms of probabilities (see section 2.4.1). The   absence of any expressed link between hazard perceptions and levels of preparedness also casts doubt on the benefits of this recommendation (Sims & Baumann, 1983; Solberg et al., 2010).

In a series of subsequent correlational and quasi-experimental studies with 5 to 13 year olds, Johnston and colleagues (Ronan & Johnston, 2003; Finnis, Johnston, Ronan & White, 2010; Finnis, Standring, Johnston & Ronan, 2004; Ronan, Crellin & Johnston, 2010; Ronan & Johnston, 2001; Ronan, Johnston, Daly & Fairley, 2006) sought to evaluate the influence of school-based hazard education on a) children's perceptions of hazard likelihood, b) their knowledge of the most appropriate action to take in the event of a hazard, c) the adoption of hazard adjustments within the home and d) levels of family emergency planning. All of the studies in this series employed quantitative, questionnaire-based methods. Typically, perceptions of hazard likelihood were investigated by asking children to identify the two hazards that were most likely to affect them and to rate the likelihood of eight different hazard events on a three point scale, ranging from likely to unlikely. For knowledge of protective actions, children were asked to select from a list the behaviour, or behaviours, they would enact in the event of a particular hazard (e.g. moving 1km inland in the event of a tsunami). For levels of hazard adjustment adoption, children were asked to peruse a list of 23 specific hazard adjustments (e.g. having a torch or radio, adding lips to shelves, bolting the house to its foundations, stockpiling food and water) and then select which adjustments, if any, had been adopted by their families. Finally, for family emergency planning, children were asked to indicate whether or not their family had developed an emergency plan or undertaken emergency drills.

Although school-based hazards education was associated with more accurate assessments of hazard likelihood, evidence that it promoted the adoption of hazard adjustments within the home was not forthcoming. Where hazards education was found to have an effect on adjustment adoption it tended to be in relation to low cost, low effort adjustments such as having a torch, a radio or a first aid kit. Arguably, these are items that many households would have in their possession regardless of potential exposure to hazards. Other more expensive adjustments or those that would require technical expertise (e.g. bolting the house to the foundations, bracing house walls or arranging bracing for the pile foundation) were not related in any way to school-based hazards education. Evidence that school-based hazards education had exerted any influence in the realm of family emergency planning was also lacking, with the majority of children reporting low levels of emergency planning regardless of their involvement in hazard education. These findings are consistent with those of Sims and Baumann (1983) and Solberg et al. (2010), both of whom concluded that hazard education programs, hazard perceptions, and knowledge of hazard adjustments are in no way related to levels adjustment adoption or preparedness.

Although involvement in school-based hazards education was not found to increase levels of adjustment within the home, it was found to increase children's knowledge of the protective actions they should take in an extreme event (Finnis et al., 2010; Finnis et al., 2004; Ronan et al., 2010). Of particular interest was the relationship between children's knowledge of protective actions and their hazard-related fears and anxieties. Firstly, it was generally found that increased hazards knowledge (i.e. knowing what to do before, during and after a hazard event), was associated with a concomitant reduction in children's hazards-related fears (Finnis et al., 2010; Finnis et al., 2004; Ronan et al., 2010). This finding is important because it contradicts any notion that educating children about hazards and disasters will trigger or exacerbate children's fears. However, it also suggests that a reduction in hazard-related fear derives not from knowing about the hazard but from knowing how to avoid its impacts, a hypothesis that would be supported by the literature on childhood fears (Gullone, 1999, 2000; Klein, 2007; King, Hamilton, & Ollendick, 1988; Morris & Kratochwill, 1983). Another important finding relating to children's fears was the demonstrable relationship between child hazard-related fear and parent hazard-related fear, with comparisons of scores on fear-related questions showing a strong positive correlation. This finding supports other research on childhood fears which has found that when parents openly exhibit their fears and anxieties, those fears can manifest in their children (Muris et al., 1996).

However, the general findings of these studies must be viewed with caution, primarily because they have tended to rely solely on hypthetico-deductive methodologies and questionnaire-based methods to the exclusion of other more inductive approaches that would permit children's own perspectives to emerge from the data. Over the last decade, the use of standardised measures such as checklists, rating scales and questionnaires in research with children has been increasingly questioned by scholars of

childhood (Corsaro, 2005; Gaskins, Miller, & Corsaro, 1992; James & Prout, 2004; Woodgate, 2000a, 2000b). It is commonly argued that such measures restrict the researcher's ability to capture a detailed understanding of children's perspectives because *a priori* theories and generalisations of adults are imposed on the data (Corsaro & Streeck, 1986; Woodgate, 2000a, 2000b). Under these circumstances, children are prevented from articulating their own understanding of a phenomenon and rarely do their interpretations of the questionnaire items form part of the analysis. Consequently, this type of research is said to elicit data that reflect the perspectives of the adult researchers, not those of the child participants and as such, it adds little to our understanding of children's knowledge, meanings or experience (Woodgate, 2000a, 2000b). Additionally, over recent years, social scientists have begun to conceptualise childhood not as a stage towards adulthood but as another culture (Kirk, 2007) and in this sense, Waddell's (1977) criticism of ethnocentrism in hazards research with adults is equally applicable to hazards research with children.

A final issue associated with child research in the hazards tradition relates to a distinct lack of any guiding theoretical or conceptual framework. It provides no explanation of the social or cognitive processes involved in the acquisition of children's knowledge or how this knowledge relates to action. Nor does it define the construct of knowledge itself. In most of the studies described above, knowledge was operationalised as a correct response on a multiple choice questionnaire (cf. Johnston & Houghton, 1995; Ronan & Johnston, 2003; Finnis, Johnston, Ronan, & White, 2010; Finnis, Standring, Johnston, & Ronan, 2004; Ronan, Crellin, Johnston, 2010; Ronan & Johnston, 2001; Ronan, Johnston, Daly, & Fairley, 2006). As such, it was conceived as a product as opposed to a process, which is at odds with most contemporary theorising on human knowledge (Cole, 1996a, 1996b; Rogoff, 1990, 2003; Rogoff et al., 1993; Moll, 1990, 2000, 2001). As Michael Cole (1996a) and many others in the field of educational and developmental psychology have convincingly argued, the construct of knowledge is best viewed as a process that is deeply embedded in social and cultural context and it is studying it in this way that reveals the most important insights for the practice of education (Daniels, 2001; Donaldson, 1978; Moll, 2001; Rogoff, 1993; 2003; Scribner & Tobach, 1997; Werstch, 1998; Vygotsky, 1962, 1978, 1981). In viewing knowledge as a product, research in the hazards tradition is unable to explain how children construct their knowledge of hazards and disasters, which limits its practical application to the development of hazards education programs that accommodate and capitalise on children's ways of knowing.

Many, but not all, of the problems associated with child research from the hazards perspective have been addressed by the concepts, theories and methodologies embodied by the vulnerability perspective. In particular, the adoption of more inductive research methodologies that privilege children's voices have enabled child participants to articulate their perspectives, which has served to highlight their capacities for knowledge and action, as well the constraints that limit them. The following section will first explicate the conceptual, theoretical, and methodological foundations of

the vulnerability perspective before reviewing the extant literature on child research in this emergent tradition.

2.5 The vulnerability perspective

2.5.1 Conceptual, theoretical and methodological foundations

As was explained earlier, Gilbert F. White's pioneering research was aimed toward redefining 'hazard' as the product of the interaction between natural and social systems (White, 1945). It has been argued, however, that by focussing on structural and technological mitigation measures and characterising people as irrational decision makers, the hazards perspective has become as environmentally deterministic as the earlier conceptualisations that White (1945) had hoped to subvert (Wadell, 1978; Hewitt, 1983a).The vulnerability perspective seeks to remedy these issues by refocussing attention on social systems and how they interact with natural systems to create hazards and cause disasters (Hewitt, 1997; Wisner et al., 2004). As Hewitt explains (1997, p.28-29):

> Whereas a hazards perspective tends to explain risk and disaster in terms of external agents and their impacts, vulnerability looks to the internal state of a society and what governs that…in this perspective risk is seen to depend primarily upon on-going societal conditions…Society rather than nature decides who is more likely to be exposed to extreme natural events and to have weakened or no defences against them.

Within the vulnerability perspective, the term 'vulnerability' itself has been variously defined. Some proponents define it solely in terms of a person's capacity to cope with, resist and recover from hazard impacts:

> By vulnerability we mean the characteristics of a person or group and their situation that influence their capacity to anticipate, cope with, resist and recover from the impact of the natural hazard (an extreme natural event or process) (Wisner et. al., 2004, p.11).

> Vulnerability involves, perhaps above all, the general and active capacities of people – what enables them avoid, resist or recover from harm (Hewitt, 1997, p.28).

Others have explicitly acknowledged the role of both hazard exposure as well as human capacities to respond and recover:

> Vulnerability refers to exposure to contingencies and stress, and difficulty coping with them. Vulnerability thus has two sides: an external side of risks, shocks and stress to which a household is subject; and an internal side which is defenceless, meaning a lack of means to cope without damaging loss (Chambers, 1989, p.1).

> Vulnerability is best defined as an aggregate measure of human welfare that integrates environmental, social economic and political exposure to a range of harmful perturbations…vulnerability can be, in other words, defined in terms of exposure, capacity and potentiality (Bohle, Downing & Watts, 1994, 37).

Despite the variations in the relative emphasis that is placed on social and natural determinants, the fundamental assumption underlying the vulnerability perspective is that disasters mark the interface

between an extreme natural event and a vulnerable population (Bohle et al., 1994; Cutter, 1996; Hewitt, 1983b, 1997; O'Keefe, Westgate & Wisner, 1976; Wisner et al., 2004).

The vulnerability perspective has its origins in the early critiques of hazards research, in which a number of authors began to question the dominant focus on the natural causes of disasters (Ball, 1975; O'Keefe, Westgate, & Wisner, 1976). In their pioneering paper, 'Taking the naturalness out of natural disasters', O'Keefe et al. (1976) argued a strong case that disasters are more a consequence of socio-economic than natural factors. In their analysis of disasters from 1947 to 1970, these authors observed that although the frequency and intensity of geological and climatic events had remained relatively constant, there had been a dramatic increase in disaster losses, in terms of both economic costs and fatalities. That this had occurred in the absence of any recorded geological or climatic change meant 'that some radical rethinking on the nature of 'natural' disasters is necessary' and 'precautionary planning must commence with the removal of concepts of naturalness from natural disasters' (O'Keefe et al., 1976, p. 566-567).

O'Keefe et al.'s (1976) proposition that disasters are caused more by social than natural forces was substantiated by research conducted throughout the 1970's and 1980's. Studies of the Sahel famine (Meillassoux, 1974; Sen, 1981; Watts, 1983), drought and starvation elsewhere in Africa (Richards, 1979; Wisner, 1975) and earthquakes in Peru (Maskrey, 1989; Oliver-Smith, 1986) all served to demonstrate that damage and loss in disasters could be explained largely in terms of 'marginality': that is, in terms of social, economic and political inequalities that result in some groups being more seriously exposed to hazard impacts than others. This general finding led early proponents of the vulnerability perspective to view disasters as being prefigured by the conditions that exist in everyday life (Hewitt, 1983a). According to this view, natural hazards appear primarily as agents that, through a disaster, reveal pre-existing weaknesses which derive from conditions and structures embedded within the social order (Hewitt, 1997).

The view that disaster is a manifestation of underlying social equalities contrasts with the commonly held view that disasters are a departure from 'normal' functioning (White, 1974). Hewitt (1983b) believes that this view has been perpetuated by the hazards perspective, which has aligned the problem of disasters with the discourse of 'the accident'. He argues that this discourse has served to create a 'disaster archipelago' in which disasters are 'severed from the rest of man-environment relations and social life' (Hewitt, 1983b, 9). This discourse emphasises the 'un-ness' of disaster, as Hewitt (1983b, p.10), explains:

> What is most obvious is the recurrent use of words stressing the 'un'-ness of the problem. Disasters are *un*managed phenomena. They are the *un*expected, the *un*precedented. They derive from natural processes that are highly *un*certain. *Un*awareness and *un*readiness are said to typify the condition of their human victims (emphases in original).

As Wisner et al. (2004) argue, separating disasters from the social conditions that prefigure them risks placing too much emphasis on the natural events themselves and not nearly enough on the social environment. It must be noted, however, that by embedding disasters within the fabric of everyday life, the vulnerability perspective does not deny the importance of natural phenomena as the triggers of disaster (Bohle et al., 1994; Chambers, 1989; Wisner et al., 2004), nor does it discount the importance of technical or planning measures, such as structural flood controls (Hewitt, 1983b, 1997). Rather, it argues for a deeper level of analysis in which the social production of vulnerability is considered with at least the same degree of importance as extreme natural processes (Hewitt, 1997). It insists that the social and the natural cannot be separated from each other: to do so not only circumvents our understanding of disasters but delimits the range of options for preventing or mitigating them (Maskrey, 1989). In this sense, the vulnerability perspective echoes the early concerns of Gilbert F. White (1945) when he proposed that a reliance on structural flood controls had served to obscure alternate ways of reducing the hazard.

Certain social, political and economic aspects of everyday life that act to increase people's exposure to hazard impacts are easily recognisable. For example, adverse economic circumstances force people into regions where extreme natural events occur and then prevent them from being able to build structures that will resist hazard impacts (Collins, 2007; Maskrey, 1989; Mustafa, 1998; Wisner et al., 2004). However, there are also many other, more covert, processes that increase exposure. These involve access to resources and services, such as education and healthcare. They also involve various forms of discrimination in the allocation of welfare and social protection, such as aid for relief and recovery (Hewitt, 1997; Wisner et al., 2004). It is these factors that embed disasters within the broader patterns of society. The role of these factors and processes in exposing people to hazards and disasters is presented schematically in Figure 2.1.

As Wisner et al. (2004) explain, at the top of the diagram, the natural environment [Boxes 1 and 2] presents people with a range of opportunities or resources [Box 3] as well as a range of potential hazards [Box 4]. Access to the resources and opportunities and exposure to the hazards are determined by social processes [Box 5]. These processes play a significant role in deciding who is most at risk: where people live and work, their wealth, health, and the nature and extent of their social networks are not elements of nature but of society. Crucially, the social processes that determine access to resources and exposure to hazards are very rarely equitable and people's exposure differs according to personal characteristics, such as class, gender, ethnicity, age, disability, and immigration status [Box 6]. The way in which these personal characteristics create exposure to risk needs to be understood in the context of political and economic systems that operate on national and global scales [Box 7]: it is these larger systems that determine how groups of people vary in relation to health, income, building safety, location of work and home, access to information and other aspects of everyday life that determine levels of hazard exposure.
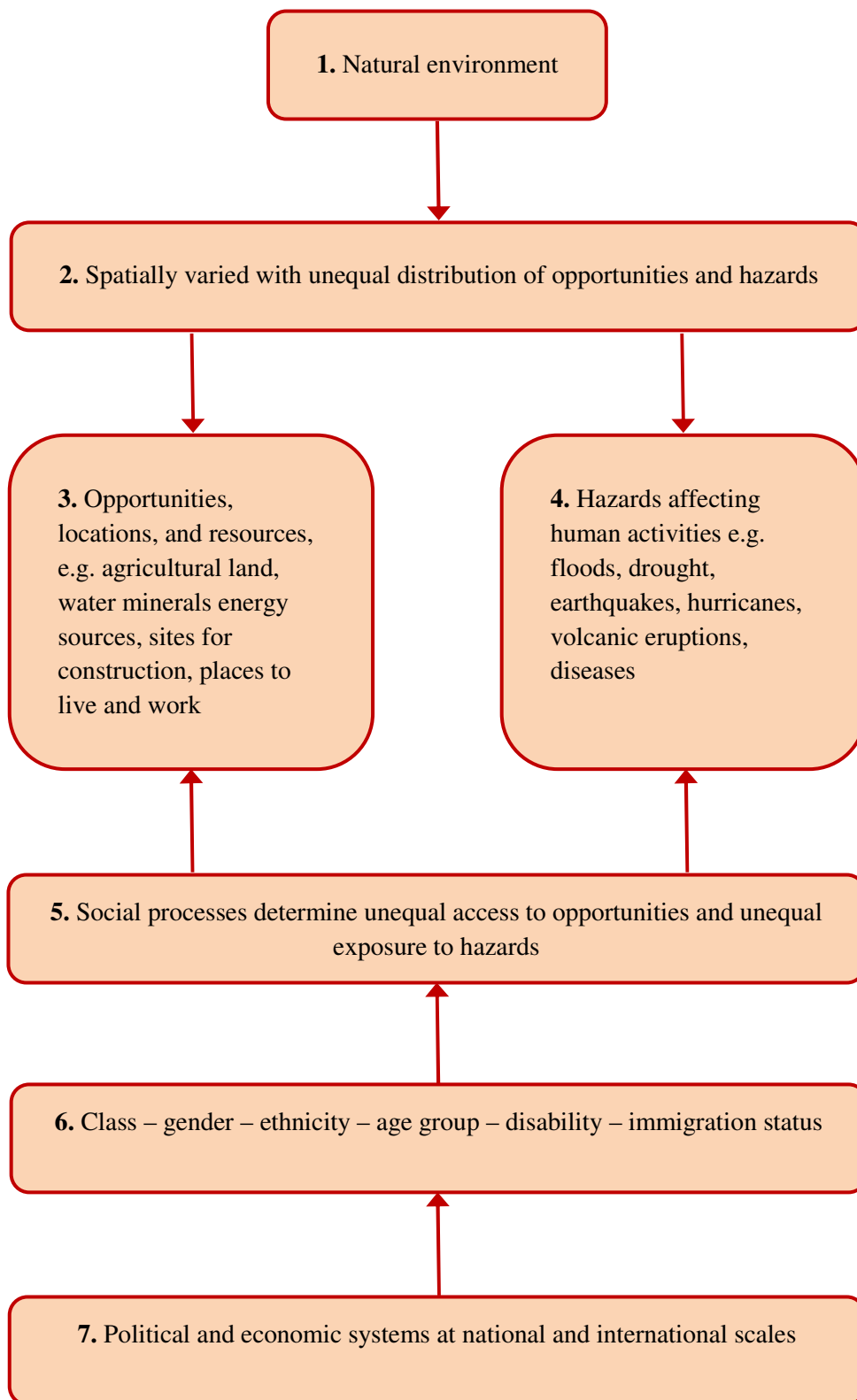
Figure 2.1: The social causation of disasters.

Source: Wisner et al. (2004).

Viewing hazards and disasters as being embedded in the conditions of everyday life has important implications for both research and practice. It is argued that because hazards and disasters are constructed in the patterns and structures of everyday life, the theory and practice of DRR must be informed by the local knowledge and lived experience of ordinary people (Hewitt, 1997; Maskrey, 1989; Mercer et al., 2008; Wisner et al., 2004; Twigg, 2004). Therefore, a defining feature of research and practice from the vulnerability perspective involves understanding hazards and disasters from the perspectives of the people who live them. This approach marks recognition that patterns of vulnerability are context specific and local in character, which privileges the knowledge and experience of local people (Chambers, 1989; Twigg, 2004; Maskrey, 1989).

Accordingly, research conducted in the vulnerability tradition forsakes the hypothetico-deductive methodologies and quantitative survey methods favoured by the hazards perspective for more inductive, hermeneutical, and participatory approaches that seek to understand hazards and disasters from the perspectives of local people. One common strategy involves facilitating local people to conduct their own vulnerability and capacity analyses so that they themselves can identify the conditions and processes that make them vulnerable, as well as the capacities and resources that are available for preventing, mitigating, and preparing for extreme events (Cannon, Twigg, & Rowell, 2003; Davis, Haghbaert, & Peppiatt, 2004; Twigg, 2007). It must be emphasised, however, that by giving priority to local knowledge and lived experience, proponents of the vulnerability perspective do not seek discount or dismiss the value of the technical and scientific knowledge of experts and authorities (Wisner et al., 2004; Twigg, 2004). As Hewitt (1997) points out, technical skill and expertise is viewed as an integral part of reducing disaster risk, but to be effective, it must be applied in conjunction with local knowledge and perspectives:

> Cultural and social understanding is as essential as geophysical or technological interpretation. To the extent that technical or official actions are required, they need to be informed by the knowledge and co-operation of residents. They need to engage in ways that accommodate the views, expectations and goals of residents. What we need to know and can do turns upon how individuals and groups 'construct' and value reality (Hewitt (1997, p. 360).

John Twigg (2004) also stresses the importance of understanding disaster risk from the perspectives of local residents. He explicitly rejects the notion that ordinary people are irrational decision-makers or fallible perceivers of disaster risk and argues that people already have knowledge of the risks they face. In Twigg's view, helping people to reduce these risks requires a thorough understanding of the nature and content of this knowledge:

> People at risk do make rational choices about protecting themselves from disasters. They do have a view of that risk. We cannot understand responses to EW [early warning] without first having a good understanding of this (cited in Wisner et al., 2004, p.265).

Twigg (2004) suggests that disaster researchers and managers have a lot to gain by attending to the experience of agencies working on sustainable community development projects in less developed countries. He explains how, traditionally, development agencies tried to augment the social and economic progress of poor communities by distributing information to them. Any failure of communities to adopt new ideas or technologies was attributed to their failure to understand the information. Hence, the challenge - as seen by the development specialists - was to find better ways of presenting the information. In the 1970's and 80's, however, it became increasingly evident that project failure could in large part be attributed to the failure of developmental specialists themselves to understand the needs, priorities, local knowledge and capacities of the communities they were trying to help (Chambers, 1989; Freire, 1972, 1972; Twigg, 2004).

In community development circles, it is now well accepted that good project outcomes require listening to local people and solving problems collectively (Chambers, 1989, 2005, 2008; Maskrey, 1989; Twigg, 2004). The emphasis has shifted from one-way information dissemination by specialists, to genuine dialogue and information exchange between specialists and local people. Yet, due largely to the dominance of the hazards perspective, which has tended to overlook the value of local knowledge and experience, the dialogue approach has not been readily adopted in the field of DRR. Rather, the assumption that people do not fully understand the risks they face, or how to deal with them, has perpetuated the view that public education must deliver clear, direct, non-technical messages from the top-down and if these messages fail to achieve the intended results, they must be repackaged so that they are easier for people to understand (see Chapter 2.4.1). Proponents of the vulnerability perspective argue that this is not education so much as a kind of public relations or marketing exercise, whereby messages are transmitted from small groups of experts to the uninformed masses (Twigg, 2004; Wisner et al., 2004). Failure to understand the knowledge and experience of recipients is one likely reason why risk communication from the hazards perspective has had so little impact (Haynes, Barclay & Pidgeon, 2008; Handmer, 1985; Sims & Baumann, 1983).

2.5.2   Critiques of the vulnerability perspective

Whilst the vulnerability perspective is gaining increasing acceptance amongst both researchers and practitioners, it has not been without it critics. Some commentators have criticised it for overemphasising the social, political, and economic processes and structures and underemphasising the value of technology and engineering. Smith (1996, p. 51) puts it bluntly:

> It can be criticised for rather stridently expressed views which, at worst, simply call for a social revolution and attempt to deny the success of any devices – such as flood banks or forecasting and warning systems- in mitigating disaster. The 'green' lobby within the   structuralist school sometimes presents the side effects of hazard reduction as worse than the original problem.

However, this assessment is not altogether fair. As noted earlier, proponents of the vulnerability perspective do not seek to discount or deny the contribution that engineering and technology can make to DRR. What they do emphasise, is that when these technological strategies are informed by the knowledge and experience of local people, their effects are dramatically enhanced and are more likely to sustained over time (Maskrey, 1989; Mercer et al., 2008; Wisner et al., 2004; Twigg, 2004).

Another criticism of the vulnerability perspective relates to the term 'vulnerability' itself. As Wisner et al. (2004) point out, work within the vulnerability paradigm has tended to focus most attention on the social, economic and political processes that make people vulnerable and hence, it has been necessary to use terminology that emphasises the problem. Indeed, if there were no problems, there would be no disasters (Wisner et al., 2004). However, it has been noted that focussing on people's vulnerability can tend to emphasise their limitations (Hewitt, 1997; Twigg, 2007 Wisner et al., 2004). As Hewitt (1997, p.82) explains, the term vulnerability may prove unfortunate because it connotes passivity and weakness:

> Unlike much of the work that it labels, the word emphasises a 'condition' and encourages a sense of societies or people as passive. Indeed as happens with the hazards paradigm, vulnerability can treat human individuals, the public or community as pathetic and weak.

Wisner et al. (2004, p.36) agree that there is a danger of vulnerability being recast as yet another of the 'social pathologies' that resemble, or derive from poverty, underdevelopment, and overpopulation. They point out that vulnerability to disaster could come to be viewed by modern society in the same way as aging, mental instability, or unemployment: that is, as 'social problems' posed by 'victims', that need to be dealt with through treatments or interventions delivered by 'experts'. This could mean that a community or society that lacks advanced technologies, professional expertise, top-down governmental interventions, or a strong consumer economy is seen as vulnerable for those reasons (Wisner et al., 2004). Such a vision would undermine the basic assumptions of vulnerability theory as outlined above and would mark a return to the technocratic paradigm that has dominated DRR for decades.

Arguably though, the term 'vulnerability' is a misnomer because much of the vulnerability literature serves to demonstrate that people are anything but victims of natural and social forces and that most people, however vulnerable, have some capacity for resisting, avoiding, and adapting to the social and natural processes that expose them to natural hazards (Wisner et al., 2004). It is for this reason that many scholars have recast discussions of vulnerability through the frame of 'resilience' (Handmer, 2003; Adger, 2000; Pelling, 2003; Twigg, 2007). In the hazards and disasters literature, resilience is usually defined in terms of the capacity of a socio-ecological system to absorb, resist, and recover from shocks and stresses. For example, Timmerman's (1981, p.21) early definition framed resilience as a buffer to vulnerability:

> Vulnerability is the degree to which a system, or part of a system may react adversely to the occurrence of a hazardous event. The degree and quality of that adverse reaction are partly conditioned by the system's resilience: the measure of a system's or part of a system's capacity to absorb and recover from the occurrence of a hazardous event.

More recently, Adger (2000, p.1036) has defined resilience in similar terms:

> By resilience we mean the capacity of socio-ecological systems to absorb recurrent disturbances such as hurricanes or floods so as to retain essential structures, processes, and feedbacks.

Pelling (2003, p.48), meanwhile, provides a more concrete definition that relates resilience directly to the concrete actions that facilitate it:

> Resilience to natural hazard is the ability of an actor to cope with or adapt to hazard stress. It is a product of the degree of planned preparation undertaken in the light of potential hazard, and of spontaneous or premeditated adjustments made in response to felt hazard, including relief and rescue.

Over the last several years, the concept of resilience has gained considerable favour amongst emergency managers. Perhaps this is due to the emphasis that it places on community self-sufficiency which has positive implications for demands on emergency management resources: whereas vulnerability is a 'problem' to be solved, resilience is a 'resource' to be tapped into. As Twigg (2007, p.6) puts it:

> A focus on resilience means putting greater emphasis on what communities can do for themselves and how to strengthen their capacities, rather than concentrating on their vulnerability or their needs in an emergency.

It is important to acknowledge, however, that a) several definitions of vulnerability have incorporated the concepts of hazard exposure *and* the capacity to cope with shocks (Bohle et al., 1994; Chambers, 1989), b) vulnerability research has sought to understand people's vulnerability *and* their adaptive capacity (Cannon et al., 2003; Davis et al., 2004; Twigg, 2007) and c) practitioners working within the vulnerability paradigm have incorporated dimensions of exposure *and* capacity in the development of safer communities (Maskrey, 1989; Mercer et al., 2008; Wisner et al., 2004). Thus, the term may connote deficits or weakness, but the work itself has served to emphasise the strengths and capacities of vulnerable groups. Nowhere has this been more evident than in recent work with children, to which the discussion will now turn.

2.5.3   Research with children from the vulnerability perspective

Despite their status as a highly vulnerable group (Cutter, 1995; Hewitt, 1997; Peek, 2008; Wisner et al., 2004; see also Ch.1.2), research with children in the tradition of the vulnerability perspective is still in its infancy. Of the few studies that do exist, all have been conducted in less developed countries where non-government organisations are active in developing and implementing programs

for 'child-centred disaster risk reduction' (CC-DRR) (e.g. Plan International, 2010a, 2010b; Save the Children, 2011). Emerging as a distinct approach to DRR in the last five years, the primary objective of CC-DRR is

> [To] strengthen children's skills so that they understand the risk of disasters in their communities and are enabled to take a lead role in reducing the risks and impacts of potential disasters (Benson & Bugge, 2007, p.9).

CC-DRR has its origins in the community development initiatives of Plan International (2010a; 2010b) and Save the Children (Bensen & Bugge, 2007). Underpinned by a human rights approach to community development and guided by the United Nations Convention on the Rights of the Child (see Ch. 1.2), both of these organisations seek to address the causes of poverty and its consequences for children's lives through participatory approaches that foster empowerment, such as those advocated by Roger Hart (1997).

Plan's work in CC-DRR began with the establishment of school-based children's clubs, where children learned about the various aspects of basic disaster preparedness, such as early warning signals, evacuation planning and drills, and first aid (Plan International, 2010a). Over time, however, and initially without any guidance or support from Plan staff, children began to extend their risk reduction activities beyond the realm of preparedness and into the realm of mitigation and prevention (Mitchell et al., 2008). Save the Children's involvement in CC-DRR similarly began with basic lessons on how to prepare emergency kits and what to do in the event an emergency (e.g. hiding under a desk in an earthquake or seeking higher ground in a flood), but as children's capacities and enthusiasm for DRR became apparent, the lessons evolved into more comprehensive disaster management programs covering all phases of the DRR cycle (Bensen & Bugge, 2007; Nikku et al., 2007). At present, CC-DRR, as practiced by Plan International and Save the Children, involves a range of child-centred activities aimed at increasing children's resilience to disasters, including:

i. Workshops that enhance familiarity with the concepts and terminology of DRR and the roles that they play in reducing disaster risk (Bensen & Bugge, 2007; Mitchell et al., 2008; Haynes, Lim-Mangada, Akhmady & Roquino, 2010; Mitchell et al., 2009; Nikku et al., 2007).

ii. Lessons in how to complete vulnerability and capacity assessments for various types of hazards (Bensen & Bugge, 2007; Haynes et al., 2010b).

iii. Training in the development of hazard awareness raising campaigns using a variety of media that fully engages the community with an emphasis on excluded and marginalised groups (Bensen & Bugge, 2007; Haynes et al., 2010b).

iv. Knowledge and skill building activities aimed at improving chances of survival before, during, and after a disaster (Bensen & Bugge, 207; Nikku et al., 2007).

v. Collaborative projects between children, communities and government with a focus on establishing and strengthening hazard mitigation strategies and preparedness plans (Bensen & Bugge, 2007; Haynes et al. 2010b).

vi. Training in the assessment and evaluation of CC-DRR project outcomes (Bensen & Bugge, 2007).

To date, the only studies of children's knowledge to be conducted from the vulnerability perspective have been aimed at developing an evidence-base for the improved development and implementation of CC-DRR programs, specifically those run by Plan International. In a series of studies conducted in Plan sponsored villages in El Salvador, Indonesia and the Philippines, researchers from the Children in a Changing Climate program at the Institute of Development Studies (IDS) have employed the participatory and qualitative methods that characterise much of the research in the vulnerability tradition to investigate children's perspectives on the causes and consequences of disasters, the actions that can be taken to mitigate or prevent them, and the roles that children can play in this process (Haynes et al., 2010c, 2010b; Mitchell et al., 2008, 2009; Tanner & Gamborit, 2007). Whilst these studies have been largely descriptive in design and content, they have identified several key issues relating to children's knowledge of DRR, each of which has important implications for research in this field.

Firstly, a general finding across the IDS studies was that children and young people could readily identify a wide range of extreme natural events to which their villages could be exposed and understood that these events had the potential to impact adversely on their households and communities (Haynes et al., 2010b, 2010c; Mitchell et al., 2008). Children were also aware of how human activities were increasing their exposure to extreme events. For example, children in Petapa in El Salvador described how burning hillsides to clear them for cultivation was increasing the landslide risk for the houses below (Mitchell et al., 2009).They also recognised how the everyday dumping of litter was blocking waterways, increasing the risk of mosquito borne diseases and flooding (Mitchell et al., 2008). Similarly, children in Northern Java in Indonesia were aware of how drought could be caused or exacerbated by poor water resource management, not just by a lack of rainfall (Haynes et al., 2010c). Awareness of the natural *and* human determinants of hazards and disasters was also demonstrated in mind-mapping exercises in which children identified both 'physical things' (e.g. the weather, the river, steep slopes, fires, wind) and 'human things' (e.g. flimsy houses, lack of love, corrupt police, no telephones, no fire brigade, a lack of knowledge) as key determinants of disasters (Mitchell et al., 2008).

Perhaps most importantly, however, children participating in the IDS studies also demonstrated knowledge of the more complex social and economic issues that can exacerbate hazard exposure (Haynes et al., 2010c). For example, one 11-year-old girl in Northern Java knew that rock mining on

the hillsides near her village was increasing the risk of landslides. However, as demonstrated in the following extract, she also recognised that during periods of drought, her family's livelihood was entirely dependent on the rock mining trade:

> Sometimes my father goes rock mining and this can cause a landslide but it also means he gets money and this is good for our family and our village. When the crops die in the drought we need to get money from rock mining (Haynes et al., 2010c, p.8).

Thus, children were able to articulate an understanding of how hazards and disasters were embedded in the everyday life of their households and how economic and social pressures can result in people having little choice but to engage in activities that could potentially increase their exposure to stresses and shocks (Hewitt, 1997; Wisner et al., 2004). At this point, it is worth noting that none of the IDS studies found any evidence of children attributing earthquakes or other extreme events to supernatural causes. Indeed, several 11-year-old boys in Northern Java demonstrated a sophisticated understanding of tectonic plates and their role in earthquakes: unfortunately, however, the scope of the study meant that this knowledge could not be explored in detail (Haynes et al., 2010c).

It is also worth noting that one of the IDS studies found qualitative differences between adult and child perspectives on disaster risk (Mitchell et al., 2008). In southern Leyte in the Philippines, adults were most concerned about day-to-day hazards such as road accidents, drowning, illness, and house fires, whilst children were more concerned about higher magnitude, less frequent events, such as landslides and typhoons (Mitchell et al., 2009). Thus, children may not have the same fears or concerns about risk or endangerment as their parents, which highlights the importance of enabling children to voice their own perspectives on risk and articulate those things that are of most concern them.

The IDS studies also provide evidence relating to children's knowledge of how hazards and disasters can be mitigated or prevented. Many children were aware of how effective emergency response can reduce the impacts of hazards during a crisis and they suggested a variety of things they could to enhance emergency response, including warning landowners to evacuate their animals from floodplains when flood waters are rising (Haynes et al., 2010). Many children also recognised the importance of taking action in advance of a crisis. Across studies, children identified how tree cover on hillsides and riverbanks would prevent the risk of landslide or flood and suggested undertaking reforestation projects on the hills and riverbanks around their villages (Mitchell et al., 2008; Haynes et al., 2010c). In Northern Java, where wildfire hazards were a particular concern, children suggested implementing a prescribed burning regime around the village in order to protect houses and livestock (Haynes et al., 2010c).

With regards to children actually implementing risk reduction strategies, the IDS research suggests that social context plays a crucial role. A common complaint amongst children was that parents and other adults in the community did not support their participation in disaster reduction, which constrained their capacity to act. For example, Mitchell et al. (2009) found that children in Southern Leyte in the Philippines exhibited a sophisticated understanding of how to reduce disaster risk and felt that they had the capacity to make a substantial contribution to DRR in their community. However, their participation in DRR activities had been curtailed by their exclusion from family decision-making processes and a strict adherence to the cultural tradition of deferring to the authority of parents and other adults. A similar finding emerged in El Salvador where traditional hierarchical social structures, and the additional constraint of insecure livelihoods, were making it difficult for children to participate in decision-making about DRR at both a household and community level (Mitchell et al., 2009). From these initial findings it is clear that CC-DRR initiatives cannot focus on children in isolation but must be seen in the context of the family and the broader community.

It must be noted that some children in the IDS studies doubted their own capacities for DRR. On the Indonesian island of Flores, for example, children initially responded to questions about their participation in CC-DRR activities with "We're too small to reduce disaster risks" (Haynes et al., 2010c, p.23). However, further investigation revealed that children were already playing a substantial role within the household: they were responsible for the care of livestock; obtaining drinking water from the river; collecting firewood from the forest; taking care of younger brothers and sisters; and undertaking typical chores, such as cleaning the house and preparing meals. Upon reflection children were able to recognise that, in many ways, taking action to reduce disaster risk would be a simple extension of their existing roles and responsibilities. As one group of children explained:

> We can choose which trees to cut when we go to collect the fire wood either after school
> or during holidays. We can also plant trees and not burn the forest (Haynes et al., 2010c,
> p.23).

A final element of social context that was found to exert a powerful effect on children's perceptions of their own capacities was related to traditional gender roles. In some research locations, such as Northern Java, girls were viewed by boys and adults as being less capable of DRR than boys. Moreover, the girls themselves tended to agree with this view. Girls were generally considered to be indecisive, physically weak, and too emotional to engage in the tasks of DRR: they were, however, considered to be better communicators and more patient than boys, which were viewed by the children as useful qualities in the aftermath of disaster. Thus, the gendered dimension of hazards and disasters that has been so thoroughly documented in the adult-based literature (c.f. Enarson & Morrow, 1998) may also be an issue amongst child populations. Once again, this highlights the importance of research methods that allow the subtleties and nuances of everyday life to emerge from the data.

Taken together, the findings of these initial empirical explorations provide some important insight into children's knowledge of hazards, disasters, and DRR. They also demonstrate how social context can influence the translation of this knowledge into action. Most importantly, however, these studies highlight the crucial importance of participatory, qualitative methods that allow children's own knowledge and perspectives to emerge. It is only through flexible, context-sensitive methods that children can define what hazards and disasters mean to them and convey how these phenomena manifest in their everyday lives. It is unlikely that even the most astutely designed quantitative survey could have tapped the complexity and local specificity that characterises the emergent findings of the IDS work.

Whilst the IDS research provides valuable insight into children's knowledge and experience of DRR, the work lacks in-depth conceptual and theoretical analyses of how children conceptualise the conditions and processes that both cause and prevent hazards and disasters. Whilst children may have expressed knowledge of the relationships between tectonic plates and earthquakes, rock mining and landslides, or deforestation and flood risk, the research did not reveal their knowledge of the specific mechanisms or processes that cause or prevent hazard impacts. The work is also largely descriptive and therefore more research is needed to provide theoretical explanations as to how children conceive the hazards and disasters and the processes through which their knowledge is constructed. Furthermore, notwithstanding passing references to the role of prescribed burning in reducing bushfire risk, these studies were largely focussed on geological, hydrological and meteorological hazards (i.e. earthquake, flood, typhoon) and hence, children's knowledge of bushfire hazards and disasters remains largely unexplored. The IDS work also tended to involve older children and young people with the average age of participants ranging from 11 to 16 across the various studies. Thus, there is a need for additional research that examines the knowledge and perspectives of younger children. Lastly, the IDS work has been conducted solely within the socio-cultural context of collectivist societies in less developed countries. Thus, there is a need to examine the knowledge and perspectives of children growing up in other socio-cultural and economic contexts.

2.6   Bushfire risk reduction in south-eastern Australia

2.6.1   Socio-ecological characteristics of the hazard

Bushfires are an inevitable occurrence in south-eastern Australia and have been for thousands of years (Bradstock, Williams & Gill, 2002). Charcoal records in sediments demonstrate that this region has been host to relatively constant fire activity over the whole of the Holocene period (i.e. the last 10,000 years) (Kershaw, Clark, Gill & D'Costa, 2002). Over this long history of regular burning, the landscape has become highly adapted to fire and fire has come to play a fundamental and irreplaceable role in sustaining many of south-eastern Australia's natural ecosystems (Bradstock et al., 2002; Luke & McArthur, 1978; Lucas et al., 2007; Whelan et al., 2006). For example, the seedlings of many tall eucalypt species are so small that they cannot survive in the deep beds of organic matter that

accumulate on the forest floor. In order to grow they require an intense fire that removes this organic matter. If eucalypt forests are not exposed to fire within their 250 to 300 year life span, they die (Cheney, 1995).

In Australia, bushfire is most common in the tropical savannahs of the Northern Territory where enormous areas burn on an annual basis (CSIRO, 2009). However, the most severe fire weather occurs in the country's south-eastern corner (Cheney, 1995; Lucas et al., 2007). This area experiences a so-called 'Mediterranean climate', with mild, wet winters and hot, dry summers. The former promotes fuel growth in the forests, while the latter allows the fuel to dry out, making it highly flammable (Lucas et al., 2007). Another weather element critical to the magnitude and aerial extent of bushfires in south-eastern Australia is the typical summer wind pattern. When a vigorous cold front approaches a slow moving high in the Tasman Sea, it drives hot, strong, north-westerly winds from the centre of the continent (BOM, 2009). As the cold front passes it causes a sudden south-westerly wind change that abruptly turns the flank of a long, narrow cigar shaped fire into a fire front several kilometres wide (BOM, 2009; Tolhurst, 2009). The scale of losses on Black Friday, Ash Wednesday, and Black Saturday were all attributed, at least in part, to this characteristic late south-westerly change (Miller et al., 1984; Stretton, 1939; Teague et al., 2010).

As noted earlier, environmental hazards derive from the interaction of natural and social systems and whilst bushfires are sometimes referred to as hazards, they are only hazardous insofar as they threaten human life, assets, infrastructure and other things that people value (Burton et al. 1978; Hewitt 1997). There are several ways in which the social and human systems of south-eastern Australia are interacting with the bushfire prone environment to create bushfire hazards. For the most part, these are associated with the changing nature of traditional land use and settlement patterns (McLeod et al., 2004). Firstly, rural decline has led to fewer Australians living in rural areas (Luck, Black & Race, 2011; Nelson et al., 2010a; Nelson et al., 2010b). Hence, there has been a decrease in the membership of rural fire brigades, and the high level of local bushfire knowledge and experience that used to characterise rural areas has deteriorated (Ellis et al., 2004; Teague et al., 2010). Meanwhile, population growth around larger cities and amenity-led migration[6], especially in coastal areas, is lengthening the rural–urban interface[7] and there is general agreement that knowledge and experience of bushfire in these areas tends toward the lower end of the spectrum (Eriksen, Gill & Head, 2010; Gledhill, 2008; Lowe, Haynes, & Byrne, 2008; Ellis et al., 2004). A further factor exacerbating the hazard are the ever increasing rents and property prices in major cities, which are forcing lower

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[6] Amenity-led migration refers to the increasing urban-to-rural movement of people predicated on desires for lifestyle change and the attraction of natural/or coastal environmental settings (Burnley & Murphy, 2004 cited in Eriksen, 2010).

[7] Rural-urban interface areas exist wherever homes and other developments are intermixed among trees and other combustible vegetation. The rural-urban interface or peri-urban developments in Australia are also known as the wildland-urban interface when referring to the equivalent in North America.

income groups out of metropolitan areas and into the more affordable, albeit more bushfire prone, regional centres (Luck et al., 2011; Ragula, 2011).

As can be seen in Table 2.1, bushfire disasters have occurred in south-eastern Australia with striking regularity. According to the Australian Attorney-General's Department Disasters Database (Australian Government, 2011), bushfires in south-eastern Australia have killed over 800 people and injured more than 9,000 others. In terms of economic losses, the average annual damage bill from disastrous bushfires in this region is estimated at $77 million (BTE, 2001)[8].

Table 2.1: Significant bushfires in south-eastern Australia 1900–2008

Date	Areas affected	Homes destroyed	Fatalities
February 14, 1926	Victoria	550	39
January 8–13, 1939 "Black Friday"	Victoria and NSW	650	79
Various fires over the summer of 1943–1944	Victoria	885	46
February 7, 1967	Hobart, Tasmania	1557	64
January 8, 1969	Lara, Victoria	230	21
February 16, 1983 "Ash Wednesday"	Victoria and South Australia	2253	60
February 18, 2003	ACT	530	4
January 11, 2005 "Black Tuesday"	Eyre Peninsula, South Australia	93	9
February 7, 2009 "Black Saturday"	Victoria	2029	173

Source: adapted from Haynes et al. (2010a).

The substantial losses resulting from bushfires in south-eastern Australia over the last 100 years have made bushfire risk reduction a key focus of emergency management agencies. The devastating losses of Black Saturday, combined with predictions that fire weather in this region will become more extreme as a result of anthropogenic climate change, have served to sharpen this focus even further (CSIRO & BoM, 2007; Parry et al., 2007; Lucas et al., 2007; Bowman et al., 2009). However, as the following discussion will reveal, implementing effective bushfire risk reduction and keeping communities safe from hazardous bushfire events is proving a significant challenge.

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[8] This figure does not include the financial losses caused by the large number of small-scale bushfire events that occur every year.

2.6.3   Approaches to bushfire risk reduction

Bushfire risk reduction in south-eastern Australia generally involves a combination of four core approaches: land and fuel management; fire-suppression; building and planning regulations; and community education.

Land and fuel management

The main purpose of prescribed burning is to make people and communities safer by reducing combustible fuel. A second purpose is protecting flora and fauna from the consequences of destructive bushfire by preferentially applying prescribed burning in the environment. In both Victoria and Tasmania, the main focus of attention for prescribed burning is public land managed by the State, such as national parks, state forests and reserves. Prescribed burning is notoriously controversial and whilst a full discussion of the issues are beyond the scope of this thesis, it should be noted that the community is deeply divided on its role in biodiversity and its effectiveness in reducing fire spread and severity (Gill, 1981, 1994; Whittaker & Mercer, 2004). Prescribed burning, or the proposed lack thereof, also figures prominently in the civil action cases that are becoming more and more commonplace in the aftermath of Australian bushfire disasters (Eburn, 2009).

The effectiveness of prescribed burning in mitigating bushfire hazards was reviewed in detail by the 2009 Victorian Bushfires Royal Commission. Drawing on the available literature and the testimony of expert fire ecologists, the commission concluded that 'properly carried out, prescribed burning reduces the spread and severity of fires' (Teague et al., 2010, p.278). Whilst a lack of data prevented expert witnesses from making any definitive statements regarding the role of prescribed burning in the spread and severity of the Black Saturday fires, the Commission determined that the amount of prescribed burning occurring in Victoria had been insufficient to significantly reduce the bushfire risk and recommended that Victoria introduce a long-term, robust prescribed burning program (Teague et al., 2010).

Land use planning and building regulations

Where people live, the standard of the buildings in which they live and how those standards are maintained are critical factors affecting people's exposure to bushfire hazards (Teague et al., 2010). Indeed, the 2004 report of the National Inquiry on Bushfire Mitigation and Management cited land use planning as 'the single most important mitigation measure in preventing future disaster losses in areas of new development' (Ellis et al., 2004, p.90). Land use planning can reduce bushfire risk in several different ways: it can provide for the development of safe evacuation routes; it can make it easier for firefighters to defend private properties under threat by imposing access and water supply requirements; and it can restrict inappropriate developments from going ahead in high risk areas where people would be exposed to unacceptable levels of risk (Ellis et al., 2004; Teague et al., 2010).

Building regulations also play an important role in reducing the risk by imposing minimum building standards on new developments. Maximising a home's capacity survive a bushfire is important, both for people who choose to stay and defend and for those who have their plans to leave thwarted by a lack warning or some other contingency (AFAC, 2010; CFA, 2011). It can also help minimise the personal, social and economic costs associated with the widespread destruction of homes (Teague et al., 2010). Research on how houses ignite and burn down has made significant progress over the last decade and there is now a solid evidence base for the development of building regulations that maximise house survivability and thereby reduce the risk of house loss, death and injury (Blanchi & Leonard, 2008). Most states in Australia have legislative frameworks that apply to the construction of new homes or other buildings in bushfire prone areas and these are generally enforced by way of building permits and planning schemes (e.g. Victorian Building Commission, 2011; Tasmanian Planning Commission, 2011).

Whilst land use planning and building regulations are an integral part of bushfire risk reduction, they are limited in the extent to which they can reduce hazard exposure in high risk areas where development has already gone ahead. Over the decades, many developments have been approved in areas of extreme bushfire risk and new land use planning and building regulations can only reduce the risk in these areas when approval for building alterations or land reconfiguration is sought (Ellis et al., 2004; Teague et al., 2010). This means that altering existing land use and retrofitting existing buildings to meet new standards is in the voluntary domain of residents and, as was argued earlier in this chapter, it cannot always be assumed that people will have the economic resources or freedom of choice to implement land-use changes or adopt building upgrades (Hewitt, 1997). It must also be noted that the unpredictable nature of fire makes it impossible to guarantee that any building will survive a bushfire, so even the strictest land use planning and building regulation schemes can never fully negate the risk, which means that people still need to have well developed emergency plans (Teague et al., 2010; Blanchi & Leonard, 2008),

Fire-suppression
Fire-suppression refers to the firefighting tactics used to extinguish flames and areas of heat with the aim of protecting human life, assets and natural wilderness. Fire-suppression takes two main forms: direct attack and indirect attack. Direct attack is undertaken by ground or aerial firefighting crews who wet, smother, or chemically quench the fire or physically separate it from unburnt fuel. Indirect attack is similarly undertaken by ground or aerial firefighting crews and involves the employment of pre-emptive tactics usually some distance away from the oncoming fire. These tactics primarily involve contructing fuel breaks or containment lines by back-burning, reducing the flammability of unburnt fuels with fire retardant or water, and physically removing combustible material with tools and earth moving equipment (CSIRO, 2000; Plucinski et al., 2007).

In collaboration with fire scientists, fire agencies have become very effective in reducing the incidence, aerial extent and intensity of bushfires through the use of the various suppression tactics and techniques (CSIRO, 2000; McCarthy & Tolhurst, 1998; Plucinski et al., 2007). However, under extreme weather conditions, such as those that arose on Black Saturday, the effectiveness of suppression is severely compromised: changing winds may cause fires to change direction and miss containment lines or containment lines might be breached by windborne sparks and embers (Teague et al., 2010). Moreover, state fire agencies often lack the resources required to protect every life, home, or asset under threat and their standard advice to residents is 'do not expect a fire truck to help you defend your home' (CFA, 2011, p.52). Accordingly, fire agencies encourage people who plan to defend their properties to be self-sufficient and instruct people who are unprepared or incapable of defending their property without assistance from firefighters to relocate early to a safe place well away from the fire's expected trajectory (CFA, 2011; TasFire, 2011; NSW RFS, 2011; CFS, 2011). This constitutes the basic tenet of the fourth and final approach to bushfire risk reduction in Australia, community safety.

Community safety

The general philosophy underlying the community safety approach to bushfire risk reduction is that those at risk should play an active role in managing and reducing their risk (Handmer & Haynes, 2008). This distinctly participatory approach is gaining increasing emphasis and acceptance in the broader bushfire risk management framework (Handmer & Haynes, 2008). Historically, however, it has been overshadowed by the more technical approaches risk reduction, fire suppression and prescribed burning, in particular (Teague et al., 2010; Rhodes, 2008). This relative lack of emphasis on community safety needs to be understood in the broader socio-historical context of Australian emergency management. As Enders (2000) points out, in Australia, emergency management has traditionally been viewed as the sole responsibility of government agencies whose primary focus has been on responding to extreme events when they occur and providing support and assistance to victims in the aftermath. Households and communities, meanwhile, have been viewed as passive recipients of agency support and assistance. With its focus on response and recovery and the relegation of residents to receivers of expert help, this model of disaster reduction has deep roots in the technocratic doctrines of the hazards perspective (see section 2.4).

More recently however, the focus on agency-based response and recovery has been identified as neither appropriate nor sustainable because agencies do not have the resources to provide complete protection for every home or every life. Thus, agencies have expanded their role into the realms of community-based mitigation and preparedness (Enders, 2001: Neilsen & Lidstone, 1998; Reinholdt, Rhodes, & Scillio, 1999; Rhodes & Reinholdt, 1999 cited in Rhodes, 2003; Tarrant, 1998). This represents an important move away from managing hazards *for* the community to managing hazards *with* the community (Enders, 2001; Tarrant, 1998) - an approach which is has been

strongly advocated by proponents of the vulnerability perspective (Hewitt, 1997; Maskrey, 1989; Twigg, 2004; Wisner et al., 2004).

Australian fire agencies have been amongst the fastest to recognise the value of a community-based approach to emergency management and have developed comprehensive community safety programs to complement the strategies of prescribed burning and fire suppression (Gledhill, 2008; Lowe et al., 2008; Handmer & Haynes, 2008). The general position taken by Australian fire agencies has been clearly articulated by the Australasian Fire and Emergency Service Authorities Council (AFAC) in a position paper titled 'Bushfires and Community Safety' (Killalea & Llewellen, 2010). Consistent with the broader progression toward community-based DRR, this paper states that:

> [E]ngaging with communities, sharing responsibility with them and building their capacity to prepare for, respond to and recover from bushfires will be a critical component in reducing loss of life and reducing broader social, economic and environmental impacts of bushfires across Australia (Killalea & Llewellen, 2010, p.7).

The centrepiece of bushfire community safety in Australia is the 'stay and defend or leave early' policy, colloquially known as 'stay or go'. Unique to Australia, this policy is based on evidence from post-incident investigations of major hazard events and other empirical studies which have revealed that a) people are more likely to be killed by radiant heat or a vehicle accident while evacuating, and b) well-prepared houses can be successfully defended from bushfires and can provide safe refuge for people during the main passage of the fire front (Blanchi & Leonard, 2008; Handmer & Tibbits, 2005; Lazarus & Elley, 1984; Leonard, 2003; Leonard & McArthur, 1999; McArthur & Cheney, 1967; Miller et al, 1984; Tibbits et al. 2008; Wilson & Ferguson, 1984). The stay or go policy is articulated in the AFAC position paper as follows:

> People living in bushfire-prone areas need to decide in the months, weeks and days before a bushfire occurs if they are going to leave for a safe place if a bushfire threatens, or stay and defend their property…[and] regardless of their decision to leave early or stay and defend, people need to prepare to ensure they will be safe when a bushfire threatens (Killalea & Llewellen, 2010, p.8-9).

Preparing a property for bushfire generally requires managing vegetation and creating defendable space, as well as undertaking house maintenance and improvements. The former involves removing all fuel within 10 metres of the house, removing all trees and large shrubs within 30 metres of the house, keeping lawns short, and keeping wood piles away from the house (CFA, 2011). The latter involves installing sarking (reflective non-combustible sheeting) in the roof, sealing any gaps in the roof, doors or windows with compressed mineral insulation or fire retardant sealant, installing bushfire sprinklers, installing wire mesh screens on doors and windows, installing metal shutters over both windows and window and frames, and using non-combustible materials for decking or separating

decking from the main structure of the house (CFA, 2011). In addition to these measures, residents are strongly encouraged to take out adequate home and contents insurance (CFA, 2011)..

In addition to preparing their properties, residents are advised to make detailed plans for staying or going. Planning to go requires identifying when to leave, where to go, when to return and what to do if leaving is not possible. Planning to stay and defend, by contrast, is a more complex, time consuming, and often costly process. Residents need to ensure that that they have 10,000 litres of water for firefighting purposes. They also need to acquire a firefighting pump, firefighting hoses, protective clothing, buckets, mops, ladders, blankets and towels, torches, a battery powered radio, shovels and rakes, firefighting knapsacks, and downpipe or gutter plugs. Enabling firetruck access onto and off the property is also a necessity. Residents then need to plan precisely how they will respond to various levels of threat including a high fire danger day, a fire in the area, and a fire approaching or impacting on the property. The process of staying to defend are covered in detail elsewhere (c.f. CFA, 2011; Tasmanian Fire Service, 2011); suffice to say here that staying to defend can be extremely challenging, both physically and emotionally, and residents need to be confident that they are both able-bodied and mentally prepared to work in difficult and dangerous conditions (CFA, 2011).

Following the Black Saturday tragedy, in which 173 civilians were killed, the stay or go policy came under intense scrutiny for two main reasons: 1) many people died whilst trying to defend their homes; and 2) many people died because they had not left early enough (Paver, 2009; Donovan, 2009; Teague et al., 2010). However, in a detailed examination of the policy's strengths and weaknesses, the Victorian Bushfires Royal Commission concluded that the basic tenets of the policy were sound and the problems were ascribed to its implementation (Teague et al., 2010). The empirical evidence examined by the Commission indicated that in many of the fire affected areas, the stay and defend or leave early message had either been misinterpreted or had not been duly adopted at the individual or household level (Teague et al., 2010; Whittaker & Handmer, 2010; Handmer et al., 2010). This problem was attributed to the failure of public education programs to effectively engage the community and accommodate the specific needs and circumstances of residents (Teague et al., 2010).

The failure of public education programs to effectively engage the community has been repeatedly identified in previous post-bushfire analyses and inquiries and has been ascribed to the dominance of top-down approaches involving the dissemination of information from fire agencies to the public via radio and television advertisements, brochures and flyers (Boura, 1998; Boura et al., 1995; Ellis et al., 2004; Miller et al., 1984; Petris, 1995; Rhodes, 2008; Wilmoth, 1992). As noted earlier, this approach to public education is based on the unwarranted assumption that hazard perceptions and knowledge of adjustments are in some way linked to adjustment adoption (see section 2.4.3). As with top-down education for other hazards, this approach to educating the public about bushfire risk reduction has

garnered little support. For example, when Beringer (2000) studied the influence of a top-down information campaign on levels of preparedness in the high-risk Melbourne suburb of North Warrandyte, he found that knowledge and awareness of local bushfire hazards did not lead to preparedness and that top-down approaches to public education (e.g. pamphlets, advertisements) 'require a great deal of reinforcement before they produce any significant change in perception or behaviour' (Beringer 2000, p.14). Several more recent studies on bushfire preparedness have confirmed Beringer's (2000) findings: that is, knowledge and awareness of bushfire hazards does *not* imply preparedness (Faulkner, McFarlane, & McGee et al., 2009; Jakes et al., 2007; McCaffrey, 2004). Yet, most of the work on household preparedness for bushfires has been conducted from the hazards perspective using hypthetico-deductive methodologies and quantitative survey methods and scientific knowledge regarding *why* people fail to prepare in spite of risk awareness has been left wanting.

More recently, however, a new wave of research using approaches more closely aligned with the assumptions of the vulnerability perspective has provided important insights into why people are not sufficiently prepared for bushfire events (Brenkert-Smith, Champ & Flores, 2006; Brenkert-Smith, 2006, 2010; Collins, 2005, 2008, 2009; Eriksen, 2010; Eriksen & Gill, 2010; Eriksen, Gill & Head, 2010; Eriksen, Gill & Bradstock, 2011; Eriksen & Prior, 2011; Prior, 2010; Prior & Paton, 2008; Proudley, 2008; Whittaker, 2009; Whittaker, Handmer & Mercer, 2012). Two of these studies have particular import for the current research: 1) Eriksen and Gill's (2010) study of bushfire mitigation and preparedness in new rural landscapes in New South Wales; and 2) Prior and Paton's (2008) study of a major bushfire crisis on the east-coast of Tasmania.

In their study of new rural landscapes, Erikson & Gill (2010) examined the gap between bushfire awareness and preparedness amongst amenity-led migrants in southern New South Wales. By adopting the stance that bushfire hazards derive from social, economic and cultural processes, this research highlighted how experiences of place, culture, and context mediate how diverse types of landowners relate to bushfire. Whilst landholders generally had high awareness of local bushfire threats, the degree to which they engaged in bushfire mitigation and preparedness was influenced by three major everyday dilemmas, time, money and lifestyle: the high financial cost of machinery (e.g. tractors, chainsaws), firefighting equipment (e.g. hoses, pumps, water tanks) and building improvements (e.g. mesh screens on doors and windows, fire resistant paint) was weighed against available economic resources; the time required for learning about and implementing fire management plans was weighed against other commitments to work and family; and the clearing of trees and bushland was weighed against attachment to the landscape and lifestyle preferences.

Issues relating to gender were found to complicate the dilemmas of time, money and lifestyle even further. Despite the influx of diverse lifestyles and values into the new rural landscapes under

investigation, the traditional gendered dimensions of emergency management as 'men's business' remained firmly intact (cf. Enarson and Morrow, 1998; Fordham, 1998; Fothergill, 1996; Hoffman, 1998; Proudley, 2008). Women consistently spoke of relying on the knowledge and ability of men for bushfire management, and whilst women often knew that their property was equipped with pumps, hoses, sprinklers and other fire fighting equipment, they did not know how to implement such systems of defence. Women also acknowledged that they viewed day-to-day maintenance (e.g. keeping gutters clear of leaves, removing fallen trees, setting up and maintaining pumps) as the responsibility of husbands, sons or other male family members. Taken together, these gendered dimensions of bushfire management limited the transfer of knowledge between household members, undermining the extent to which women engaged with mitigation and preparedness activity.

Prior and Paton's (2008) study of the 2006 bushfire crisis on the east coast of Tasmania also emphasises the importance of understanding bushfire mitigation and preparedness from the perspectives of residents. In their study of human responses to the crisis, these authors found that inconsistencies between fire agency pronouncements and community knowledge and expectations played a major role in residents' protective actions, or lack thereof. Firstly, whilst most residents had engaged in some form of preparedness before the fire arrived, most of this activity had taken place in response to the presence of proximal cues (e.g., visibility of flames coming their way) as opposed to warnings and messages disseminated by the by fire agencies. In some cases, this meant that residents had only 30 minutes to prepare before the fire reached their properties.

Residents' reticence in regard to early preparedness and warning response was traced to the influence of two situational characteristics. Firstly, residents had expected warnings from fire agencies to advise them specifically about what to do and when to do it, whereas fire agencies had expected people to start preparing in response to the public education program that had been launched at the beginning of the fire season. Consequently, peoples' actions often ran contrary to the messages outlined in the 'Prepare to Survive' DVD, which states that individuals should plan (at the start of the season) whether to 'stay and defend' or 'leave early'. It was found that many residents had not watched this DVD before the crisis. This was not because people did not perceive fire safety issues as important. Rather, the timing of the formal public education program had failed to accommodate the salience of fire safety for people. That is, fire safety messages had competed with more pressing issues in peoples' lives, such as healthcare and employment, which meant that it had taken the presence of proximal cues for people to act.

Secondly, there was a pervasive misconception within the community regarding the potential severity of bushfire. When relating their experiences, residents reflected on how ill-prepared they were in the face of such an extreme bushfire situation. This was particularly consequential for the more recent arrivals to the area. Residents referred to experiences they had with bushfires in their youth (up to 40

years ago), where they fought a bushfire with branches or wet Hessian sacks and these experiences had influenced their perception of how severe bushfires can be and how they can they can be fought. Residents were also unfamiliar with how rapid changes in wind speed and wind direction can increase the level of threat extremely quickly. This lack of knowledge had caused residents to believe that they would be able to defend their homes without implementing significant preparations and that these preparations could be implemented upon the observation of proximal cues, such as smoke and flames. As such, respondents remained with their homes in a situation where they should probably have left. One resident in this situation, realising that his preparations would be ineffectual, fled on foot from his home with his wife, whose shoe was scorched by the fire as they ran. Other residents had packed their cars with important possessions, in case attempts to defend were unsuccessful and a last minute evacuation had to be initiated. Prior and Paton (2008) refer to this behaviour as 'hedging bets': that is, people make the decision to defend their home, but have the car ready to go just in case unforeseen contingencies arise. This kind of decision-making also figured prominently in Tibbits and Whittaker's (2007) study of the 2003-2004 Victorian bushfires and has been recognised as a major factor undermining the effectiveness of the stay or policy (Teague et al., 2010).

The findings emerging from this recent work demonstrate the critical importance of studying bushfire hazards from the perspectives of the people who live them. It is only through these kinds of analyses that researchers and fire agencies can gain a clearer picture of how the social system interacts with bushfire to create or ameliorate bushfire hazards. As Eriksen and Gill (2010) argue, attributing low levels of knowledge and preparedness to wilful ignorance or complacency is highly problematic because people's preparedness knowledge and behaviour is powerfully mediated by the socio-ecological contexts in which they live their day to day lives and the meanings that emerge from their own lived experience. By studying how preparedness messages and emergency warnings are interpreted from the perspectives of ordinary people, the work of Prior and Paton (2008) and Eriksen and Gill (2010) has offered important insights into a problem that has concerned and perplexed fire agencies and other emergency managers for many years. That this insight was provided through the adoption of hermeneutical, qualitative approaches has particular import for the current research and points to the vulnerability perspective as the appropriate frame through which to conduct a study of children's knowledge of bushfire hazards and disasters.

2.6.4.   Children's roles and perspectives

As argued in Chapter 1, children have not figured prominently in traditional models of DRR and until very recently, children have not featured as a major priority in the community bushfire safety frameworks of Australian government agencies (Teague et al., 2010). Although Australian fire services have been delivering fire safety programs to primary school students for many years, the focus of these programs has tended to be on house fire safety. For example, the aim of Tasmania's 'School Fire Education Program' is to 'promote to all Tasmanian primary school children an

awareness of fire safety and what to do if fire breaks out in the home' (Tasmanian Fire Service, 2011). The now defunct 'Brigades in Schools'[9] program developed and delivered by the CFA similarly prioritised house fire over bushfire and whilst topics relating to bushfire were included in the program materials, these accounted for a only a small proportion of overall content. Moreover, substantive content relating to bushfire was only included in the programming for the upper primary school levels (i.e. grades 3-6).

Given that children are more likely to be killed or injured in a house fire than a bushfire, prioritising house fire safety in this way is both understandable and justified (ABS, 2005; Haynes et al., 2008b). However, since this research began in 2006, there has been a profound policy shift in regards to children's bushfire education and, as this thesis goes to print, new policies relating to children's bushfire education are being implemented across south-eastern Australia in anticipation of the 2011/2012 bushfire season. This shift can be wholly attributed the tragedy of Black Saturday and the subsequent Victorian Bushfires Royal Commission which identified bushfire education for children as a key strategy in the development of safer communities (Teague et al., 2010). Whilst governments have failed to act on previous recommendations for bushfire education in schools, the gravity of the Black Saturday disaster has compelled governments across south-eastern Australia to ensure that bushfire education is incorporated into the formal school curriculum (Victorian Department of Education, 2011). It has also compelled fire agencies to ensure that bushfire education is made a higher priority in their existing school-based fire safety programs (S. Barber, personal communication, 2010; CFA, 2011).

However, as has been argued throughout this chapter, education programs that fail to accommodate the existing knowledge and interpretive processes of recipients are unlikely to enhance people's understanding of bushfire hazards or the risk reduction process. Furthermore, education programs that fail to attend to the broader social, economic, and political context in which people live their daily lives are unlikely to have a positive effect on people's behaviour. Whilst recent research has begun to shed light on how these factors influence the decision-making processes and behaviours of adults living in bushfire prone areas, no research of this nature has been conducted with child populations. To date, all bushfire research with children, both in Australia and internationally, has focussed on their post-fire emotional adjustment, with a particular emphasis on PTSD symptomology and behavioural problems. Whilst this research is crucial for the development of sound, evidence-based policies and programs for children's post-fire recovery, it does not provide the conceptual or theoretical insights that are critical to the development of bushfire education programs that accommodate children's knowledge, experience or interpretive processes. Nor does it increase understanding of how the social, economic or political contexts of children's everyday lives influence

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[9] The Brigades in Schools program was current at the time of data collection but has since been replaced by 'Fire Safe Kids' (CFA, 2011).

their knowledge development, or the extent to which they can engage in bushfire risk reduction activities. It is only by conducting this research that education programs can fulfil the mandates of the Victorian Bushfires Royal Commission and the Hyogo Framework for Action, which are outlined as follows:

> The State [must] revise the approach to community bushfire safety education in order to: ensure that in content and delivery the program is flexible enough to engage individuals, households and communities and to accommodate their needs and circumstances (Teague *et al.,* 2010, p.54)

> The information should incorporate relevant traditional and indigenous knowledge and culture heritage and be tailored to different target audiences; taking into account cultural and social factors (UN-ISDR, 2005a, p.9).

2.7. A study of children's knowledge of bushfire hazards and disasters

It is clear from this extensive review of the literature that the appropriate way to engage in a study of children's knowledge of bushfire hazards and disasters is from the vulnerability perspective. Whilst the assumptions and methodologies that characterise this perspective are by no means new, it is only recently that research has empirically demonstrated the value of its application to bushfire research. Whilst the hazards perspective - with its focus on the tripartite model of hazard perception, knowledge of adjustment, and adjustment adoption and its reliance on hypthetico-deductive methodologies - has failed to articulate *why* people fail to prepare or *how* they understand the risk, the vulnerability perspective - with its focus on how hazards and disasters constitute, and are constituted by, the practice of everyday life - has provided profound insights into the mechanisms and processes that both facilitate and constrain hazard knowledge and risk reduction behaviour. A study of children's knowledge of bushfire hazards and disaster is also more fully aligned with the moral and ethical assumptions underpinning the vulnerability perspective; specifically, that hazards research must privilege the voices of those who are most at risk. Whilst their strengths and capacities are being increasingly recognised by scholars in the field, children remain one of society's most vulnerable groups.

The following chapter presents a detailed exposition of the philosophical assumptions and theoretical perspectives that underpinned and guided the research. The chapter following on from that explains the methods of data collection, analysis and theory development that were employed in the pursuit of developing a substantive theory that increases understanding of a) children's knowledge of the conditions and processes that cause bushfire hazards and disasters, b) children's knowledge of the conditions and processes that mitigate or prevent bushfire hazards and disasters, and c) how environmental and socio-cultural context facilitates or constrains the development of children's knowledge in these two domains.

CHAPTER 3: PARADIGM OF INQUIRY

What of a truth can that be, which these mountains limit to us,
and make a lie to all the world living beyond them?

- Michael de Montaigne (Hazlett, 1842, p.271)

3.1 Introduction

In 'The structure of scientific revolutions', Thomas Kuhn (1970, p.175) defines 'paradigm' as 'the entire constellation of beliefs, values and techniques, and so on shared by the members of a community'. In practical terms, delineating a paradigm of inquiry involves three separate but interrelated tasks: a) taking a philosophical stance on the nature of reality and how that reality can be known; b) identifying an appropriate theoretical perspective through which to view that reality; and c) selecting a suitable methodological approach for investigating that reality (Guba & Lincoln, 1994). This process directly informs the choice of methods for data collection and analysis: it also determines how results and conclusions deriving from the research should be interpreted (Crotty, 1998; Kuhn, 1970). Thus, in any research endeavour, issues of paradigm are crucial. This chapter discusses the paradigm of inquiry within which this research was conducted and it is organised into three sections. The first section describes the constructivist and social constructionist philosophical frameworks that underpin the research. The second section presents the theoretical perspectives that guided the research: specifically, symbolic interactionism, socio-cultural psychology, the ecology of human development, and the new sociology of childhood. The third and final section introduces the constructivist grounded theory methodology that was employed to address the research aims. Descriptions of the methods of data collection, analysis and theory development are reserved for Chapter 4.

3.2 Philosophical framework

Guba and Lincoln (1994, p.107) define a philosophical framework as 'a set of basic beliefs (or metaphysics) that deals with ultimates or first principles. It represents a worldview that defines for its holder, the nature of the 'world', the individual's place in it, and the range of possible relationships to that world and its parts'. As they point out, these beliefs are basic in the sense that there are no foundational criteria with which to assess their ultimate truth: they must be accepted simply on faith. These beliefs guide and inform every stage of the research process, from the initial framing of research questions to how the findings are interpreted and the conclusions that are drawn (Crotty, 1998). Kuhn (1970) argues that commitment to an *a priori* philosophical framework must precede the generation of knowledge and it is this commitment that makes knowledge possible. Guba and Lincoln (1994) agree that no researcher can conduct research without delineating the philosophical assumptions that inform and guide their approach. What follows, is a detailed exploration of philosophical issues and an explication of the philosophical framework guiding this research.

3.2.1 Ontology and epistemology

Issues of ontology and epistemology are central to any scientific investigation of the natural or social world (Guba & Lincoln, 1994; Kuhn, 1970). Ontology is concerned with the form and nature of reality and asks questions about what can be said to exist (Crotty, 1998). Guba and Lincoln (1994, 2005) identify two major ontological positions that occupy opposite ends of a continuum. At one end, the *realist* position assumes that an objective reality exists and that objects and events have truth and meaning residing within them. At the other end, the *relativist* position holds that reality exists only in the form of mental constructions that derive from the perspectives and experiences of the individuals or groups constructing them: the various constructions are not considered to be more or less 'true' in any absolute sense, just more or less informed or sophisticated (Guba & Lincoln, 1994).

Epistemology is concerned with how we know what we know (Crotty, 1998). It deals with 'the nature of knowledge, its possibility, scope, and general basis' (Hamlyn, 1994, p. 242). Epistemology is important because it provides a philosophical grounding for deciding what kind of knowledge is possible and how we can assess its legitimacy (Maynard, 1994). Lincoln and Guba (1994) identify two major epistemological positions: *objectivism* and *subjectivism*. The objectivist position assumes a realist ontology and views the observer and the observed as independent entities. As Knorr-Cetina (1981, p.1) explains, 'to the objectivist, the world is composed of facts and the goal of knowledge is to provide a literal account of what the world is like'. Gergen (1991, p.91) adds that 'objectivists are deeply committed to the view that the facts of the world are essentially there for study: they exist independently of us as observers, and if we are rational we will come to know the facts as they are'.

The subjectivist position, by contrast, assumes a relativist ontology by denying that there is a reality 'out there', waiting to be 'discovered' (Geertz, 1973, p.15). It asserts that knowledge and truth are not discovered but are created to fit the purposeful acts of human agents. As Schwandt (1994, p.125) puts it:

> Subjectivists are deeply committed to the view that what we take to be objective knowledge and truth is the result of perspective. They endorse the claim that contrary to common sense, there is no unique 'real world' that pre-exists and is independent of human mental activity and human symbolic language.

From this perspective, reality exists only in the form of the meanings we construct to frame and organize our perceptions and experiences (Gergen, 1985).

3.2.2 Positivism and constructivism

The contrasting ontological and epistemological positions on reality and how that reality can be known have informed the two major philosophical frameworks in scientific inquiry: *positivism* and *constructivism* (Crotty, 1998). The philosophical framework of positivism is underpinned by a realist ontology and an objectivist epistemology and asserts that the only authentic knowledge is that which is based on sense, experience, and positive verification (Kuhn, 1970). Positivism has its origins in the

thought of enlightenment philosophers such as Francis Bacon (1561-1626), René Descartes (1596-1650) and later, Auguste Comte (1798-1857). Delanty (2005) identifies five major assumptions that underpin positivist inquiry:

i. The logic of scientific inquiry is same for both the natural and social sciences and hence, there should be a unity of method across these disciplines.

ii. All phenomena are reducible to observable units that correspond directly with the nature of reality and thus, reality can be directly and neutrally observed.

iii. The most appropriate method for studying phenomena is through the development of hypotheses that can be positively verified using the experimental method (i.e. empiricism) which reveals general laws, explains cause and effect relationships and ultimately, enables the prediction of phenomena.

iv. Science must be value-free: politics, morals, or values of scientists must not be allowed influence in any stage of research process.

v. The ultimate goal of science is to develop knowledge that is technically useful, such as cures for disease and new technology.

Historically, positivism has dominated scientific inquiry in both the natural sciences and, to a large degree, the social sciences also (Crotty, 1998). In psychology, the positivist movement was influential in the development of both behaviourism and psychometrics (Tolman, 1992). In the 1950's, however, social scientists began to question the legitimacy of the positivist position and launched a powerful critique of its realist and objectivist assumptions (Guba & Lincoln, 1994). The main crux of this critique was that the human world is fundamentally different to the natural world and therefore it must be studied differently (Patton, 2002). As Patton (2002, p.96) explains:

> Because humans have evolved the capacity to interpret the world and *construct* reality – indeed they cannot do otherwise - the world of human of human perception is not real in an absolute sense, as the sun is real, but is 'made up' and shaped by cultural and linguistic constructs (emphasis in original).

The notion that humans actively interpret and construct reality constitutes the fundamental tenet of constructivism. Taking a relativist, subjectivist stance, constructivists assume that humans 'do not have direct access to a single knowable external reality. All of our understandings are contextually embedded, interpersonally forged, and necessarily limited' (Neimeyer, 1993, pp.1-2). In constructivist inquiry, this is considered true of both the researcher and the researched. Hence, constructivists not only seek to study the multiple realities constructed by people and the implications of these constructions for their daily lives, but they fully accept that the findings of the research will be deeply mediated by their own constructed reality (Schwandt, 1994). Thus, whereas positivism assumes that science is value free, constructivism assumes that the researcher will have a relationship with, or be implicated in the object of their research: that the researcher will shape the research process and the findings is considered inevitable

(Schwandt, 1994). Guba and Lincoln (1994) identify five key assumptions of the constructivist framework:

i. Cause and effect relationships do not exist except by imputation.

ii. Phenomena can be only understood in the context within which they are studied: findings from one context cannot be generalized to another and neither problems nor solutions can be generalized from one setting to another.

iii. Facts have no meaning except within some value framework, hence, there cannot be any 'objective' assessment of any proposition.

iv. Findings derived from constructivist inquiry are not granted 'truth' status; they simply represent another construction to be taken into account in the move towards consensus.

v. 'Truth' is a matter of consensus among informed and sophisticated constructors, not of correspondence with an objective reality.

That 'truth' does not represent an objective reality but a consensus among informed and sophisticated constructors is what prevents constructivist inquiry from falling into an abyss of 'unbridled relativism' (Gergen, 1985, p.176). It is also the fundamental tenet of social constructionism. The philosophy of social constructionism has special relevance to the field of child psychology and as will be argued in the discussion that follows, it is of particular importance for the current research.

3.2.3   Social constructionism

Many people confuse the concepts of constructivism and social constructionism or use the terms interchangeably (Crotty, 1998; Gergen, 1985; Patton, 2002). Like constructivism, social constructionism challenges the idea that there is some objective basis for claims to knowledge or 'truth' and examines the process of knowledge construction, but instead of focusing on the matter of individual minds and cognitive processes, it looks outward to the world of the intersubjective social construction of meaning and knowledge (Schwandt, 1994). Crotty (1998, p.58) provides a useful explanation of the distinction between the two:

> Constructivism points out the unique experience of each of us. It suggests that each one's way of making sense of the world is valid and worthy of respect as any other, thereby tending to scotch any hint a critical spirit. On the other hand, social constructionism emphasises the hold our culture has on us: it shapes the way we see things (even in the way we feel things) and gives us quite a definitive view of the world.

Social constructionism challenges the objective basis of conventional knowledge and commonly accepted understandings by illustrating how the criteria for identifying and classifying phenomena are exceedingly constrained by socio-cultural and historical context (Berger & Luckman, 1966; Latour & Woolgar, 1979; Gergen, 1985). According to Gergen (1985), the social constructionist framework is based on four core assumptions:

i. Scientific knowledge is not a decontextualised reflection or map of the world but is an artefact of the social interchanges that take place among people: the process of understanding is not automatically driven by the forces of nature, but is the result of an active, cooperative enterprise of persons in a relationship.

ii. The social interchanges from which scientific knowledge derives are historically situated.

iii. The degree to which a scientific theory or perspective prevails is not dependent on the empirical validity of the theory but on the vicissitudes of social processes within the scientific community.

iv. Descriptions and explanations of the world serve to sustain and support certain social patterns to the exclusion of others (Gergen, 1985).

According to this view, child psychology, like the children it seeks to describe, is a cultural invention that derives from the ideologies and practices of the larger culture (Kessen, 1979). Historical investigation, for example, has revealed that the concept of childhood is not a biological given but is socially and historically constructed (Walkerdine, 2008). In the Middle Ages, childhood was not considered a specialised phase of development: children mixed freely with adults and were seen more as 'little adults' than as a distinct social age group (Aries, 1960). This serves to highlight how concepts such as childhood are not direct reflections of the entities and objects themselves but are lodged in historically contingent factors (Gergen, 1985). Scholars have also argued that what passes as 'fact' in child psychology is highly dependent on the same social processes identified by Latour and Woolgar (1979) in their ethnographic study of how 'truth' and 'knowledge' are 'discovered' in natural science laboratories; primarily, through communication, negotiation, rhetoric and conflict. Gergen (1985) asserts that a theory of child development can be retained despite variations in children's conduct and, conversely, a theory can be abandoned despite the stability or repetition of their conduct: the retention or abandonment of a theory is determined by social processes within a community of interlocutors.

Within the field of developmental psychology, social constructionists have advanced a powerful critique of the positivist goal of identifying structural fundamentals of growth that, regardless of social, cultural, or historical context: an approach often described as 'carving nature at the joints' (Jahoda, 1992). William Kessen's (1979, p. 815) pioneering paper 'The American child and other cultural inventions' was one of the first to urge developmental psychologists to 'peer into the abyss of the positivistic nightmare – that the child is essentially and eternally a cultural invention and that the variety of the child's definition is not the removable error of an incomplete science'. In his paper, Kessen (1979) illustrated how the economic, political, social and ideological climate of 19th century America laid the foundations for a particular kind of developmental psychology, one in which the child is invariably conceived as an independent being who develops as a self-contained complete individual, and upheld as the single, proper unit of

developmental analysis. Woodhead (1999) has argued that it is this singular focus on *the* child that has permitted the formulation of universal laws of growth deemed applicable to all children, regardless of social, cultural, or historical context (Woodhead, 1999).

When Kessen's paper was first published, child development as a social construction was only just beginning to be taken seriously. Indeed, some authors in the field continue to adhere steadfastly to positivist scientific principles. As Schaffer (1993, p.38) contends:

> Developmental psychology today is a truly objective science…Today a developmentalist determines the adequacy of a theory by deriving hypotheses and conducting research to see whether the theory can predict the observations he or she has made. There is no room for subjective bias in evaluating ideas: theories of human development are only as good as their ability to account for the important aspects of children's growth and development.

Despite such declarations, over the last three decades, developmental psychologists have become increasingly willing to recognise that research is a cultural practice, driven by certain patterns of social exchange which do not *reveal* childhood so much as *construct* it (Bronfenbrenner, 1979; Kessen, 1976; Kessen& Siegel, 1983; Richards, 1974; Richards & Light, 1986; Woodhead, 2000; Walkerdine, 2008).

In one of the most compelling social constructionist analyses of developmental psychology, Valerie Walkerdine (2008) has used a Foucaultian framework to illustrate how certain historical 'conditions of possibility' (c.f. Foucault, 1979) contrive to make the emergence of developmental psychology seem both natural and inevitable. She traces the origins of modern developmental psychology back to the late 19th century and the introduction of compulsory schooling, the goal of which was to produce rational, civilised adults capable of participating in a liberal government. At the time, it was believed that this could only be achieved with an education that worked *with* and not *against* children's nature, making it necessary to know what that nature was.

At this time, Darwin's theory of evolution was becoming well known. Darwin (1859/2003) argued that human nature is not simple bedrock but has been formed by a process of phylogeny (change and adaptation to an environment over long periods of pre-historical time). What is important for the study of children, Walkerdine (2008) argues, is that he extended this idea of phylogeny to ontogeny - the development or course of development for an individual organism. It was in this way that childhood came to be viewed as a developmental process in which adaptation to the environment was understood as a natural stage-wise progression towards a rational, civilised adulthood. The best known exponent of this approach is Jean Piaget (1952, 1955, 1960), who attempted to demonstrate the evolution or successive adaptation of structures of reasoning up until the attainment of adult 'rationality'.

As Walkerdine (2008) notes, it could be argued that Darwin's studies in evolution demonstrated an advance on what was known before, and therefore it became possible to know scientifically that

childhood is a distinct state which follows a stage-wise progression towards adulthood. Nevertheless, this argument ignores 'that specific history demonstrates not a simple path of progress towards knowledge, but a political project of liberalism which drew on scientific studies for its rationale. In this analysis, the production of the rational subject for liberalism is central' (Walkerdine, 2008, p.116). What this analysis helps us understand is that the truth of Piaget's and others' claims about development are not timeless or universal scientific realities but are produced in a particular historical moment as an effect of power. Specifically, concerns about the production of the rational, civilised individual and the formulation of a naturalistic developmental sequence to achieve that are part of the technologies of population management (Foucault, 1979). As Walkerdine (2008) asserts, there can be no timeless truth about childhood, only understandings of how childhood is produced at any one time and place, and an imperative to understand the kind of childhood we want to produce.

Whilst social constructionism offers no foundational rules of what constitutes 'truth', this does not mean that 'anything goes'. Gergen (1985) points out that because scientific knowledge systems derive from social processes within communities of interlocutors, scientific activity will always be governed in large measure by normative rules. Social constructionism simply invites researchers to view these rules as historically and culturally situated, and as being subject to critique and transformation. This approach has the dual advantage of providing the stability of shared understandings within scientific communities while circumventing the stultifying effects of doctrinaire conventions. Moreover, the recognition of scientific knowledge as a social construct sharpens the lens on the moral implications of scientific practice. In the spirit of the early pragmatist philosophers, such as John Dewey (1929), social constructionism prevents scientists from justifying socially deplorable conclusions on the grounds that they are 'scientific facts': on the contrary, they must consider the moral ramifications of their conclusions for the broader society (Gergen, 1985). As Dewey (1930, p.196) surmised, 'the final import of the conclusions as to knowledge resides in the changed idea it enforces into action'.

This research on children's knowledge of bushfire hazards and disasters is underpinned by both constructivist and social constructionist philosophies. Like other research in this philosophical tradition, it seeks to understand how the people in a particular setting have constructed reality, it explores their reported perceptions, truths, explanations, beliefs and world views and the consequences of those views for their own behaviours and for those with whom they interact (Patton, 2002). It also acknowledges that the research findings are mediated by the researcher's own views on the world and social life within that world (Crotty, 1998). My own views on the world, insofar as they relate to this research, are expounded in the following section which explicates my theoretical perspective and provides a context and logic for evaluating the outcomes of the research.

3.3   Theoretical perspective

A theoretical perspective is a stance expounding one's view of the world and of social life within that world (Crotty, 1998). It makes clear the theoretical assumptions brought to the research task, provides a context for the research process, and grounds the logic and criteria of the adopted methodology (Crotty, 1998). This research was based on the assumptions of three separate, yet complementary, theoretical perspectives: symbolic interactionism (Blumer, 1969), socio-cultural psychology (Cole, 1996a, 1996b; Rogoff, 2003; Vygotsky, 1978), the ecological theory of human development (Bronfenbrenner, 1979), and the new sociology of childhood (James & Prout, 1990, 2005). The assumptions of each of perspective and its implications for the research will now be explained.

3.3.1 Symbolic interactionism

Symbolic interactionism is a theoretical perspective developed in the post-World War I context of the University of Chicago's Department of Sociology. Although Herbert Blumer is viewed as its intellectual leader, most of its elements have their origin in the pragmatist philosophies of George Herbert Mead, whom Blumer acknowledged as the most important influence on his thinking (Wallace & Wolf, 2006). In an early explication of symbolic interactionism published in 'Man and Society' (Schmidt, 1937), Blumer stepped away from the then popular theories of instinct psychology and the stimulus-response approach, depicting his views on social psychology thus:

> The development of the infant into childhood and adulthood is fundamentally a matter of forming organized or concerted activity in place of its previous random activity, and of channelising its impulses and giving them goals or objectives. This view recognises original nature to be important, but not determinative of its subsequent development. It emphasizes the active nature of the child, the plasticity of this nature, and the importance of the unformed impulse. It is substantially the view taken by the group of social psychologists who may be conveniently labelled 'symbolic interactionists'.

In this statement, Blumer identifies the fundamental principle of symbolic interactionism: human beings are not passive receptacles who are impinged upon by external forces, simply receiving and responding to stimuli. Rather, they actively interpret, evaluate, define, and map out their own actions. Blumer (1969) specifies the three basic tenets of the symbolic interactionist perspective as follows:

i.   People act towards things - physical objects, other people, institutions, ideals, situations encountered - on the basis of the symbolic meanings that the things have for them. Throughout the course of everyday life, people are constantly indicating things to themselves. Whether they are making a cup of coffee or writing a book, people are constantly inferring meaning upon things and making decisions on the basis of those meanings.

ii.   Meanings are not inherent in things: they arise in the process of interaction between people. They are socially produced and emerge as people act towards one another with regard to things. As Stryker and Vryan (2003) explain, meaning

begins with a social act whereby at least two persons take each other into account in the process of resolving some issue or problem.

iii. The use of meaning also occurs through a process of interpretation in which people communicate meanings to themselves in order to form and guide their actions and interactions in everyday life. Symbolic interactionists reject behaviorism because it denies the intermediary role of interpretation, thereby reducing the individual to a passive responder of environmental stimuli. In symbolic interactionism the stimulus-response paradigm is transformed to become stimulus-interpretation-response (Blumer, 1975; Mead, 1937).

Taken together, these three tenets of symbolic interactionism stress the ways that human action and interaction emerge from an individual's ability to confer meaning to a situation. Accordingly, symbolic interactionism argues for the necessity of including subjective experience, or covert behaviour, in addition to observable behaviour in scientific explanations of human action. While symbolic interactionists acknowledge the influence of the external social and physical world, they are primarily concerned with explaining individuals' decisions, opinions, and actions and do not believe that this can be achieved through focussing solely on external forces (Wallace and Wolf, 2006).

3.3.2 Psychological theories of child development

There are different approaches to conceptualising child development and the challenge for researching children's knowledge of bushfire hazards is to adopt one that adequately represents how children learn, think and behave, preserves their needs and rights, and promotes active participation in their communities. Two of the major approaches to child development are broadly represented by the *universalist* approach and the *socio-cultural* approach. The following sections describe the basic tenets of these two approaches and discuss their implications for this research.

The universalist approach

As noted earlier, historically, the principle goal guiding the study of child development has been to identify the general or universal laws of growth (Woodhead 1999). Jahoda (1992) traces this 'universalist' perspective back the underlying philosophical assumption of the enlightenment – that humans are considered part of nature and as such, are subject to general laws that can be discovered within a positivistic scientific paradigm. Based firmly within this tradition, the dominant thesis on child development over the last half century has been that of 'stage theory', a perspective which sees a child's age and developmental stage as the most important predictors of children's capacities for skill and knowledge acquisition (Boyden 2003).

The most influential proponent of stage theory was Jean Piaget (1954; 1969). He considered child development to be governed by universal psychological and biological structures and marked by fixed stages, beginning at birth with sensory-motor action and culminating in adolescence with autonomous logical thought. Piaget considered each stage to represent a child's understanding of the world during that period with each but the last stage being an inadequate approximation of reality (Piaget, 1999). Development from one stage to the next would arise from an accumulation of errors in the child's understanding of the environment, catalysing a reorganisation of thought structures that result in a new understanding of the world and a qualitatively distinct set of skills and capacities (Piaget, 1999).

Research in the Piagetian tradition has largely focussed on investigating the ages at which these qualitative shifts in perspective occur, thereby identifying the ages at which children should be capable of certain skills or should be ready to develop specific forms of knowledge and understanding (Woodhead, 1998). The underlying thesis is that attempts to teach the skills or knowledge of a later stage before previous stages have been transcended will not facilitate development or foster understanding (Wood, 1998). The idea that children pass through stages of development and the assertion that they cannot learn or be taught how to function at 'higher' levels before they have passed through the lower ones have been widely adopted and have formed the basis for a theory of learning 'readiness' (Woodhead, 1998). This notion has dominated international policy on child care, education and welfare for many years (Boyden 2003; Singer 1992; Wood 1988). This is problematic because, for the most part, research in the tradition of Piagetian stage theory has been conducted with children from middle-class communities in Europe and North America, with the cultural context often being neglected in terms of research questions, sample selection and methodology (Woodhead 1998). Yet, as Rogoff (2003) points out, much of this research has been generalised beyond the cultural context in which it was conducted, with many researchers often claiming that 'children do this', as opposed to 'these children do this in this context'.

As Woodhead (1999) warns, extending theories and normative ideas about child development beyond the cultural and social context in which they were formulated should be done with caution, particularly when the purpose of doing so is to prescribe the 'developmental appropriateness' of particular learning experiences and activities or to make assumptions about children's 'needs'. Boyden (2003) agrees that the practice of taking expectations about children's capacities - intellectual, emotional or social - from one context as an inviolable standard to inform policy or programming for other childhoods is highly questionable.

The socio-cultural approach

In the socio-cultural paradigm, human development is viewed as a cultural process with people developing as participants in the practices and circumstances of their communities (Rogoff 1990). In this formulation, cultural context is not outside or peripheral to the process of knowledge development, but is an intrinsic part of it: knowledge is seen to be embodied in the actions, work, play, technology, literature,

art, and talk of members of society, and it is only through interaction with the more mature members that a child can acquire, embody and further develop that knowledge (Cole, 1996; Rogoff, 2003).

Socio-cultural approaches to human development have their origins in the work of the Russian psychologist Lev Vygotsky (1978). A contemporary of Piaget, Vygotsky placed language and communication at the core of intellectual and personal development and his primary concern lay in understanding the nature, evolution and transmission of human culture. His perspective on psychology and human development reflected his interests in art, history, literature, cultural activity and sociology. These interests guided his views on the historical and cultural origins of the way in which people in different societies come to act upon, construe and represent their world (Wood 1998). Vygotsky's main contribution to educational theory is the concept of the 'zone of proximal development', which he defined as a dynamic region of sensitivity where the child and their more skilled partners engage in joint activity that is just beyond the child's developmental level (Vygotsky, 1978). According to Vygotsky (1978) it is by interacting under these conditions, that the child is able to acquire knowledge or skills that they would not be able to acquire by working on their own.

The concept of the zone of proximal development is in stark contrast to the view of learning posed by Piagetian stage theory (i.e. that a child is only ready to learn a particular skill when they have achieved the pre-requisite stage of development). In Vygotskian terms, learning readiness involves not only the state of the child's existing knowledge but also their capacity to learn with instruction. This instruction may be formal or informal and can be performed in many different contexts by more knowledgeable peers or siblings, parents, grandparents, friends, acquaintances and teachers. For as long as this instruction takes place in the child's zone of proximal development, there is, theoretically at least, no restriction on what can be learnt, or at what level of detail.

The socio-cultural approach acknowledges that different cultural communities expect children to engage in activities at vastly different times in childhood. Rogoff (2003) cites numerous examples of childhood activities that are likely be considered dangerous or developmentally inappropriate by western cultural standards: among the Kwara'ae of Oceania, three-year olds not only take care of younger siblings, but take produce they have grown themselves to sell at market, which makes a significant and valued contribution to household income; the Aka tribe in central Africa teach their eight to ten-month old infants how to throw small spears and use small pointed digging sticks and miniature axes with sharp metal blades; among the Efe communities in the Democratic Republic of Congo, infants are routinely taught to use machetes safely; and infants in the Fore communities in New Guinea are able to handle both knives and fire safely by the time they can walk. These examples highlight the need to consider and understand child development as a product of specific economic, social, ecological and cultural processes, not just biological maturation. It should be noted that the socio-cultural approach does not discount the significance of biological maturational processes: rather, it emphasises that child development is shaped

by human action and social processes that are mediated by complex belief systems including those pertaining to the 'proper' ways in which children should develop (Woodhead 1999).

Viewed through the frame of socio-cultural theory, children's knowledge of bushfire hazards will, as for any other knowledge domain, depend largely on routine circumstances in their community and on cultural practices they are used to. Their capacities will also depend on the cultural meaning given to bushfire events and the social and institutional support provided by communities for learning and carrying out risk reduction activities. Thus, a child's knowledge of bushfire hazards and his or her capacity for DRR is likely to differ across communities. It is critical therefore that bushfire research with children is built around the socio-cultural contexts of children's lives. This idea is further explored in the following discussion of the ecology of human development.

The ecology of human development

In the 1970's, Urie Bronfbrenner (1976; 1979) identified serious limitations in the prevailing approaches to research on human development. He argued that in the quest for rigor, research in developmental psychology had sacrificed both scope and relevance: experiments tended to involve unfamiliar, artificial, short-lived situations that called for unusual behaviours that could not easily be generalised to other settings. Bronfenbrenner (1976, p.1) proposed that, in effect, developmental psychology had become 'the science of the strange behaviour of children, in strange situations with strange adults for the briefest possible periods of time'.

Bronfenbrenner (1976) called for a more naturalistic approach to research but not of the kind advocated by the psychological ecologists, such as Roger Barker (1968), who had adapted to the study of human behaviour a model originally developed by ethologists for the study of animals. This model conceptualised the environment in terms of the immediate concrete setting containing the animal, and focussed attention on one, or at most two, animals at a time, and in only one setting. Bronfenbrenner argued that whilst entirely adequate for the study of animals, this conceptualisation of the environment was hardly sufficient for the study of human beings, who occupy a far more complex, multifaceted world. Bronfenbrenner (1976, 2) summarised his view on the matter as follows:

> Understanding human development demands going beyond the direct observation of behaviour on the part of one or two persons in the same place: it requires examination of multi-person systems of interaction not limited to a single setting and must take into account aspects of the environment beyond the immediate situation containing the subject.

To remedy these limitations, Bronfenbrenner (1976, p.2) proposed 'the ecology of human development', which he outlined as follows:

> The ecology of human development is the scientific study of the progressive, mutual accommodation, throughout the lifespan, between a growing human organism and the changing immediate environments in which it lives, as this process is affected by

conditions obtaining within and between these immediate settings and the larger social contexts, both formal and informal, in which the settings are embedded.

In this approach, the ecological environment is conceived as a nested arrangement of structures termed the *microsystem*, the *mesosystem*, the *exosystem*, and the *macrosystem,* as depicted in Figure 3.1.
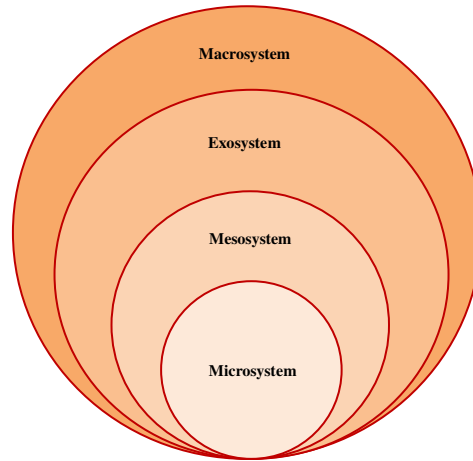
Figure 3.1: The human ecological environment.

These structures and their applicability to the current context of children's bushfire education can be described as follows:

i. The *microsystem* is the complex of relations between the developing person and the environment in the immediate setting containing that person (e.g., home or school). A setting is defined as a place with particular physical features in which the participants engage in particular activities with particular objects in particular roles (e.g. student, daughter, parent, friend, or teacher). Thus, within the microsystem, a child might participate in bushfire education at school with their teacher guiding and facilitating the development of their knowledge.

ii. The *mesosystem* comprises the interrelations among the major settings containing the developing person at a particular point in his or her life. Essentially, the mesosystem is the system of microsystems. For an Australian 10 year old, for example, the mesosystem would typically encompass interactions among school, family, and peer group. Thus, a child might discuss with parents or siblings what they have learned about bushfires at school, thereby instigating an interaction between the microsystems of school and family.

iii. The *exosystem* is an extension of the mesosystem, which embraces the concrete social structures, both formal and informal, that impinge upon the immediate settings containing the person and thereby influence, delimit or determine what goes on there. These structures include the major institutions of the society such as local, state, and national governments and their subsidiary agencies and departments. Thus, whether or not bushfire education is included in primary school curriculums could be seen to rest with the serving Minister for Education and their office.

iv. *Macrosystems* refer to the overarching institutions of the culture such as the economic, social, education, legal, and political systems within which the micro-, meso-, and exosystems are set. Macrosystems are conduits of information and ideology that both explicitly and implicitly bestow meaning and motivation to the concrete social structures of the exosystem. What place or priority children are assigned in bushfire risk reduction is essentially a function of the macrosystem. As discussed in Chapter 2, the macrosystems of most post-industrial societies, have sanctioned a top-down technocratic approach to disaster risk reduction and ordinary people, much less children, have been viewed as having little to contribute to the 'citadel of expertise' (Hewitt, 1983).

A key concept in the ecology of human development is that of *reciprocity*. Bronfenbrenner (1976) argued that in contrast to the conventional, unidirectional model typically employed in the laboratory, ecological research must allow for reciprocal processes between people as they interact in the mesosystem. In the context of the current thesis, this would require that attention is given not only to how parents influence their children's understanding of bushfire hazards but how children influence the understanding of their parents. Thus, the construction of knowledge and understanding is conceived as a bidirectional process and research must incorporate strategies for tapping the ways in which children influence parents and the ways in which this influence feeds back into children's knowledge and understanding. In this research, this was achieved by interviewing parents of the child participants and focussing analyses on the role of social context in the development of children's knowledge.

3.3.3   The new sociology of childhood

The final theoretical perspective to provide a context for this research was 'the new sociology of childhood' (James &Prout, 1990; 2005). This perspective has its origins in the work of Charlotte Hardman (1973, p.85) who compared her work on the anthropology of children to the study of women, arguing that 'both women and children might perhaps be called "muted groups" i.e., unperceived or elusive groups (in terms of anyone studying a society)'. This statement is entirely applicable to the hazards and disasters sphere, where children and youth have been largely excluded from the social

science research agenda (Anderson, 2005). Where research has been conducted, it has tended to adopt a positivistic approach, particularly in the evaluative studies of school-based hazards education, where surveys and experimental methods have been used to assess children's knowledge, thereby delimiting the extent to which children can articulate their own meanings in their own words. This positivist approach is challenged by the new sociology of childhood, which views children as 'people to be studied in their own right, and not just as receptacles of adult teaching' (Hardman, 1973, p.87). It draws on symbolic interactionist notions of children as agents in, as well as products of, social processes (Blumer, 1967). It also emphasises social constructionist principles of childhood as socially, culturally, and historically situated (Walkerdine, 2008). The central tenets of the new sociology of childhood, as outlined by James and Prout (1990, 2005) are as follows:

i.   Childhood is a social construction. It is biological immaturity not childhood which is a universal and natural feature of human groups. Although the institution of childhood is a specific structural and cultural component of all known societies, the way it is conceptualised and articulated into philosophies, attitudes and practices varies both culturally and historically.

ii.   As a variable of social enquiry, childhood can never be entirely separated from other variables such as class, gender or ethnicity. Comparative and cross-cultural analyses have revealed a variety of childhoods rather than a single, simple phenomenon, thereby challenging the trend towards a dominant western notion of a 'universal' childhood.

iii. Children's perspectives are worthy of study in their own right, independent of the perspectives and concerns of adults. The new sociology of childhood attempts to give a voice to children and places emphasis on providing children with the opportunity to express their own meanings, in their own words, about the issues that concern them.

iv.   Children must be seen as actively involved in the construction of their own social lives, the lives of those around them and of the societies in which they live. Children can no longer be regarded as the passive subjects of social structures and processes.

v.   Ethnography is a particularly useful methodology for research with children. Qualitative research methods such as participant observation and interviewing allow children to express their own meanings and perspectives than do surveys and experimental methods.

vi. Childhood is subject to the double hermeneutic of social science. As argued by Giddens (1987, p.20), 'the 'findings' of the social sciences very often enter constitutively into the world they describe'. To assert a new paradigm of childhood research is to engage in and respond to the process of reconstructing childhood in society.

The central tenets of the new sociology of childhood strongly influenced my approach to this research: its social constructionist stance forced me to assess my assumptions about childhood and critically evaluate the origins of those assumptions; its position on the variability of childhood across social, cultural, and economic contexts compelled me to embed analyses of children's knowledge within the social contexts of their everyday lives; its insistence that children are active in shaping their own social worlds also required that my analyses attended to the influence that children exert on the knowledge, attitudes, and behaviours of their caregivers and companions; and finally, its assertion that children must be afforded opportunities to have their voices heard in the research process required me to adopt qualitative methods that would enable children to articulate their own perspectives, in their own words, about the issues that concern them.

3.4   Methodology

The term methodology is often used interchangeably with the word method. However, most methodologists make a clear distinction between the two. Teddlie and Tashakkori (2009, p.21) make the distinction as follows:

> A research *methodology* is a broad approach to scientific inquiry specifying how research questions should be asked and answered. This includes world view considerations, general preferences for designs, sampling logic, data collection and analytical strategies, guidelines for making inferences, and the criteria for assessing improving quality…Research *methods* include specific strategies and procedures for implementing research design, including sampling, data collection, data analysis, and interpretation of the findings. Specific research methods are determined by the overall methodological orientation of researchers (emphases added).

Harding (1987, p.27) makes the same distinction, albeit more succinctly:

> Methodology is a theoretical analysis defining a research problem and how research should proceed. It should be viewed as distinct frommethodwhich refers to the specific research strategies or techniques adopted.

The purpose of this section is to describe the methodology that was employed in this research. A discussion of method is reserved for Chapter 4.

3.4.1 Hypothetico-deductive and intepretivist methodologies

Guba and Lincoln (1994) distinguish between two main methodological approaches in modern scientific inquiry. The first is the experimental, manipulative or *hypothetico-deductive* approach. This approach derives from the realist/objectivist stance that an independent reality exists and that this reality can be apprehended in its "true" state. Hypothetico-deductive methodologies derive propositional hypotheses from *a priori* theory and subject them to empirical test for verification or falsification (Kuhn, 1970). Accordingly, there is a methodological imperative to eliminate confounding factors with experimental manipulations and controls because failure to do so would obscure 'the way things really are'. Here, the goal of inquiry is explanation, the establishment of cause and effect relationships, and ultimately, the control and prediction of phenomena (Guba& Lincoln, 1994). This approach has dominated the natural sciences for centuries and until more recently, the social sciences also.

The second approach can be described as hermeneutical, naturalistic, or *interpretivist* (Guba & Lincoln, 1994; Henwood & Pidgeon, 1992). This approach originated in 19th century Germany when a group of neo-Kantian historians and sociologists, led by Wilhelm Dilthy, reacted against an uncritical adherence to the natural science model and its reductionist approach to human consciousness (Schwandt, 1994). They believed the natural sciences to be fundamentally different to the human sciences and argued for a clear distinction to be drawn between the two. It was argued that whilst the natural sciences could be studied through the external observation and explanation of regularities in physical events (*Erklären*), the human sciences should pursue a search for meaning or understanding (*Verstehen*) (Henwood & Pidgeon, 1992). This early perspective is clearly reflected in interpretivist methodologies of today, which show a commitment to a relativist/subjectivist stance, and an emphasis is placed on meaning, understanding, and description as opposed to explanation and prediction. Here, the goal of inquiry is theory generation as opposed to theory testing. The end result of this approach is a representation of reality through the eyes of the participants, with the meaning of experience and behaviour conveyed in context and its full complexity (Guba & Lincoln, 1994).

The interpretivist perspective is also reflected in the assumptions of symbolic interactionism. Blumer's (1969) position implies that because people are actively and continuously constructing and transforming meanings and definitions in the course of interaction itself, meanings and definitions are subject to moment-to-moment change, and therefore, do not have the generality required of theoretical concepts from which predictive theories can be developed. As Blumer (1975, p.62) explains:

> The isolation of relations, the development of prepositions, the formulation of typologies and the construction of theories are viewed as emerging out of what is found through constant observation of that world instead of being formed in an *a priori* fashion through deductive reasoning from a set of theoretical premises.

Therefore, the symbolic interactionist perspective precludes a methodology that derives hypotheses about social behaviour from *a priori* theory (Stryker &Vryan, 2003). Rather, it is committed to an inductive

approach in which understanding or explanations of human behaviour are induced from data with which the researcher has become thoroughly familiar (Wallace & Wolf, 2006). In keeping with the assumptions of symbolic interactionism, this research employed the interpetivist methodology of grounded theory (Glaser & Strauss, 1967; Strauss & Corbin,1998, 2008; Charmaz, 2006), the essential features of which will now be described.

3.4.2 Grounded theory methodology

Grounded theory methodology is an interpretivist-inductive methodology that emerged from Barney T. Glaser and Anselm L. Strauss's (Glaser & Strauss, 1965, 1967) sociological study of dying in hospitals. In this study, Glaser and Strauss (1967) were specifically interested in how terminal patients became aware that they were dying and how they dealt with the news. By observing this process in a variety of hospital settings, they worked to construct theoretical analyses depicting the social, organizational and temporal nature of dying (Charmaz, 2006). As they undertook their analyses, they outlined a set of systematic methodological strategies which were later published as 'The Discovery of Grounded Theory' (Glaser & Strauss, 1967). 'The Discovery of Grounded Theory' challenged many conventions of the hypothetico-deductive mode of inquiry that was dominating the social science landscape at the time. Consistent with the central tenets of the interpretivist tradition, Glaser and Strauss (1967) advocated an inductive approach that focussed on the development of theory from research grounded in data, rather than the testing of *a priori* hypotheses derived from existing theories (Charmaz, 2006).

Stated simply, grounded theory methodology consists of systematic, yet flexible guidelines for collecting and analysing data to construct theories that are 'grounded' in data (Charmaz, 2006). It is important to emphasise that grounded theory is a general methodology (Strauss & Corbin, 1998); that is, it's a way of thinking about and conceptualizing data and offers a set of principles and heuristic devices rather than formulaic rules (Charmaz, 2006). As outlined by Glaser and Strauss (1967) the defining components of grounded theory methodology include:

i. Simultaneous involvement in data collection and analysis.
ii. Constructing analytic codes and categories from data, not from preconceived logically deduced hypotheses.
iii. Using the constant comparative method which involves making comparisons during each stage of the analysis.
iv. Advancing theory development during each step of data collection and analysis.
v. Memo writing to elaborate categories, specify their properties, define relationships between categories, and identify gaps.
vi. Sampling aimed toward theory construction, not for population representativeness.
vii. Conducting the literature review after developing an independent analysis.

Contrasting versions of grounded theory methodology

The original explication of grounded theory merged the contrasting philosophical and disciplinary traditions of its creators (Charmaz, 2006). Glaser had received rigorous training in quantitative methods and middle range theories at Colombia University under the guidance of methodologist Paul. F Lazarsfield and noted sociologist of science Robert K. Merton (Strauss & Corbin, 2004). Strauss, by contrast, had studied at Chicago University, which was renowned for its emphasis on pragmatist philosophy, Mead's (1937) social psychology, Blumer's symbolic interactionism (see 3.3.1), and ethnographic field research (Strauss & Corbin, 2004) .

In the decades that followed the publication of 'The Discovery of Grounded Theory', Glaser and Strauss parted ways and developed divergent versions of grounded theory that more closely reflected their respective philosophical and disciplinary backgrounds. Glaser (1978, 1992) formulated and advocated an objectivist version which came close to traditional positivism with its assumptions of an objective, external reality, and a neutral observer who discovers that reality and renders it in a value-free, unbiased way (Charmaz, 2006). By contrast, Strauss and his colleague Juliet Corbin (Strauss & Corbin, 1998, 2008) took grounded theory in a direction that was more closely aligned with the theory of symbolic interactionism: however, their epistemological assumptions remain more closely aligned with those of postpositivism which proposes that 'one reasonably hold that concepts and ideas are invented (rather than discovered) yet maintain that these inventions correspond to something in the real world' (Schwandt, 1998, p.237).

Charmaz (2006) has since taken Strauss and Corbin's (1998) version one step further towards postmodernism. Her constructivist grounded theory denies an external reality and the 'discovery' of concepts. Concepts are not viewed as a direct reflection of reality but as mental constructions arising out of interaction with participants in a temporal, cultural, and structural context. The researcher and participants frame this interaction and confer meaning upon it, making the researcher a part of what is studied rather than separate from it. In this sense, constructivist grounded theory has a profoundly symbolic interactionist character. Constructivist grounded theory also privileges the perspectives of the participants over those of the researcher, which contrasts with the priority accorded to the researcher's perspectives in the objectivist version. The foundational assumptions, objectives, and analytic implications of constructivist grounded theory are contrasted with those of the objectivist version in Table 3.1.

Table 3.1: Comparison of objectivist and constructivist grounded theory

	Objectivist grounded theory	**Constructivist grounded theory**
Foundational assumptions	Assumes an external reality. Assumes discovery of data. Assumes conceptualizations emerge from data. Views representation of data as unproblematic. Assumes the neutrality, passivity, and authority of the observer.	Assumes multiple realities. Assumes mental construction of data through interaction. Assumes researcher constructs categories. Views representation of data as problematic, relativistic, situational, and partial. Assumes the observer's values, priorities, positions, and actions affect views.
Objectives	Aims to achieve context-free generalizations. Aims for parsimonious, abstract conceptualizations that transcend historical and situational locations. Specifies variables. Aims to create theory that fits, works, has relevance and is modifiable.	Views generalisations as partial, conditional, and situated in time, space positions, action and interactions. Aims for interpretive understanding of historically situated data. Specifies range of variation. Aims to create theory that has credibility, originality, resonance and usefulness.
Implications for analysis	Views data analysis as an objective process. Sees emergent categories as forming the analysis. Sees reflexivity as one possible data source. Gives priority to researcher's analytic categories and voice.	Acknowledges subjectivities throughout data analysis. Recognises co-construction of data shapes analysis. Engages in reflexivity. Gives priority to participants' views and voices.

Source: Charmaz (2000)

This research adopts the constructivist version of grounded theory as developed and advocated by Charmaz (2006) because it is most consistent with the philosophical assumptions and theoretical perspectives upon which the research is based.

3.4.3 Grounded theory research with children

In recent years, grounded theory has been increasingly identified as an appropriate methodology for studying children's perspectives and experiences (Woodgate, 2000; Greig & Taylor, 1999). Greig and Taylor (1999, p.43) have argued that the assumptions and techniques of grounded theory are consistent with contemporary theoretical perspectives on childhood and knowledge, making it an ideal methodology for researching children's knowledge of particular phenomena:

> The notion that [grounded] theory is created from or emerges from data is consistent with the view that that the child is subjective in nature and that his understanding, knowledge and meanings are subjective, and emerge in interactions with others in a given context.

Despite being identified as an appropriate methodology for research with children, the number of published grounded theory studies with children is limited. Of the studies that have been published, most have been conducted in the field of paediatric nursing, with a major focus on children's experiences of illness and cancer, in particular (Bluebond-Langer, 1978; Clarke-Steffen, 1993, 1997; Coyne, 2006; Hinds & Martin, 1988; Sartain, Clarke, & Heyman, 2008; Stewart, 2003; Wenstrom, Hallberg & Bergh, 2008; Woodgate & Kristjansen, 1996). Whilst limited in number and scope, the insights deriving from these grounded studies have transformed the theory and practice paediatric nursing (Woodgate, 2000a, 2000b). The contributions of grounded theory findings to paediatric nursing suggest that it could be usefully employed to develop a more theoretically rigorous understanding of children's knowledge of environmental hazards and disasters. However, an extensive search of the literature confirms that grounded theory has not yet been used in any published study of children's knowledge of environmental hazards and disasters. Hence, this research represents the first application of grounded theory methodology in this field.

3.5 Concluding remarks

This chapter has explicated the paradigm of inquiry upon which the research is based. It has discussed the philosophical framework that underpins the research, presented the theoretical perspectives that guided the research, and introduced the constructivist grounded theory methodology that was employed to address the specific research aims. In doing so, it has established a framework for the interpretation of the results and conclusions that emerged from the research process. Importantly, the paradigm of inquiry outlined in this chapter also provides a solid basis for the choice of qualitative methods and that were used to gather and analyse the data. These methods and the specific interpretive techniques that were employed to develop the substantive grounded theory are the focus of the following chapter.

CHAPTER 4: RESEARCH METHODS AND THEORY DEVELOPMENT

Grown-ups never understand anything by themselves, and it is tiresome
for children to be always and forever explaining things to them.

- Antoine de Saint-Exupéry (1971, p.7)

4.1   Introduction

This chapter discusses the methods that were used to collect and analyse the data as well as the approaches that were employed to develop the substantive grounded theory. It is organised into four sections. The first section draws a distinction between quantitative and qualitative research and provides a clear justification for the adoption of the latter. It also examines the specific challenges associated with conducting qualitative research with children and introduces the child-centred techniques that were used to overcome these challenges and gain access children's meanings and perspectives: namely, focus groups interviews, the draw and write technique, and the use of props and visual aids. The second section describes the specific procedures that were employed to collect the data and the third section describes how this data was analysed and rendered to produce a substantive grounded theory. The chapter concludes with a discussion of the ethical dimensions of the research and describes the measures that were taken to ensure thedignity, safety and well-being of participants.

4.2   Methods

4.2.1   Qualitative versus quantitative research

In psychological and social science research, the two major approaches to the gathering and analysing of data are qualitative and quantitative. Historically, the dominance of hypothetico-deductive methodologies has resulted in a heavy emphasis on quantitative methods (Henwood & Pidgeon, 1992). As discussed by Henwood and Pidgeon (1992) this is because quantification states the concepts embedded in theoretical schemes or hypotheses as precise mathematical formulas that are readily observable, manipulable and testable. This has been viewed as a necessary, if not sufficient, condition for the findings of research to be replicable and generalisable and for predictions upon the basis of observed regularities to be made. When the aim of science is the prediction and control of phenomena, the formulaic precision attained through the use of quantitative methods has considerable value. It's not surprising therefore, that quantification has traditionally been seen as *the* scientific method (Guba & Lincoln, 1994; Henwood &Pidgeon, 1992).

Recently, however, a cogent critique of quantification has gained considerable traction in the literature (Guba & Lincoln, 1994). This critique is not new. It was first put forth by Dilthy as part of the *Verstehen* movement, albeit with limited impact (Henwood & Pigeon, 1992; see section 3.4). It was also present in the nomothetic-idiographic debate of the 1950s and 1960s when Allport (1962) argued that an individual's personality could not be adequately understood with the use of aggregate statistical scores. In

his expositions of symbolic interactionism, Blumer (1969) also questioned the validity of quantitative methods such as experiments and questionnaires because they do not involve a direct examination of the empirical world: that is, they do not focus directly on the actor's contextually rooted meanings, definitions, and interpretations as these emerge in ongoing, naturally occurring action and interaction (Stryker &Vryan, 2003). Blumer (1937, p.194) explained his objection to the quantitative approach as follows:

> The items on a questionnaire…may be clear and precise and the individual may answer in the categorical and definite way that is needed for the quantitative treatment of responses. But the point made is that the responses to these items do not tell what is the meaning of these items to the individual; hence, the investigator is not in a position to state what are the individuals' attitudes or to know what would be his likely behaviour if he were actually to act toward the objects to which the items refer.

Symbolic interactionists do not categorically deny the usefulness of quantitative research, but for the research questions they want to ask, quantitative experimental or survey-based approaches are inadequate (Blumer, 1969): the symbolic interactionist emphasis on meaning is simply not conducive to quantitative methods (Wallace & Wolf, 2006).

In more recent times, the critique of quantitative methods, and the broader hypothetico-deductive approach from which they derive, has been more fully developed and now poses a significant challenge to the conventional wisdom that has sustained the hegemony of quantification. The five major elements of this critique, as identified by Guba & Lincoln (1994) are as follows:

i. *Context stripping.* Quantitative research design, with its focus on experimental controls and randomization, 'strips' the research context of other variables that could potentially affect outcomes if they were allowed to exert their influence. Exclusionary quantitative designs that delimit the influence of contextual factors have limited applicability and generalisability because their outcomes can only be applied in circumstances similarly devoid of context.

ii. *Exclusion of meaning and purpose.* Unlike the physical world, human behaviour cannot be understood without reference to the meanings and purposes attached by human actors to their activities. There are also issues concerning the overwriting of internally structured 'subjectivities' by externally imposed 'objective' systems of meaning. This reflects the earlier sentiments of Blumer (1969).

iii. *Disjunction of grand theories with local contexts: the etic/emic dilemma.* The *etic* (outsider) theory or hypothesis imposed on an inquiry by an investigator may have little or no meaning within the *emic* view of the individuals, groups, societies or cultures under inquiry. In quantitative research, there is the potential for

inappropriately fixing meanings where these are variable and renegotiable in relation to their context of use. This is particularly important in research with children where the items on a questionnaire may not have the same meaning for children as they do for the adults who developed them (James & Prout, 2004).

iv. *Inapplicability of general data to individual cases: the nomothetic/idiographic dilemma.* Generalisations based on nomothetic data derived from quantitative inquiry may be statistically meaningful but do not necessarily apply to individual cases because they neglect the uniqueness and particularity of human experience. This reflects Allport's (1962) critique, as outlined earlier.

v. *Exclusion of the discovery dimension in inquiry.* An emphasis on the verification of specific *a priori* hypotheses undermines the origins of those hypotheses, which have usually been generated by what is commonly termed the *discovery process*. Consequently, quantitative normative methods are privileged over the insights gained from innovative research practices, thereby denying opportunities for the emergence of new or divergent theory.

As several authors note (Denzin & Lincoln, 2005; Guba & Lincoln, 1994; Henwood & Pidgeon, 1992), each of these problems can be remedied by increase in qualitative inputs that a) study phenomena in all of their contextual complexity, b) give priority to the meanings and purpose of participants, and c) permit the unique perspectives of different groups to be articulated. Such approaches enable new or divergent theory to emerge from the research process. Given that the aim of this research is to develop a theory that increases understanding of children's knowledge of bushfire hazards as conceptualised by the children themselves, qualitative methods of data collection and analysis are required.

4.2.2   Qualitative research with children

Traditionally, qualitative methods have not been viewed as an appropriate choice for research with children (Curtin, 2002). Graue and Walsh (1995) attribute this to a tendency for researchers to assume that 'children are too developmentally immature to be able to think conceptually or to have the language necessary to be able to express their ideas' (p.146). Waksler (1986) proposes that there are two prevalent beliefs regarding children's competencies: first, adults tend to think of children as being immature, less knowledgeable, less serious, and being less important than adults; second, adults tend to believe that children are routinely wrong, in error or don't understand. Waksler (1986) further contends that whilst adults might assume that their perspectives and understandings are superior to those of children because of their maturity and experience, it is actually more appropriate to view children as *different* to adults as opposed to *inferior*. Qvortrup (1994) also advocates this stance and has stressed the importance of viewing children as '*human beings*', not '*human becomings*'. This view is becoming increasingly

accepted and over the last several years researchers have begun to view children as reliable informants who are capable of providing accurate accounts of their experiences in qualitative research (Greig et al., 2007; Lamb, Sternberg, Orbach, Hershkowitz & Esplin, 1999; Zwiers & Morrissette, 1999).

The recent increase in child-centred qualitative outputs has highlighted the value of engaging children as informants of their own knowledge and experiences: primarily, because they have demonstrated the discrepancies that often exist between the personal meanings that children and adults attribute to events and actions (Greig et al., 2007). Hence, when it comes to developing programs and policies that accommodate children's perspectives, qualitative research that focuses on children's personal meanings, perspectives and experiences is crucial. An additional advantage of employing qualitative methods in research with children is that children can benefit from being active participants in the research process itself. Weithorn and Scherer (1994) suggest that children's participation in the decision-making activities that characterise the research process may also promote a sense of being responsible for their own lives versus being 'powerless victims of the whims of adults' (Weithorn, 1983, p.241).

4.2.3   The challenges of qualitative research with children

Whilst qualitative research with children is becoming increasingly accepted, it is important to acknowledge that conducting qualitative research with children can also pose significant challenges (Eder & Fingerson, 2002; Greig et al., 2007; Greene & Hogan, 2005). Two major issues that must be taken into account when conducting qualitative research with children pertain to children's communication abilities and the power differentials that exist between child research participants and adult researchers (Eder & Fingerson, 2002; Greig et al., 2007).

Children's communication abilities

As noted earlier, it has traditionally been assumed that children are too developmentally immature to have the language abilities necessary to reliably express their own perspectives. Whilst recent work has served to undermine this view, it is important to acknowledge that children are not adults and that they have different ways of communicating and expressing their views. As Greig et al. (2007) emphasise, interviewing children requires careful preparation to ensure that the questions asked are within the realm of children's language and communication abilities. Drawing on the extant literature in child language and communication development, Greig et al. (2007) provide some important guidelines regarding the kinds of questions that children can competently understand and respond to. These are summarised in Table 4.1 below.

Table 4.1: Guidelines on children's question answering abilities

Question type	Children's abilities
Who? What?Where?	By 3 or 4 years of age, children are able to identify people, places, and locations, and distinguish between self and others.
Why? When? How?	By the time children enter school at around 5 years of age they are able to respond to questions that require explanation.
Events in the past, present, and future	By the time children are 4 years of age, they are using past, present and future tense and their notions of time improve when they reach school and are exposed to clocks, calendars etc.
Questions that rely on memory	By the time they reach the end of primary school at around 12 or 13 years, children have developed a memory capacity comparable to that of adults. Before this age, children may need additional support or clarification may be required when talking about events in the past.
Sensitive questions	By 3 or 4 years of age, children can distinguish fact from fantasy and understand the difference between the truth and lies and that telling lies is wrong.
Reporting on knowledge and beliefs	Caution must be exercised when using open questions or statements with early primary school aged children (5 or 6 years of age) because they tend to agree with the questioner, even if they do not know what is meant. They are capable of invention and can be distractible and literal.

Source: Adapted from Greig et al. (2007).

Greig et al. (2007) suggest that by following these basic guidelines, it is possible to gather high quality verbal data that represents children's views and perspectives. Whilst the statements children make may appear meaningless or shallow because of the lack of verbal detail, upon close examination, they are often rich with meaning (Zwiers & Morrissette, 1999). Thus, communicating with children and learning about their perspectives can take more time and effort than is the case with adults, which may explain why researchers have avoided undertaking qualitative research with children (Tammivarra & Enright, 1986).

The child-adult power differential

There is general agreement that when interviewing children it is essential that researchers begin by examining the power dynamics between adults and children (Eder & Fingerson, 2002; Hood, Mayall & Oliver, 1999; Mayall, 2008). Eder and Fingerson (2002) argue that, too often, researchers fail to recognise that children in western societies generally have lower status than adults and lack power. Mayall (1999) views children as a minority group who have their control taken away from them by adults who see them as lacking the essential characteristics and competencies of adulthood. Frones (1994)

similarly argues that children are primarily seen as an 'age-group' which effectively positions them at the bottom of an age-graded power structure, undermining any recognition of their identity as a group with its own culture and unique abilities. As a result of their diminished status and power, children learn from a very young age to listen to, respect, and obey teachers, parents, relatives, and adult friends, all of whom have the power to command their actions (Koocher & Keith-Spiegel, 1994). Children learn that when a teacher or another adult asks a question, they expect a 'correct' answer and children will seek to provide this, even if the question is odd or nonsensical (Tammivaara & Enright, 1986). Hughes and Grieve (1980), for example, asked children questions such as, 'Is red heavier than yellow?' and found that almost all children provided answers, presumably in an attempt to win the adult researcher's approval. Children also learn that if they challenge what an adult says, 'their views are routinely discounted' (Waksler, 1986, p.77) and hence, 'children have learned to keep their thoughts from adults' (Fine & Glassner, 1979, p.170). Additionally, children are careful about how they act in the presence of adults, and, consequently, there exists a 'hidden world of childhood' that adults do not see (Fine & Sandstrom, 1988, p.43).

The child-adult power differential has important t implications for the research process. Specifically, if a researcher asks a child a question, the child may think there is a right answer, that the adult, as the authority, already knows and as a result, the child may try to guess at an answer instead of expressing their own thoughts and perspectives (Curtin, 2001). Moreover, children might be hesitant to say that they do not know the answer to a question because they fear that not providing an answer will be looked upon disapprovingly (Curtin, 2001). Whilst it would be naïve to think it is possible to completely neutralise the power differential that exists between child research participants and adult researchers, there are several ways in which it can be minimised. These are explored in the following section on child-centred research techniques.

4.2.4 Child-centred research techniques

Whilst children's communication abilities and the child-adult power differential represent challenges to conducting qualitative research with children, researchers can employ a variety of techniques and adaptations that minimize these issues and assist children to express their views and perspectives (Curtin, 2002; Eder & Fingerson, 2002; Greig et al., 2007). In this study, issues of communication and power dynamics were addressed through the use of several well accepted techniques including *focus groups*, *thedraw and write technique*, and *the use of props*. Each of these techniques, and their utility in gathering qualitative data in research with children, are discussed in detail below.

Focus groups

A focus group is a discussion involving a small number of participants which seeks to gain insight into the participants' experiences, attitudes and/or perceptions (Hennessey & Heary, 2005). The origins of the focus group method, as it is applied in contemporary social inquiry, can be traced to the pioneering work of Merton and Kendall (1955) in which it was used as a means for understanding and interpreting the

results of quantitative research. They described the focus group interview as having three key characteristics: 1) the group comprises a small number of individuals who have something in common; 2) the data gathered represents the subjective experience of the individuals involved; and 3) there is a moderator who guides the discussion on the topics of interest (Merton & Kendall, 1955). This approach to data gathering became popular in the 1970's primarily in applied settings and particularly in the field of market research (Hennessey &Heary, 2005). By the mid 1980's the approach was being heavily utilised by social scientists who saw it as having significant value as a qualitative research method, especially within the fields of sociology and anthropology (Hennessey & Heary, 2005).

The last decade has seen a considerable rise in the use of focus groups in research with children and the general consensus amongst researchers across disciplines is that they constitute a valuable method for eliciting children's views and experiences (Curtin, 2001; Eder & Fingerson, 2001; Peek & Fothergill, 2009; Greig et al., 2006; Hennessey & Heary, 2005; Hill, 2005; Morgan et al., 2002). Although the method has predominantly been applied in the field of child-centred health research (e.g. Bauer,Yang, & Austin, 2004; Horner, 2000; Morgan et al., 2002; Neumark-Sztainer, Story, Perry & Casey 1999; Reilly et al., 2005), it has also been applied to the field of child-centred disaster research where it has been used to investigate the experiences of displaced children and youth following Hurricane Katrina (Fothergill & Peek, 2006; Peek & Fothergill, 2006).

Eder and Fingerson (2002) propose that focus groups are particularly useful in research with children because they enhance children's abilities to communicate their own meanings in their own words. They argue that because children acquire knowledge and construct meaning through a shared process of social interaction, this is the most natural way for them to share their knowledge and perspectives with others. In their own work, these researchers have found that that children are more relaxed and engage in typical peer routines when interviewed in groups (Simon, Eder & Evans, 1992; Eder, 1995; Fingerson, 1999). They also suggest that a researcher is less likely to impose adult language and interpretations in focus groups because there are more opportunities to pick up on the terminology and phrasing which children use to communicate about a particular topic (Eder & Fingerson, 2002). Eder and Fingerson (2001) also note that children of all ages are usually more confident and comfortable when they know that they outnumber the adults in the setting and, in a research context, this has the effect of minimising the power differential that can inhibit children from expressing their views and concerns (Curtin, 2002; Eder & Fingerson, 2001; Morgan et al., 2002).

Perhaps most importantly, the available evidence suggests that children find the focus group format enjoyable (Morgan et al., 2002; Peek & Fothergill, 2010). Although the children in this study were not asked to formally evaluate their focus group experience, their enjoyment of the process was frequently conveyed through spontaneous comments and questions such as 'Can you come back again?', 'This is cool', and 'When can we do interviews again?' The most telling feedback came from a child who turned

to his friend during the interview and whispered, 'Do you realise that we're not doing *any* work right now?' Specific details on how focus groups were arranged and conducted in this research (e.g. sampling, group composition and interview structure) are provided in the discussion of data collection procedures in section 4.3.

The draw and write technique

Participatory methods are becoming increasingly popular with researchers who wish to engage with children in a meaningful way (Coad & Lewis, 2004). Over the last decade, there has been a considerable expansion of one particular participatory method in social and educational research - *the draw and write technique*. To date, the technique has predominantly been used to in research investigating children's conceptions of health and illness: Macgregor et al. (1998) used the technique to ask children about their views on health in schools; Williams et al. (1989) used it to ask children about their perceptions of five different health issues; and Horstman and Bradding (2002) used it to ask both healthy children and children with various chronic illnesses about their perceptions of health care provision, health care environments, and their information needs.

In essence, the draw and write technique involves asking children to draw a scenario on a particular topic and write or talk about what is happening in the picture (Pridmore & Bendelow, 1995). Some researchers have also encouraged children to use 'thought bubbles' to express how the people in the picture are thinking or feeling (Horstman et al., 2011). The drawing can then be the focus of questions that are pertinent to the research aims (Driessnack, 2006). The technique has been used in a variety of settings as a stand-alone task or as part of a wider set of research methods. It has been used in school-based studies as a classroom task administered by teachers and/or researchers (Bendelow & Oakley, 1993; Wetton & McWhirter, 1995) and as part of a wider interview schedule with follow-up focus group discussions moderated by researchers (Hendry, 1995). It has also been used as ice-breaker for semi-structured interviews on a sensitive topic (Backett & Alexander, 1991; Barnett et al., 1994; Young, 1994 cited in Backett-Milburn & McKie, 1999).

The general consensus among researchers is that the draw and write technique provides an effective medium for facilitating communication between the child and the researcher (Horstman et al., 2011). Horstman et al. (2011) identify draw and write as valuable method in child research because children's ability to retrieve information that is encoded about their experiences may be more readily accessed by stimulating their visual perception senses than by relying solely on semantic stimuli. Alderson (1993) sees the technique as valuable because drawing can help children to create order, solve problems and make sense of the world. Hill, Laybourn and Borland (1996) propose that the technique can also assist children who find it difficult to convey their perspectives or feelings verbally. Similarly, Pridmore and Lansdown (1997) assert that the technique facilitates children who are less able to communicate their

perceptions verbally because it lets them draw and then seek adult help to express their thoughts in writing or dialogue.

As Horstman et al. (2011) point out, virtually all school-age children are familiar with producing drawings and writing about them or talking about them; therefore, it helps to create the natural context which is repeatedly identified as primary requirement for conducting qualitative research with children (Eder & Fingerson, 2002; Greig et al., 2007). Rollins (2005) suggests that asking children to draw a picture first and then asking them to talk about it puts them into the role of 'expert': they are given the message that their thoughts are valued which can go some way towards reducing the child-adult power differential. Driessnack (2006) similarly believes that the act of drawing takes the focus away from the adult researcher asking direct questions and instead provides a child-centered way for their lived experience to be shared. Researchers have also noted the richness that characterises data that has been gathered in this way (Horstman et al., 2011). Pridmore and Lansdown (1997) reported that asking children to draw and write provided richer data than writing alone and that children appeared to enjoy producing a drawing.

Whilst there is general consensus that the draw and write technique has significant value as a child-centred qualitative method, it is also subject to several potential pitfalls and limitations. Drawing is usually seen as an enjoyable, participatory activity that all children can take part in; however, not all children enjoy drawing or have confidence in their drawing ability and it should not be assumed that the technique will suit the needs and preferences of all children (Backett-Milburn & McKie 1999). Thus, as with all qualitative research, a high degree of sensitivity and flexibility is required on the part of the researcher to ensure that participants are engaging in the research process in a way that they are comfortable with. To insist that children produce a drawing when they do not wish to would serve to reinforce the adult-child power differential and undermine the quality of the data gathered. Therefore, draw and write should be seen as just one tool in the qualitative tool box and, when children indicate either verbally or non-verbally that they do not wish to engage in drawing activities, alternatives must be sought.

It is also necessary to acknowledge that drawing is not an easy skill to acquire and hence researchers must refrain from viewing children's drawings as 'direct translations of mental states and images onto paper' (Thomas, 1995 cited in Backett-Milburn & McKie 1999, p.390). Caution needs to be used when analysing children's drawings, especially when they represent more abstract concepts or scenarios or when pictures are more symbolic because drawings can be more ambiguous than verbal or written data (McDonald & Rushforth 2006; Wetton & McWhirter 1998). The likelihood of over-interpreting or misinterpreting children's drawings can be reduced by seeking children's *own* interpretations of what their drawings mean to *them*. Indeed, this was the original purpose of the draw and write technique. When

utilised in this way, the unit of analysis becomes the meaning that the child attributes to their drawing as opposed to the drawing itself.

In this research, the draw and write technique was incorporated into the focus group discussions as an additional means through which children could express their knowledge and understanding of bushfire hazards in their own terms and in a way that they were comfortable and familiar with. This is the first time that the draw and write method has been applied in empirical research on children's knowledge of hazards and disasters. Specific details on how the draw and write technique was administered in the focus groups are provided in the discussion of data collection procedures in Section 4.3.

Props and visual aids

The strategic use of props and visual aids has been commonly endorsed as a useful technique for stimulating children's participation in qualitative research (Brooker, 2001; Graue & Walsh, 1998; Freeman & Mathieson, 2009; Zwiers & Morrisette, 1999). Props (e.g. dolls, toys) and visual aids (e.g. pictures, photographs) can help to help clarify the research topic for the children and focus their attention and responses (Parker, 1984). They can also improve comprehension by reducing dependency on oral information (Zwiers & Morrisette, 1999). Tammivaara & Enright (1986, p.232) assert that 'children often find doing something with something and talking about that something to be easier, more comfortable, and more interesting than only talking about something that isn't physically present (i.e., an event, a routine, an idea)'.

This study employed both props, in the form of two puppets, and a visual aid, in the form of a custom designed illustration of a high fire risk house (see Figure 4.1 overleaf). To elicit younger children's perspectives on the research topic, the puppets were used as proxy interviewers. This approach to interviewing children, especially younger children, has been identified as having significant utility because it places children in the role of 'experts', thereby circumventing many of the issues created by the child-adult power differential. As Morgan et al. (2002) have pointed out, children may be reluctant to answer questions to which they think adults already know the answer (e.g. 'what is a bushfire?', 'how do they start?', 'what do they look like?'). By using 'naïve puppets or other characters as their mouthpiece, researchers can create a research environment that reassures children that their knowledge is superior and thereby worthy of expression (Morgan et al., 2002). Tammivaara and Enright (1986) have endorsed the approach of 'playing dumb' which involves explicitly taking on the role of an ignorant, confused participant who requires the assistance of child insiders. In their own work these authors have

Figure 4.1: Illustration for eliciting children's perspectives on bushfire hazards.

found that this often yields excellent explanations of how children interpret and understand their worlds. Playing dumb involves trying to understand the children's explanations, but failing, using devices such as incorrect assertions, obvious discrepancies, and logical fallacies. They suggest that once the interviewer is established as a 'dummy' in need of guidance, children will often provide explanations and information voluntarily and at almost any time in or out of the formal interview encounter.

In the present research, after a series of pilot interviews, it became clear that using the puppets as proxy interviewers was most effective with children aged between 5 and 7 years. Children older than this tended to feel that they had outgrown such activities. Thus, with older children, the illustration was used on its own, with me adopting the role of the 'naïve city-dweller' who was interested in learning about the bushfire hazards in their particular area.

Taken together, the child-centred techniques of focus groups, drawing, props and visual aids provided children with a natural and familiar context in which they could express their ideas. They also provided a certain degree of flexibility which enabled children to exert some control over how they wanted to contribute to the research. The flexible approach employed in this research should not be viewed as constituting an 'anything goes' approach that forsakes methodological rigour: rather, when doing research with children, the flexible use of different methods should be viewed as integral to gaining access to children's inner worlds (Greig et al., 2007; Tammivaara & Enright, 1986). The particulars of how the various child-centred techniques were administered in the data collection phase of the research are detailed the section that follows.

4.3   Data collection

4.3.1   Selection of research locations

The research locations for this study were selected on the basis of two major criteria:

> 1)   The location was identified by state fire authorities as one that could be impacted by a bushfire event; and
>
> 2)   There had not been major bushfire in the area in the lifetime of the children living in that location.

The main reason underlying this second criterion was that a major bushfire in any particular location is a relatively infrequent occurrence. Thus, education programs must be informed by analyses of how children understand bushfire risk in the absence of any direct experience with a major bushfire event. Therefore, interviewing children who experienced such an event would be a confounding factor in the analysis.

In collaboration with the CFA and Tasmanian Fire Service, potential research locations that satisfied each of the selection criteria were identified. This involved examining fire agency risk assessment databases and hazard maps. The Directors of Community Safety at both the CFA and the Tasmanian fire service facilitated this process by providing the required information and verifying that the potential research locations satisfied each of the selection criteria. As a result of this process, 27 locations in Victoria and 19 locations in Tasmania were identified as potential research locations. Ten research locations in each State were then randomly selected and letters of invitation to participate were sent to primary school principals in those locations. Whilst four Victorian and three Tasmanian principals expressed an interest in participating, only two principals in Victoria and two principals in Tasmania agreed to provide open access to their school community. The final four schools participating in the research were:

> i.   Warrandyte Primary School, Victoria
> ii.   Macedon Primary School, Victoria
> iii.   Huonville Primary School, Tasmania
> iv.   Bothwell District School, Tasmania.

The geographic position of each school location is presented in Figure 4.2. The environmental and socio-demographic characteristics of these locations will now be described[1].

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[1] These descriptions are intended as succinct introductions to the research locations only. The interested reader will find more information relating to the socio-demographic characteristics of each location in Appendix 4.11.

Figure 4.2: Geographic position of research locations.
Source: Google Earth

Warrandyte, Victoria

The outer suburb of Warrandyte (pop. 7,393) is located on the Yarra River, approximately 24 kilometres north-east of Melbourne's central business district (ABS, 2007a). Traditionally home to the Wurundjeri people, the area was first settled by Europeans when gold was discovered there in 1851 (Blainey, 2006). Over the last several decades, as the urban sprawl of Melbourne has extended further to north, what used to be a rural area has become an outlying suburb of the metropolitan area. The most notable environmental feature of Warrandyte is the densely vegetated, hilly terrain. The publicly owned and managed Warrandyte State Park comprises a total of 586 hectares of remnant bushland, large pockets of which are dotted throughout Warrandyte and the surrounding area (Nielson & Stone, 2006). Strict council regulations on tree removal (Nillumbik Shire Council, 2011) and the strong conservationist values of the local community (e.g. Friends of Warrandyte State Park), have seen the dense vegetation that characterises the State Park extend beyond park boundaries into residential areas. This blurring of State Park and privately owned residential land can be clearly observed in the aerial view presented in Figure 4.3 below.

Figure 4.3: Aerial view of Warrandyte, Victoria

Source: Google Earth

The Warrandyte area boasts a highly bio-diverse range of vegetation. Manna Gums, Yellow Box Eucalypts, Swamp Gums and Silver Wattles line the Yarra River, whilst Stringy Bark Eucalypts, Peppermint Eucalypts, and Black Wattles cover the hills where native grasses, creepers, rare orchids and other wildflowers are also abundant (Neilson & Stone, 2006; Van Bockel & Coupar, 2009). The dense cover of trees and grasses combined with steep, hilly terrain make Warrandyte particularly prone to bushfire activity. In addition, the narrow, winding, dead-end, dirt roads that characterise many of the residential areas are likely to be blocked by falling trees or traffic in a bushfire event, which would severely impede access in and out. The single lane bridge which separates north and south Warrandyte would further impede access by restricting traffic flow. Taken together, these factors represent an extreme fire risk for the local community and the entire Warrandyte area is identified by the CFA as an 'extreme fire risk zone' (CFA, 2009).

Warrandyte has been affected by several serious bushfires over the last century. In 1939, the 'Black Friday' fires burned through Warrandyte destroying 100 homes (Foley, 1947). In 1962, a fire starting at nearby Christmas Hills destroyed 85 homes and killed two men (ABC, 2009). Just seven years later, in 1969, the 'Black Wednesday' fires destroyed 25 homes (ABC, 2009). The most recent fire event was in 1991, when a fire started in the State Park and burned across the Yarra River into North Warrandyte, where it threatened several houses: however, no houses or lives were lost (ABC, 2009). On Black Saturday in 2009, the devastating Murrindindi/Kinglake fire burned within 20 kilometres of Warrandyte before its path was diverted by a late southerly wind change.

Macedon, Victoria

The town of Macedon (pop.1,439) is nestled at the base of Mount Macedon, a six million year old dormant volcano, 64 kilometresnorth-east of Melbourne (ABS, 2007b). Large parts of the mountain are publicly ownedand constitute the 2427 hectareMacedon Regional Park. Traditionally home to the DjaDja Wrung and Wurundjeri people, the area was first settled by European pastoralists in the mid-18th century (Blainey, 2006; Hutton, 1990). In the 1870s, the natural beauty and cool climate of Mount Macedon began to attract members of Melbourne's wealthy social elite and the government released some land on the south side of the mountain to the middle and upper classes who built a number of grand Victorian homes for their summer residences (Hutton, 1990). More recently, Macedon has become a popular destination for amenity-led migration with people being drawn to the town not just by the natural attractions and lifestyle changes but by the local property market which has been perceived as offering better value for money than the market in metropolitan Melbourne (Luck, Black & Race, 2011; Ragusa, 2011).

The most significant internal landscape feature of Macedon is the town's highly treed character and, as can be observed in Figure 4.4, the town is also surrounded by dense forest coverage. The northern boundary of the town is defined by remnant forest of the Regional Park and the eastern and southern boundaries are defined by the margins of the densely vegetated Black Forest. The vegetation in these publicly managed native forests varies according to elevation: at lower levels Swamp Gums, Manna Gums, Stringybark Eucalypts and Candlebark Eucalypts predominate, whilst at higher elevations of the mountain are characterised by Mountain Ash, Alpine Ash, Snow Gums, and various species of Wattle (Parks Victoria, 2011).

Figure 4.4: Aerial view of Macedon, Victoria.

Source: Google Earth

Given the densely vegetated nature of Macedon and its surrounds, bushfires occurring in and around the area have the potential to spread and severely impact upon the town's residents (CFA, 2009). Thus, the CFA identifies Macedon and the neighbouring townships of Mount Macedon and Woodend as having a 'very high fire risk' (CFA, 2009).

Historically, Macedon has been impacted by a number of serious bushfires. In the 1983 Ash Wednesday fires, the townships of Macedon and Mount Macedon were all but destroyed: 239 houses were burnt out, many more were seriously damaged and seven people were killed (Wilson & Ferguson, 1986). The Macedon Family Hotel was one of the only buildings to survive and provided a safe refuge for over 300 people, animals and firefighters as the fire engulfed the town (Kenworthy, 2007).

Huonville, Tasmania

The south-eastern Tasmanian town of Huonville (pop. 1,934) is located on the Huon River in the Huon Valley, 38 kilometres from the state capital of Hobart (ABS, 2007c). Originally occupied by the Mellukerdee band of the Nuenonne people, Huonville was first settled by Europeans in the mid 1800's (Ryan, 1996). However, it wasn't until the Huonville Bridge was constructed in 1876 that the town began to flourish. Historically, the Huon Valley was the hub of Tasmania's prodigious apple growing industry and whilst the area continues to be one of Tasmania's largest apple producers, a steady decline in the industry since the 1950's has seen primary production diversify into other areas including to other export-focused primary industries, including forestry, agriculture, fishing and aquaculture (Davidson, 2003).

Whilst Huonville itself has been largely cleared of vegetation, its proximity to large tracts of native and plantation forest makes it highly susceptible to bushfire activity: to the west and south-west is the 600,000 hectare World Heritage listed South-West National Park, to the east is the Sherwood Hill Conservation Area and to the south-east is the 5,600 hectare Snug Tiers Nature Recreation Area. Each of these publicly owned and managed parks are characterised by large stands of eucalypt forest that are both highly adapted to, and dependent on fire. The proximity of Huonville to the margins of these forests can be observed in Figure 4.5. The local climate, characterised by extreme periods of low humidity and strong winds from the north-west, also provides ideal bushfire conditions and topographically, the steep terrain surrounding Huonville has the result of increasing bushfire speed.

Figure 4.5: Aerial view of Huonville, Tasmania.

Source: Google Earth

Historically, the Huonville area has been impacted by several serious fires. The town was severely affected by the 1897 'Black Friday' fires when several people were killed and dozens of homes were destroyed (Britton, 1983). Seventy years later, the town narrowly escaped the 1967 'Black Tuesday' disaster when a series of fires all but destroyed the nearby towns of Kingston, Snug, Margate, Cygnet and Ferntree (Wettenhall, 1975).

Bothwell, Tasmania

The rural town of Bothwell (pop. 556) is located in central Tasmania approximately 70km north west of Hobart (ABS, 2007d). Nestled on the banks of the Clyde River, the township is surrounded by eucalyptus covered hills that extend up into the densely forested mountain highlands (Bush et al., 1975). An aerial view of Bothwell is presented in Figure 4.6.

Figure 4.6: Aerial view of Bothwell, Tasmania

Source: Google Earth

Bothwell is one of Australia's oldest townships and it depends almost entirely on primary industry for its existence (Ellis, 2001). Approximately 40% of local livelihoods are dependent on the agricultural industry (ABS, 2006), with timber harvesting, sheep, cattle and grain farming, and the cropping of opium poppies for the pharmaceutical industry constituting the main forms of primary production in the area (Ellis, 2001). From the early 1990's until the time of data collection (late 2006), extended periods of drought had impacted heavily on the local agricultural industry (Bureau of Meteorology, 2011) and, on several occasions, lakes and waterholes for irrigation have dried up and large quantities of feed have been brought in to keep livestock on survival rations ((Bureau of Meteorology, 2011; Ellis, 2001).

The Tasmanian Fire Service identifies Bothwell and the surrounding area as being highly susceptible to bushfire activity. With their large stands of native eucalyptus, the hills that skirt the township are prone to forest fires whilst the township itself is prone to grass fires and ember attack from the surrounding hills (Killalea, personal communication, 2006). Ellis (2001) documents persistent bushfire activity since European settlement in the early 1800's and, over the last few decades, Bothwell has been threatened by several major fires. The 1967 Black Tuesday fires burned within several kilometres of the township, as did another large fire in 1982. More recently, in 2004, a large forest fire in the hills to the west of the township took firefighters several days to bring under control (Turnbull, personal communication, 2006). Several children in this study also reported that their properties had been directly threatened by a spate of minor grass, scrub, and forest fires in early 2006.

4.3.2   Recruitment of participants and sample characteristics

It is important to note from the outset that in grounded theory methodology, sampling proceeds not in terms of drawing representative samples of particular populations of individuals, units of time, and so on, but in terms of concepts, their properties, dimensions, and variations (Corbin & Strauss, 1990). As Corbin & Strauss (1990, p.7) explain:

> When a project begins, the researcher brings to it some idea of the phenomenon he or she wants to study. Based on this knowledge, groups of individuals, an organization, or community representative of that phenomenon can be selected for study. For example, if a researcher wants to study nurses' work, he or she would go to where nurses are working-a hospital, clinic, or home (or all three) - to watch what they do". Once there, the researcher would not be sampling nurses as such, but sampling the incidents, events, and happenings that denote the work that the nurses do, the conditions that facilitate, interrupt, or prevent their work, the action/interaction by which it is expressed, and the consequences that result...In grounded theory, representativeness of concepts, not of persons, is crucial. The aim is ultimately to build a theoretical explanation by specifying phenomena in terms of conditions that give rise to them, how they are expressed through action/interaction, the consequences that result from them, and variations of these qualifiers. The aim is not to generalize findings to a broader population per se.

This process of sampling for representativeness of concepts rather than persons is fundamental to grounded theory procedures and is referred to in the grounded theory literature as theoretical sampling. Theoretical sampling and its application to this study will be discussed in further detail in section 4.4.3.

At each participating school, participants aged between 5 and 12 years old were recruited via direct classroom presentations at each grade level. Upon agreeing to participate in the research, school principals were contacted and times for student recruitment presentations within the school were arranged. Recruitment presentations involved informing children about the purpose of the research and what volunteering for an interview would entail. Care was taking to explain the concepts of 'research', 'volunteer', and 'interview', and children were encouraged to ask questions and share their own understanding of these terms with the class. Children did not appear to have any difficulty understanding these concepts and expressed a reasonably accurate understanding of their meanings (e.g. 'research is like when you do a project on something to find out about it', 'volunteering means you don't get paid', 'volunteering means that you want to do it and you don't have to' and 'an interview is like on the news when they ask someone questions about something').

Children were informed that volunteers would be interviewed in groups, at the school, during class time, in a classroom or office. It was explained that the interview would involve a discussion about bushfires and the damage they can do, as well as what people can do to prevent this damage. Children were also informed that the interview would be videotaped in order to obtain an accurate record of their knowledge and ideas. In relation to issues of anonymity and confidentiality, it was made clear to the children that the video recording would only be viewed by my supervisor and myself. Children were also advised that they would not be identified by name in any research output. Invitations to participate (Appendix 4.2) and

consent forms (Appendix 4.3 and Appendix 4.4) were then distributed to the class. Attached to the consent forms was a short demographic questionnaire (Appendix 4.5).

At the end of the recruitment presentation, children were encouraged to talk to their friends, family and teachers to help them decide about volunteering. Children were informed that if they decided to volunteer they would need to have their parents read and sign the consent form and return it to their teacher within two weeks. The children were then asked if they had any questions regarding the project. Typically, they did not have questions but had bushfire stories that they wanted to share with the group. At this point, the teacher or I would explain to the children that if they wanted to volunteer for the interview, they would be able to share their stories then. Recruitment presentations concluded with a brief summary of what we had discussed and a reiteration of the voluntary nature of participation.

Teachers were asked to collect the returned consent forms from their students and deliver them to the school office where there would be an envelope in which to place them. These envelopes were collected from the school after a period of two weeks. Classroom teachers were then emailed the names of the volunteers from their class and asked to allocate them to groups of three to five children based on who they thought would work well together. The number of children to be allocated to each group was guided by suggestions in the literature that the ideal number of participants in child focus groups is three to five participants (Peek & Fothergill, 2010; Morgan et al., 2002). Once teachers had allocated children to groups, times for the interviews were arranged. Interview times with parents were arranged by contacting them directly using contact details provided on the returned consent forms.

As detailed in the Research Information Sheet (see Appendix 4.2), children who had experienced loss or trauma as the result of a bushfire were strongly discouraged from participating in the study. There were two main reasons for this: firstly, it is possible that someone who has experienced loss or trauma as the result of a fire might find thinking and talking about bushfires distressing; secondly, and as noted earlier, a major bushfire in any particular location is a relatively infrequent occurrence and therefore, education programs must be informed by analyses based on how children understand bushfire risk in the absence of any direct experience with a major bushfire event. A direct experience with a major bushfire constituted the only exclusionary criterion to be applied in this study; all other children were invited to participate, regardless of gender, language, religion, ethnicity, or disability.

At the four schools involved the study, a total of 41 child focus groups (N= 131) were conducted. A total of 6 of these were held at Huonville, 7 were held at Bothwell, 15 were held at Warrandyte and 13 were held at Macedon. The disparity in focus group numbers reflects the relative size of the schools. For example, Bothwell District School has 74 students whilst Warrandyte Primary School has 289.

Participants ranged in age from 5 to 12 years, with the majority of children being aged between 8 and 10yrs (49.6%). Within the overall child sample, male to female ratios approached 1:1, with 66 males (50.3%) and 65 females (49.7%). The demographic characteristics of the child participants are presented in Table 4.2.

Table 4.2: Demographic characteristics of child participants

		Bothwell	Huonville	Macedon	Warrandyte	Total
Gender						
	Male	8 (6.1%)	9 (6.8%)	28 (21.3%)	29 (22.1%)	66 (50.3%)
	Female	11 (8.3%)	10 (7.6%)	16 (12.2%)	20 (15.2%)	65 (49.7%)
Age						
	5-7yrs	6 (4.6%)	2 (1.5%)	16 (12.2%)	14 (10.6%)	38 (29%)
	8-10yrs	10 (7.6%)	9 (6.8%)	20 (15.2%)	28 (21.3%)	65 (49.6%)
	11-12yrs	3 (2.3%)	8 (6.1%)	8 (6.1%)	7 (5.3%)	28 (21.3%)

As outlined in the earlier discussion of Bronfenbrenner's (1976) ecology of human development (see section 3.3.2), a key concern in this research pertained to how parents and children influence each other's understanding of bushfire hazards. In this research, this influenced was investigated by interviewing as many parents of the child participants as possible. Parents were invited to participate via the Information Sheet that was sent home with the children (see Appendix 4.2). Across research locations, a total of 37 parents volunteered to be interviewed. Their ages ranged from 32 to 47 years with an average age of 41 years. Females were disproportionately represented, with 31 females (81.1%) and 6 males (18.9%). This may be explained by the fact that many of the female participants were either taking leave from work or working part-time in order to raise their young families, and this made them more available to volunteer for an interview. It is also worth noting that the response rate of parents was much higher in Victoria than Tasmania, with only four parents in Tasmania volunteering to be interviewed. Whilst the reasons for this disparity are not clear, it might also be attributed to issues of time availability. It may be that the parents in the Tasmanian locations, both of which are characterised by a lower socio-economic demographic than the Victorian locations (ABS, 2007c, 2007d) may have had less flexible work conditions which precluded them from volunteering. The demographic characteristics of the adult participants are presented in Table 4.3.

Table 4.3: Demographic characteristics of adult participants

	Bothwell		Huonville		Macedon		Warrandyte		Total	
Gender										
Male	0	0%	1	2.7%	0	0%	6	16.2%	7	18.9%
Female	1	2.7%	2	5.4%	12	32.4%	15	40.5%	30	81.1%
Age										
35-40yrs	1	2.7%	1	2.7%	5	13.5%	11	29.7%	18	48.6%
41-45yrs	0	0%	1	2.7%	6	16.2%	7	18.9%	14	37.8%
46-50yrs	0	0%	1	2.7%	1	2.7%	3	8.1%	5	13.5%

4.3.3   Semi-structured focus group interviews with children

The timing

The Tasmanian focus groups were conducted during the months of September, October and November in 2007, whilst the Victorian focus groups were conducted exactly one year later during the months of September, October and November in 2008. Thus, all data was collected before Black Saturday. This was extremely fortunate: not only did the events of that day receive extensive media coverage but it is highly likely that some of the Victorian children would have known people who had been directly affected by the disaster, particularly in Warrandyte which is located near the heavily impacted town of St Andrews. Whilst exposure to media coverage or personal involvement with disaster victims would have added an intriguing dimension to the data, the original aim of the research was to examine how children understand bushfire hazards during times of quiescence, because it is in this context that most children will be involved in bushfire education programs. Hence, completing the data collection phase of the research before the Black Saturday disaster, allowed for the original aims of the research to be reliably pursued.

The setting

Focus groups were conducted at the participating schools during class time. On the day of their interview, children were collected from their classrooms and taken to another location within the school, usually an unused classroom, office, library, or meeting room. The interviews were usually conducted sitting around a table. Occasionally, however, children sat in a circle on the floor. Regardless of seating arrangements, I was always seated on the same level as the students in order to reduce the child-adult power differential (Eder & Fingerson, 2002).

Introductions and icebreaking activities

Focus groups began with me re-introducing myself to the children and recapitulating the purpose of the research. It was emphasised that the questions I would ask them were 'not like a test' and that the aim of the interview was to find out how they, as children, understand bushfires so that the fire agencies can improve their education programs and make them more fun, interesting, and useful for children. Children were reminded that their participation in the interview was voluntary and if at any time they felt that they didn't want to stay, they were welcome to return to their classroom. It should be noted, however, that no child took this option during the course of the research.

Children were reminded that the interview was going to be videotaped so that I would have an accurate and reliable record of their ideas. Children were shown the video camera and given an opportunity to see how it worked. This was actually a very effective ice-breaker and seemed to help the children relax into the new setting. Children were then asked how they felt about the interview being videotaped and their responses ranged from indifference to excitement. Children were reminded

that the video would only be watched by myself and my supervisor and upon completion of the project, all videotapes would erased. Children were assured that they didn't have to be in the video frame if they didn't want to be: however, no child took this option during the course of the research. Indeed, many children were disappointed to hear that their interview would not be broadcast on national television (!). As part of this introductory phase of the interview, younger children were also introduced to the puppets and were invited to have a play with them. This was also a very effective icebreaker and helped the children to relax and become more familiar with the interview setting.

Focus group procedure

As noted earlier, interviewing children requires careful preparation to ensure that the questions asked are within the realm of children's language and communication abilities (Greig et al., 2007). Using the guidelines provided by Greig et al. (2007) (see Table 4.1), a semi-structured protocol was developed. This protocol covered the main topics under investigation, including children's knowledge of 1) the conditions and processes that cause bushfires, 2) the consequences of bushfires and 3) what people can do to prevent those consequences. The protocol also included questions aimed at revealing how children's social contexts influence the development of their bushfire knowledge. This protocol is presented in Table 4.4.

Table 4.4: Semi-structured focus group protocol

Topic area	Example questions
Conditions and processes that cause bushfires	· Where do bushfires happen? · When do bushfires happen? · How do bushfires happen? · Why do bushfires happen? · Could there be a bushfire at [insert town/suburb]? · Could there be a bushfire at your house? · Could there be bushfire at the school? · PROBES: Why/Why? How? When? How close could it come to X?
Consequences of bushfires	· What would happen here if the there was a bushfire? · What would happen if there was a bushfire at [insert town]? · What would happen if there was a bushfire at your house? · What would happen if there was a bushfire at the school?? · What happens to houses in bushfires? · What happens to people in bushfires? · PROBES: How would X happen? Why would X happen? When would X happen?
Conditions and processes that prevent bushfire consequences	· What can people can do to stop X from happening? · What can your family do to stop X from happening? · What can you do to stop X from happening? · What can your school can do to stop X from happening? · How could Y stop X from happening? · PROBES: Why? When? How?
The role of social context	· Where did you learn about X? · Who have you talked about X with? · How did you know about X? · Have you ever talked to X about Y? · PROBES: When? What? How? Why/Why not?

Whilst a high degree of flexibility was fundamental to the interview process, topic areas were usually discussed in the order presented in Table 4.4. This was because the discussion of each topic provided an important scaffold for discussions of the topics that followed. The concept of 'scaffolding' was originally coined by Jerome Bruner (1985, pp. 24-25) who described it as follows:

> The tutor or peer serves the learner as a vicarious form of consciousness until such a time as the learner is able to master his own actions through his own consciousness and control. When a child receives that conscious control over a new function or conceptual system, it is then that he able to use it as a tool. Up to that point, the tutor in effect performs the critical function of 'scaffolding' the learning task to make it possible for the child to internalise external knowledge and convert it into a tool for conscious control.

Discussing the interview topics in the order presented in Table 4.4, provided a scaffold which struck a balance between providing enough freedom for the children to voice their own perspectives in their own words, but not so much freedom that the discussion was decontextualised or confusing. Striking this balance helped to engage and maintain the children's interest and buffered their attention against distractions.

Scaffolding was also found to be an extremely useful technique for exploring children's knowledge *within* each topic area. For example, one way that children believed that they could build resilience to bushfires by making an emergency plan (see Ch. 6.4). One of the most effective ways to tap children's knowledge of emergency plans was to guide them through a bushfire scenario that began with receiving a warning about a bushfire in the area and concluded with the arrival of a fire at the house. These type of scenario exercises provided opportunities for the children to develop the detail of their plans, as well as modify and revise them as they identified various problems and obstacles. Hence, they provided a deeper level of insight into children's capacities for critical thinking and reflection than an un-scaffolded planning exercise.

Whilst the interview protocol and the technique of scaffolding provided the basic content and structure of the focus group discussions, the discussions themselves were embedded within the selected child-centred research techniques. For example, interviews with younger children involved working through the interview protocol using the puppets as proxy interviewers: children were informed that the puppets had just moved into the house depicted in Figure 4.1 and needed advice on how to be safe in their new home. Interviews with older children, meanwhile, involved using the illustration on its own, with me directing the discussion through the list of topics in the protocol. In these activities, children of all ages were provided with texta markers or crayons that they could use to circle or scribble out various hazards and draw in different preventative measures.

Using the draw and write technique, children were also asked to draw their own properties, and then, working through the interview protocol, they were asked to identify the various hazards as well as potential management strategies. This technique proved extremely useful for children of all ages: not only did it help to focus their attention but it helped me to gain a better understanding of their own personal situation which enhanced my capacity to ask relevant and meaningful questions. The children's drawings also provided a very useful visual aid for focussing and scaffolding the emergency response scenarios: children were able to draw a fire approaching their house and then think about what they would do at each stage of the fire event to protect themselves, their families, and their homes. Some of the children provided verbal consent for their drawings to be used as examples in this thesis and other research outputs and these are presented in Appendix 4.6.

The focus group interviews concluded with children being encouraged to ask any questions or share any thoughts about their interview experience. I also took time to address the major misconceptions that children had articulated during the interview, making sure not to undermine their responses by emphasising that what they had contributed was extremely valuable and was going to help fire agencies develop better education programs. Children were also encouraged to go home and talk to their families about their emergency bushfire plan and share what they had learned with their parents and siblings. Lastly, school principals and teachers were informed or reminded of the school-based bushfire education programs that are delivered by both TasFire and the CFA, and were given details on how to arrange for a program to be delivered in their school.

Upon completion of the interviews, which tended to run for approximately one hour, the video footage was transcribed verbatim for coding purposes and transcripts were then stored in a password protected computer file.

4.3.4 Semi-structured interviews with parents

The aim of the semi-structured interviews with parents was to glean an understanding of how children participate in discussions and activities associated with bushfire risk reduction within the home. These interviews were typically conducted at the family home, at a local coffee shop, or at the parent's workplace. Conducting the interviews at the family home was particularly useful because it gave me an opportunity to see for myself where the children lived, which further enhanced my understanding of how they conceptualised their own personal exposure. Whilst the majority of interviews were conducted with just one parent, for two of the interviews, both the mother and father were present. All interviews with parents were audio recorded and were transcribed verbatim for coding purposes. Transcripts were then stored in a password protected file.

Interviews with parents typically began with questions relating to their perceptions of bushfire hazards in their area and on their own property. These discussions were especially useful when the interviews were conducted away from the home because they helped to contextualise parents' perspectives on their own personal exposure. Parents were then asked to describe what steps, if any, they had taken to mitigate bushfire hazards on their property. They were also asked to describe their bushfire emergency plan. Both of these topics were explored in-depth to gain an understanding of levels of preparedness within the household. Parents were also invited to comment on any challenges they had faced in their attempts to mitigate and prepare, and how they had dealt with those challenges. Parents were then asked about how they had involved their children in family discussions and activities pertaining to bushfire mitigation and preparedness. They were also prompted to consider whether their children had involved *them* in any discussions or activities. Parents were also asked to comment on the challenges of involving children in discussions and activities related to mitigation and preparedness, and how they had dealt with these challenges. Taken together, these questions and the discussions they

triggered elicited rich, dense accounts that were integral to building an understanding of the role of the family in the development of children's bushfire knowledge.

4.4 Data analysis and theory development

4.4.1 Coding procedures

In grounded theory, 'coding' is the essential link between collecting data and developing an emergent theory to explain those data (Glaser & Strauss, 1967; Strauss & Corbin, 1998; Charmaz, 2006). It is through coding that the researcher defines what is happening in the data and seeks to understand its meaning (Charmaz, 2006). Charmaz (2006) identifies three main phases of the grounded theory coding process: 1) an *initial coding* phase that involves naming each word, line, or segment of the data; 2) a *focussed coding* phase that uses the most frequent initial codes to sort, synthesise, integrate, and organise large amounts of data into broader categories or processes; and 3) a *theoretical coding* phase that weaves the categories and processes together to create a cohesive account of the studied phenomenon.

An inherent feature of grounded theory methodology is that, regardless of the coding phase in which the researcher is engaged, the *method of constant comparison* is continuously employed to develop incisive analytic distinctions that are firmly grounded in the data (Glaser & Strauss, 1967; Strauss & Corbin, 1998). The method of constant comparison involves continuously comparing data with data, codes with codes, and categories with categories at every level of the analytic process (Strauss & Corbin, 1998). This process is essential to grounded theory research because it maintains a high level analytic rigor throughout the three-phase coding process. The distinct procedures involved in the three-phase process will now be described in detail.

Initial coding

Initial coding (Charmaz, 2006), also referred to as open coding (Glaser & Strauss, 1967; Strauss, 1987; Strauss & Corbin, 1998, 2008), involves labelling segments of data at a high level of specificity. Charmaz (2006) identifies three levels of initial coding that correspond to the labelling of different sized data segments or 'units of data'. At the first level, *word-by-word coding* involves attending to the words that participants use and reflecting on their associated images and meanings. This is a highly nuanced level of coding. In this study, word-by-word coding was particularly useful in helping to draw attention to the meanings that the children attributed to particular terms such as 'staying to defend' and 'evacuating'. These meanings were not always consistent with the meanings held by fire agencies or other adults, such as parents and teachers, and word-by-word coding helped to illuminate these differences.

At the second level, *line-by-line coding* involves labelling each line of the transcribed interview. At this stage of coding, it is important to look for tacit assumptions and implicit actions and meanings

and make them explicit. As Charmaz (2006) notes, coding every line can be somewhat arbitrary because not every line contains a complete sentence and not every sentence appears to be important: however, through coding each line of data, the researcher is forced to remain open to the data and the associated nuances. In this way, the process of line-by-line coding contains a corrective measure which restricts the researcher from superimposing their own preconceived notions on the data. In this study, line-by-line coding helped to capture the full complexity and diversity of children's perspectives by forcing me to consider each line of data anew and label it in the most discrete and specific terms possible. It also helped me to identify key concepts and processes that were worth exploring in more detail in further interviews.

At the third level, *incident-by-incident coding* involves labelling larger segments of data, such as a participant's full account of a particular event, or a full conversation about a particular concept or issue (Charmaz, 2006). In this study, incident-by-incident coding was particularly important for elucidating children's perspectives on more complex phenomena, particularly those with a temporal dimension, such as planning to respond to a bushfire event. This level of coding was also very useful in identifying contextual factors, including the nature of children's interactions with me, and with each other, during the interview process, as well the ways in which their meanings were sustained or transformed as a consequence of these interactions.

Focussed coding

In initial coding, strong analytic directions are established (Charmaz, 2006). *Focussed coding*, also referred to as 'selective coding' (Glaser & Strauss, 1967; Strauss & Corbin, 1998, 2008), involves acting upon these analytic directions by sifting through the most significant and/or frequent codes from the initial coding phase and synthesising and categorising them at a superordinate level that is characterised by a higher level of abstraction (Charmaz, 2006). Thus, focussed coding requires making decisions about which initial codes make the most analytic sense in order to categorise the data most incisively and completely. This process acts to condense data which makes the data more manageable. It is in this phase of coding that the researcher exercises the highest level of interpretation: first, by selecting the superordinate categories that they feel most adequately represent the core phenomenon under investigation; and second, by forming hypotheses about the extant relationships between these categories (Cahrmaz, 2006; Glaser & Strauss, 1967; Strauss & Corbin, 1998, 2008).

Typically, the outcome of the focussed coding process is a conceptual framework consisting of three major components: 1) *the basic social-psychological problem*; 2) *the basic social-psychological category*; and 3) *the contextual and modifying conditions* (Glaser & Strauss, 1967; Strauss & Corbin, 1998, 2008). As defined by Glaser & Strauss (1967), the basic social psychological problem is a problem that is shared by the group studied and may not always be articulated, whilst the basic social

psychological category represents the process in which people engage to deal with the problem as they perceive or experience it. The contextual and modifying conditions, meanwhile, are the structural conditions that shape the nature of situations, circumstances and problems, and the means by which individuals respond to them (Strauss & Corbin, 1998).

For the children in this study, the basic social psychological problem was *perceiving vulnerability*. Perceiving vulnerability involved being aware of the potential to be affected by *hazard impacts*, which were conceived as arising from an interaction between *the biophysical* process of bushfire and particular *conditions of exposure.* The basic social-psychological problem of perceiving vulnerability will be presented in detail in Chapter 5. The basic social-psychological process in which children engaged to deal with the problem of perceiving vulnerability was *building resilience*, which had two had two main phases: *mitigating the hazard* and *preparing for a bushfire event.* The two-phase process of *building resilience* will be presented in Chapter 6. In this study, four specific contextual and modifying conditions were found to substantially influence children's conceptions of both *perceiving vulnerability* and *building resilience*. These were *direct experience with fire, the family, the school,* and *the research process.* Each of these conditions and their role in children's conceptualisations of the basic social-psychological problem and process will be discussed in detail in Chapter 7.

Theoretical coding

The final phase of coding is theoretical coding. Theoretical coding weaves the focussed codes (i.e. the problem, process, and contexts) into hypotheses that work together in a theory that represents the main concern of the participants (Glaser, 2005). It is in this phase that a substantive theory is developed (Charmaz, 2006). In grounded theory, the term 'substantive theory' refers to a set of explanations that account for phenomena within a specific or substantive area (Glaser & Strauss, 1971). A substantive theory differs from formal theory, which provides an explanation of a set of phenomena that have broad applicability across several areas of study. Strauss and Corbin (1990) defined substantive theory as theory developed for a specific substantive or empirical area of social inquiry: it evolves 'from the study of [a] phenomenon situated in a particular situational context' (Strauss & Corbin 1990, p.174). Formal theory, by contrast, is 'theory developed for a formal or conceptual area of sociological study such as status passage, stigma or deviant behavior etc' (Glaser & Strauss, 1967, p.177): it evolves from exploring a phenomenon in a variety of contexts with a variety of different social groups (Strauss & Corbin, 1990). Most grounded theories are substantive theories: only occasionally are they further developed into a formal theory through higher levels of abstraction and conceptual integration across a wider range of situational contexts and social groups (Lempert, 2007).

The theory developed in this study is a substantive theory. The particular situational context was constituted by four locations in south-eastern Australia that are highly exposed to bushfire hazards. The studied phenomenon was how children living these areas understood and perceived these hazards and the various approaches for dealing with them. The substantive theory presented in this thesis is titled 'Seeking Adaptation' and it weaves together the problem of *perceiving vulnerability*, the process of *building resilience*, and the various contextual and modifying conditions to form a theoretical exposition that represents the main concern for the children in this study. The theory of 'Seeking Adaptation' is discussed in detail in Chapter 8.

4.4.2   Memo-writing

A key element of grounded theory methodology is memo-writing. Memos are informal analytic notes that chart, record and detail the researcher's ideas as they move through the analytic process, from the early phases of initial coding through to the later phase of focussed coding and theory development (Strauss & Corbin, 1998; Charmaz, 2006). Memo-writing constitutes a crucial process in grounded theory because it encourages and enables the researcher to reflect deeply and think more analytically about emergent codes, categories and processes from early on in the research process. It also charts the course of further data collection by identifying key issues and themes as they emerge from the analysis (Charmaz, 2006). Memos are also heavily relied upon for clearly defining and characterising categories and processes during the write-up phase of the research process. Indeed, Charmaz (2006) argues that memo-writing is the pivotal intermediate step between data collection and writing a draft paper or dissertation on the emergent theory. In this study, memos were also a particularly useful tool for reflecting on methodological issues: they were used to document what kinds of questions or interview techniques produced the richest, most vivid accounts, and they specified how these techniques could be further refined to gather further insight into children's perspectives. An example memo from my own analysis of the child data is presented in Appendix 4.7.

4.4.3   Theoretical sampling and saturation

Theoretical sampling and saturation are both key strategies in a grounded theory analysis (Charmaz, 2006; Glaser & Strauss, 1967; Glaser, 1978; Strauss, 1987; Strauss & Corbin, 1998). Together, they ensure that the theory is rich, dense and represents the full range of knowledge and experience associated with a phenomenon.

Theoretical sampling

In grounded theory, the research process commences with initial sampling which involves seeking data that addresses the original research questions. As Charmaz (2006) explains, it is through the initial coding of this early data that ideas about the data are constructed and then examined through further empirical inquiry. Then, as data collection continues and coding becomes more focussed, tentative categories are formed. At this point, theoretical sampling is employed as a means of seeking

pertinent data to elaborate and refine the categories. It helps to delineate and develop the properties and dimensions of a category as well as its range of variation. Engaging in theoretical sampling prompts the researcher to predict where and how they can find needed data to fill gaps and saturate categories (Strauss & Corbin, 1998).

Theoretical sampling follows a different logic than sampling techniques for traditional quantitative research design (Strauss & Corbin, 1998; Charmaz, 2006). Whereas quantitative researchers use their data to make statistical inferences about target populations, grounded theorists aim to fit their emerging theories with their data (Charmaz, 2006). However, as Charmaz (2006) points out, it is not uncommon for grounded theory researchers to invoke the logic of quantitative research and seek to make their samples represent distributions of larger populations. The error of this approach lies in assuming that qualitative research aims for generalisability. Although this strategy may be useful for initial sampling, it does not fit the logic of grounded theory and can result in the researcher collecting unnecessary and conceptually thin data. Thus, theoretical sampling pertains only to conceptual and theoretical development: it is *not* about representing a population or increasing statistical generalisability of the results (Strauss & Corbin, 1998; Charmaz, 2006).

In this study, initial sampling began by gathering general data pertaining to children's views on whether there could be a bushfire in their area, how a bushfire in their area might impact upon their property or their personal safety and what could be done to reduce or prevent these impacts. This allowed for the development of initial ideas and tentative categories. Data pertaining to these tentative categories were then sought in subsequent interviews. For example, early interviews revealed that the tentative category of 'evacuating' involved a number of different processes including 'identifying triggers to leave' and 'deciding what to take'. Theoretical sampling was employed to explore the variation in children's conceptions of these processes and this enabled all of the relevant properties and dimensions to be identified.

Theoretical saturation

In grounded theory, the process of theoretical sampling continues until categories are 'saturated' and the gathering of fresh data no longer provides new theoretical insights, nor reveals new properties of the categories. It is important to emphasise that theoretical saturation is not the same as witnessing repetition of the same perspectives or stories, as Glaser (1978, p.191) explains:

> Saturation is not seeing the same pattern over and over again. It is the conceptualisation of comparisons of these incidents which yield different properties of the pattern until no new properties of the pattern emerge. This yields the conceptual density that when integrated into hypotheses make up the body of the generated grounded theory with theoretical completeness.

According to the canons the of grounded theory methodology, theoretical saturation is what the grounded theorist should aim for (Glaser & Strauss, 1967; Strauss & Corbin, 1998; Charmaz, 2006). Grounded theorists argue that the logic of theoretical saturation supersedes sample size, and in some cases, this means that the sample size in a grounded theory study is very small. In this study, however, the saturation of categories required a larger sample size of 131 children: it was only after sampling this many children that I was satisfied that the categories were theoretically complete and that continued sampling was not revealing any new properties or variation.

4.4.4   Computer aided analysis software

Given the large volume of data gathered in this study (approximately 80 hours of video and audio data that equated to approximately 1000 pages of transcription), Computer Assisted Qualitative Data Analysis Software (CAQDAS) provided an essential data management tool. NVIVO (Version 8) was selected as the most appropriate software as it provides tools and functions for both initial and focussed coding as well as memo-writing and diagramming. Interview transcripts were imported into NVIVO and initial codes were entered as *free nodes*. By using the method of constant comparison, similarities and differences between the free nodes lead to the development of higher order categories which were then entered as *tree nodes* that defined the higher order categories and their properties and dimensions. For example, *'getting burnt'*, *'smoke inhalation,* and *'getting crushed'* were first entered as free nodes and were then entered under the tree node of *'death or injury'* which was, in turn, entered under a higher order tree node of *'hazard impacts'* which also included *'property damage or loss'* and *'environmental degradation'*. This process demonstrates the inductive nature of grounded theory: individual data segments are named and labelled and then encapsulated in high order categories from the ground up.

4.4.5   The place and purpose of the literature review

The final stage of a grounded theory project involves searching the literature and comparing the findings of the research with extant empirical and theoretical work (Charmaz, 2006). In grounded theory, literature is considered as source of data that helps to contextualise research findings (Glaser & Strauss, 1967). However, the extant literature is not supposed to influence the development of the theory: it is only incorporated once the theory had been developed. This ensures that the theory is developed from the ground up, which is of course, the very purpose of grounded theory methodology. In this research, once the substantive theory of 'Seeking Adaptation' had been developed, I undertook an extensive search of the literature across the fields of psychology, geography, hazard and disaster management, sociology, education and community development to find extant empirical and theoretical work that related to my own findings. I also discussed my findings with scholars from various disciplines which helped to guide me in the direction of   literature that was highly relevant but may have otherwise remained elusive. I then wove the relevant literature into the discussion of 'Seeking Adaption' that is presented in Chapter 8. In doing so, I have shown the points of

convergence and divergence between my own empirical and theoretical findings and the work of others before me.

4.5 Ethical considerations

Participation in the research was voluntary and informed consent was obtained from all participants. As the study involved children, it was necessary to obtain informed consent for their participation from parents/guardians. However, explicit verbal consent was also obtained from the children at the beginning of the interview. At the beginning of the interviews, all participants were reminded that the information they provided would be confidential and anonymous and great care was taken to ensure that the children understood what this meant before they were asked to provide their verbal consent to participate. Permission to video-record the interviews was obtained from children at the beginning of the interview and it was also obtained from their parents on the consent form. Permission to audio record interviews with parents was obtained on both the consent forms and verbally before commencement of the interview. All participants were encouraged to withdraw their participation from the interview if they decided at any time that they no longer wanted to be involved. It was emphasised that they would not need to provide a reason and would simply needed to say that they were ready to finish the interview.

In the interviews, the children often expressed serious misconceptions about bushfire safety and time was always taken at the end of the interview to debrief the children on any misconceptions they had articulated. Children were also encouraged to seek more information from their parents and teachers about the issues in question. An additional ethical concern related to distress that might have been experienced as a result of thinking and talking about bushfire hazards. For this reason, the information letter provided to parents informed them that children who had experienced any trauma as a result of fire would need to be excluded from the study. In the interviews, all children were closely monitored for any signs of distress and whilst children did report that thinking and talking about bushfires was sometimes scary, they generally believed that talking about it was a good thing. As will be shown in later chapters, this constituted a key finding of the research. However, should any child have become distressed in the interview, the interview would have been terminated, every effort would have been made to console or comfort the child, and parents and teachers would have been informed immediately.

In order to maintain confidentiality, participants were allocated pseudonyms and were identified by these in all transcripts, and research outputs. Video footage was not used for any purpose beyond the initial transcribing and coding of data and was stored in password protected files that were accessible only to me. All video data was stored in password protected computer file and will be destroyed five years after the date of collection. All other raw data was stored in a locked filing cabinet within the

School of Psychology at the University of Tasmania and will also be destroyed after five years from the date of collection.

This research was approved by the *Human Research Ethics Committee (Tasmania) Network* which adopts the guidelines explicated by the *NHMRC National Statement on Ethical Conduct in Research* (2007) (see Appendix 4.8). Approval to conduct the research in Victorian and Tasmanian was also sought and granted by the Victorian Department of Education and Training (see Appendix 4.9) and the Tasmanian Department of Education (see Appendix 4.10).

4.6   Concluding remarks

This chapter has outlined the research methods that were used to examine children's knowledge of bushfire hazards and disasters. It has described the various child-centred techniques that were used to address the issues that confront researchers when they engage in qualitative research with children, and it has emphasised how flexibility was the key to accessing their perspectives and ideas. The chapter has also outlined the methods of analysis and theory development that were employed to develop a conceptual framework and substantive theory that resembles children's perspectives as closely as possible. The components of this framework and the emergent substantive theory are the focus of the following four chapters.

CHAPTER 5: PERCEIVING VULNERABILITY

*Fire can be dangerous. When there is fire and wind near a town, it can burn it
up into pieces. Fire can kill people and animals too. Fire can kill everything.*

- Sally, 7yrs, Huonville

5.1 Introduction

A core assumption underlying grounded theory methodology is that groups experiencing the phenomenon being studied share a basic social-psychological problem that may not necessarily be articulated (Glaser & Strauss, 1967; Strauss & Corbin, 1998; Charmaz, 2006). Identifying and presenting the social-psychological problem as defined by those who experience it, is integral to grounded theory research (Glaser and Strauss, 1967; Charmaz, 2006). The social-psychological problem experienced by the children in this study was conceptualised as *Perceiving Vulnerability* and was the product of three separate but interrelated components: 1) *the biophysical process* which represents children's knowledge of the conditions and processes that facilitate bushfire activity in the natural environment; 2) *conditions of exposure* which represents children's knowledge of the various circumstances through which people and property are exposed to the biophysical process; and 3) *hazards impacts* which represents children's knowledge of the spectrum of adverse consequences that result when *the biophysical process* interacts in time and space with *conditions of exposure*. These three components and the relationships between them are depicted schematically in Figure 5.1.
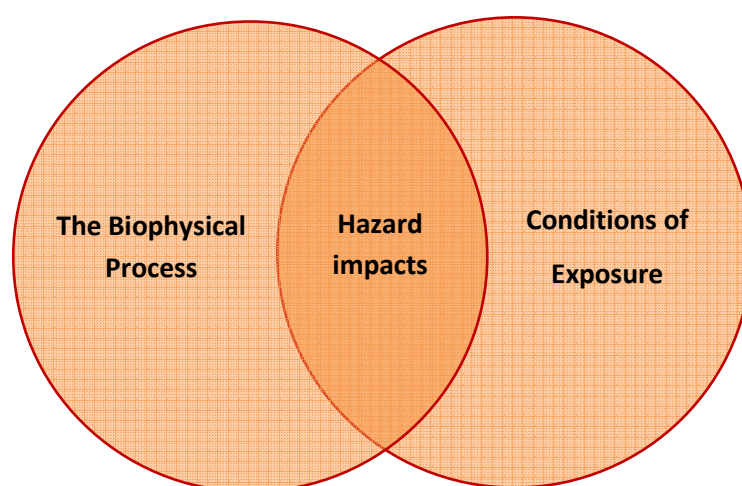
Figure 5.1: The problem of Perceiving Vulnerability

This chapter presents the social-psychological problem of *Perceiving Vulnerability* and its constituent components, as understood by the children. For ease of discussion, it presents children's knowledge of *hazard impacts* first, followed by their knowledge of *the biophysical process* and *conditions of exposure* and how these two components interact to generate hazard impacts. It is important to

emphasise that the purpose of the chapter is to present the social-psychological problem as articulated by the children. In accordance with the basic tenets of grounded theory methodology, my own interpretation of *Perceiving Vulnerability* and its relationship with the extant literature is reserved for Chapter 8.

5.2 Hazard impacts

The children in this study were acutely aware of the adverse effects that bushfires can exert on individuals, households, and communities. The three hazard impacts about which children expressed most concern were 1) *property damage and destruction*, 2) *death and injury* and 3) *environmental degradation,* each of which are discussed in detail below.

5.2.1   Property damage and destruction

The first category of hazard impacts identified by the children was *property damage and destruction.* As reflected in the following extracts, children were highly aware that bushfires can burn down houses and destroy other valuable buildings, belongings and assets:

Briony: What happens in a bushfire?
Laura: Trees get burnt and grass gets burnt, and if there's a house, that can get burnt too.
<div align="right">-5yrs, Bothwell</div>

Sally: The bushfire can burn the house up, and your favourite things - CD's, toys, teddies, clothes, favourite food, drinks, photos.
<div align="right">-7yrs Huonville</div>

Olive: Bushfires are dangerous.
Penny: Yeah, people can lose their houses and their very beloved stuff.
<div align="right">-8yrs, Warrandyte</div>

Briony: What would happen to your house if a bushfire did come through Bothwell?
Mike: Probably burn down.
Mandy: It would burn all your good stuff. There would be nothing left.
Brendan: Yeah, there'd be no houses.
<div align="right">-10yrs, Bothwell</div>

Mary: In a bushfire, some people's houses could get burnt down, and some of their stuff could get destroyed or most of it.
<div align="right">-11yrs, Huonville</div>

As reflected in the above extracts, children perceived bushfires as potentially catastrophic events that can cause widespread material and economic losses. There was also a distinctly personal dimension to the way children framed material losses: people lose their 'beloved' possessions, their 'favourite things', their 'good stuff'. As such, property damage and destruction was a key concern for the children in this study.

5.2.2   Death and injury

The second category of hazard impacts of concern to the children in this study was *death and injury*. As the following extracts illustrate, the children were fully aware of the potential for bushfires to kill or seriously injure people:

Briony: Mahra, what's dangerous about bushfires?
Mahra: They can hurt people.

-5yrs, Bothwell

Briony: What could happen to you if there was a bushfire?
Harper: We could die.

-6yrs, Warrandyte

Briony: So what happens to people in bushfires?
Luca: They get really hurt and have to go to hospital.

-7yrs, Macedon

Taylor: Lots of people die from bushfires and it's not a very pretty sight.

-9yrs, Warrandyte

Ellie: There's a very high risk of being killed I think.

-10yrs, Warrandyte

Briony: What can happen to people in bushfires?
Steph: The fire burns them and they just die.

-11yrs, Macedon

Children were also concerned about the potential for bushfires to kill pets and other animals:

Alyssa: You could lose your pets.

-8yrs, Warrandyte

Penny: If you had a dog, you could lose your dog.

-8yrs, Warrandyte

Children identified a variety of ways in which people could be killed or injured in bushfires. The first of these was smoke inhalation, with many children describing a process whereby smoke would interfere with normal lung function and cause suffocation:

Ismail: You could get really sick cos the smoke goes in your mouth and it…. [pats chest and simulates difficulty breathing].

-7yrs, Macedon

Briony: So A, how could the smoke make someone die?
Mandy: Because the smokes really thick and because when the smoke goes into your lungs and makes it [difficult to breath] yeah.
Brendan: And people could get really, really hot and couldn't breathe through the smoke.
Briony: And what happens when you breathe too much smoke?
Mandy: You die.
Mike: It hurts your lungs.

- 10/11yrs, Bothwell

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Philip: Smoke inhalation and that's a way of dying pretty much, you breathe in too much smoke and then your lungs don't work

-12yrs, Macedon

Children also identified burns as major cause of death and injury:

Kirsty: You might get killed.
Briony: How?
Kirsty: Because they're really hot and they burn you all up.

-6yrs, Warrandyte

Briony: How could someone die in bushfire?
Ben: You can get burnt really badly.

-7yrs, Bothwell

Briony: How do people die in bushfires?
Sacha: They could get burnt.

-9yrs, Huonville

Briony: What would be the dangers [for people]?
Philip: Getting burnt. Getting third degree burns or getting incinerated.

-11yrs, Macedon

In terms of causality, burns were primarily attributed to actually catching on fire, as depicted in the following extracts:

Briony: Okay, so what can happen to people in a bushfire?
Mick: They die. They catch on fire.

-8yrs. Warrandyte

Amy: They could get their hair on fire and then your whole body will catch on fire.

-9yrs, Macedon

Mai: You could catch alight and be burnt alive.

-11yrs, Huonville

Very few children attributed burns to exposure to radiant heat and the following extract represents the only explicit reference to radiant heat as a cause of death.

Briony: How would someone die in a bushfire?
Lucas: Radiant heat.
Briony: Yep, tell me about radiant heat?
Lucas: It like the heat that comes off the bushfire.

-9yrs, Warrandyte

Whilst this reference did not specify the precise mechanisms by which radiant heat would impact on the human body, it portrays at least a rudimentary awareness of its effects.

A number of children also identified dehydration as a cause of death or injury. However, as the following extracts illustrate, it was not identified as a primary cause of death, but as a mediating factor that would incapacitate people and increase their chances of getting burnt:

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Larry: You could get dehydrated and get knocked out and then the fire could come closer and
          closer and then [gestures being covered by the fire]
                                                                              -8yrs, Macedon

Briony: What are the other major dangers for people when there's a bushfire?
Tom: Getting dehydrated.
Briony: What's dehydrated?
Sila: It means like if you haven't had water and it's a very hot day you can like get all dried up
          and like blackout and then it would be bye-bye to you cos like you're just there blacked out
          and the fire's come.
                                                                              -10yrs, Macedon

Briony: How would someone die in a bushfire?
Lang: Dehydration and then you'd like collapse and then the fire takes you.
                                                                              - 12yrs, Warrandyte

The final cause of death and injury identified by the children in this study was getting crushed by
burning trees and other falling debris:

Briony: Are there any other ways someone could die in a bushfire?
Ismail: Yeah. A tree could fall down and land on your head and then they can just die.
                                                                              -7yrs, Macedon

Greg: Well, if you're like really inside all these trees, if one tree gets catched on fire, nearly every
          other tree gets catched on fire so if they all fall down you'd probably really get squashed by
          them.
                                                                              -8yrs, Macedon

Briony: Are there any other ways people can die in bushfire?
Ben: If the fire burns a tree and a tree falls on you.
                                                                              -9yrs, Bothwell

Briony: What are the other dangers? How does a bushfire kill?
Dave: Falling trees landing on you.
                                                                              -11yrs, Bothwell

Lang: Well, I reckon the danger is something falling on top of you or something.
Scout: Like falling rubble.
                                                                              -11/12yrs, Warrandyte

As will be explored in greater depth in later discussions pertaining to *conditions of exposure*, falling
trees and collapsing houses were a major concern amongst the children and were strongly associated
with both serious injury and death.

For the children in this study, being aware of the potential for property damage and destruction was
often a source of negative emotional reactions including worry, fear, and sadness:

Steph: I'm afraid of bushfires because they can kill people and animals and I love animals.
                                                                              -7yrs, Huonville

Gemma: I've thought about fires at bedtime at it feels like I just wanna cry.
Briony: Why is that?
Gemma: Because I'd lose everything and I could lose myself or my mum and dad.

-9yrs, Warrandyte

Parents also reported signs of bushfire-related fear and anxiety in their children. In the most extreme case, Sally had observed her son become extremely anxious after the family moved to Macedon from the inner city suburbs of Melbourne and described how, at one point, this fear had impeded his everyday functioning:

Sally: Well, we talked about fires in the first year and he would get really frightened: very, very frightened. You know like he would have trouble sleeping because he was worried about there being a bushfire and it was something like, you know, he chose not to go and play.

-Mother of Brian (9yrs), Macedon

It is important to emphasise at the outset, that although children articulated various degrees of bushfire related fear, there was no evidence in the data that talking about bushfire hazards and disasters served to exacerbate these fears. Rather, as will be argued throughout this thesis, talking about hazards and disasters, and identifying strategies for preventing, mitigating and preparing for them was found to serve a key ameliorative function.

5.2.3   Environmental degradation

An additional category of potential bushfire impacts identified by the children was environmental degradation. There was a distinct tendency for the children to perceive bushfires as having a detrimental effect on the natural environment. Bushfires were viewed as responsible for destroying vegetation, killing native animals and destroying native habitat:

Jesse: It's not healthy for the bush because the fire burns the roots out.

-9/10yrs, Macedon

Will: A bushfire could burn all the bush and all the animals would probably die.

-10yrs, Macedon

Scout: Bushfires destroy thousands of native animal's homes.

-11yrs, Warrandyte

The children were generally unaware of the regenerative and restorative impacts of bushfire on Australian native ecosystems.   However, one child did articulate an understanding of bushfire's role in plant succession. When this child was asked if he viewed bushfire as a positive or negative event, he responded thus:

Solomon: I guess I find them both positive and negative. They are negative because you can get burnt and die and I heard that it's like 900 degrees inside a bushfire, that's what I've heard. And the positive thing is that when it burns all the big trees and they die, because there's a lot of ash and ash makes good fertiliser, a lot of shrubs and stuff come up.

-11yrs, Macedon

Having outlined children's awareness of bushfire impacts, the discussion will proceed to the conditions and processes that were perceived as contributing toward them.

5.3 The biophysical process

The biophysical process encapsulated children's knowledge of bushfire behaviour in the natural environment, including how bushfires start and then spread through the landscape. Children generally conceptualised the biophysical process of bushfire as deriving from the interaction of three elements: *fuel, ignition,* and *weather*. This is depicted schematically in Figure 5.2.
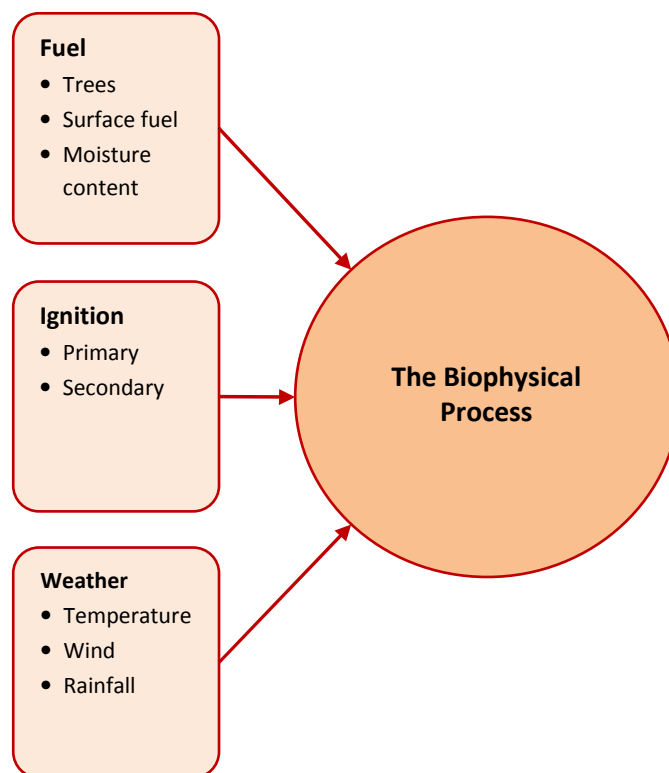
Figure 5.2: The biophysical process of bushfire

It is important to emphasise that no single element was viewed as being more important than the others, and as will be demonstrated in the discussions that follow, each element was perceived as making a unique and integral contribution to the biophysical process.

5.2.1   Fuel

The first element that children identified as being essential to the biophysical process was *fuel*. Children identified a variety of fuels that would constitute fuel for a bushfire, primarily on the basis of their flammability. Trees took precedence as the most commonly identified fuel type and were widely perceived as highly flammable:

Penny: Trees make fire. You can easily burn down trees.

-5yrs, Bothwell

Sally: Fire can burn everything up, even trees.

- 7yrs, Huonville

Rod: Trees catch fire really easily.

-8yrs, Macedon

Sean: Trees are really easy to burn up.

-9yrs, Warrandyte

Several children offered explanations as to why trees burn so easily. Some children attributed the flammability of trees and timber debris to their wood composition:

Hugo: A tree could catch on fire because it's made of wood.

-6yrs, Warrandyte

Pete: Trees are wood, so it's sort of like, as we know, wood can burn up easily.

-9yrs, Warrandyte

Other children, meanwhile, were aware that particular tree species, such as native eucalyptus, are highly flammable due the chemical composition of their leaves:

Colin: We've got a lot of gum trees around our house and they've got like that oil in them.
Briony: What oil?
Colin: I'm not sure but there's oil in the leaves and stuff so….
Mark: It burns really fast even if it is green or anything they just burn. That's like eucalyptus.

-11yrs, Huonville

The importance accorded to trees as a source of fuel was clearly articulated in children's assessments of whether or not a bushfire could occur in their local area. Typically, dense tree coverage was associated with high a likelihood of bushfire activity:

Briony: Who thinks there could be a bushfire in Warrandyte?
Kirsty: Yes, because there's a lot of wood trees.

-6yrs, Warrandyte

Briony: Could there be a bushfire around here this summer do you think?
Bec: Yeah, because there's like lots of trees that could catch on fire.

-7yrs, Macedon

Briony: So where do bushfires happen?
Larry: In places with lots of trees.
Ismail: Like on the mountain where there's quite a lot of trees.

-8yrs, Macedon

Briony: Could there be a bushfire around Huonville?
Mai: Yep, because there's like heaps of bushes and trees.

-11yrs, Huonville

Conversely, sparse tree coverage was associated with a low level of potential bushfire activity:

Ben: If there was a fire, I don't think it would be much of a bushfire because there's not many trees around.

-7yrs, Bothwell

Josie: It's most unlikely that there's gonna be a bushfire in the city because it doesn't have much trees to catch on fire.

-9yrs, Macedon

Whilst trees tended to be the most frequently mentioned fuel type, children also acknowledged the role of surface fuels such as grass and leaf and timber litter in the biophysical process:

Hugo: A log could catch on fire because it's made of wood.

-6yrs, Warrandyte

Zach: Leaves are really good things to burn.

-6yrs, Macedon

Hugo: Grass can catch on fire

-6yrs, Warrandyte

Connor: If there's some grass a fire could probably spread all over the grass.

-7yrs, Huonville

Given that native bushland and other forest ecosystems are comprised of dense tree coverage and thick carpets of surface fuel, it is not surprising that children perceived bushland and forested areas as the prime location for bushfire activity. However, as the following extracts suggest, semantics may have also played a role in this perception:

Julia: That's why they're called bushfires because they're trees from the bush.

- 5yrs, Warrandyte

Greg: It probably wouldn't be called a bushfire if it wasn't in the bush.

- 8yrs, Macedon

Nonetheless, when substantiating their assessments of bushfire likelihood in a given location, children often made reference to the bushland environment:

Briony: Do you think there could be a bushfire around here?
Larry: Well I think there could be one day, because it's like really in the bush.

-8yrs, Macedon

Briony: So why could there be a bushfire in Warrandyte? What is it about this area?
Pam: There's lots of trees and it's a bushy place. Yeah, it's got a lot of trees and it's a bushy area.

-9yrs, Warrandyte

Briony: Do you think there could be a bushfire around here this summer?
Mike: Yep. It's really like really bushy so lots of things could catch on fire and stuff.

-10yrs. Bothwell

In Warrandyte, children perceived the Warrandyte State Park, with its 586 hectares of remnant bushland, as especially prone to bushfire activity and perceived a very high likelihood of activity there, further highlighting the general association of bushfires with bushland areas:

> Briony: So do you think there could be a bushfire in Warrandyte?
> Jade: Yes, because the state park's up there.
>
> -7yrs, Warrandyte

> Briony: Do you think there could be a bushfire around here?
> Pete: Yes, definitely, because we've got the State Park and there are a lot of trees.
>
> - 9yrs, Warrandyte

> Briony: So do you think there could be a bushfire around the Warrandyte area?
> Craig: Definitely, because there's lots of state park around here and lots of trees.
>
> -9yrs, Warrandyte

In addition to identifying the various types of fuel that would aid the biophysical process, children also made a distinction between 'green' and 'dry' fuel. Dry fuels were perceived as being highly susceptible to ignition:

> Penny: The leaves could easily burn because they're dry.
>
> -5yrs, Bothwell

> Anna: The fire will get dry things and the leaves will obviously be dry and it will just make the fire bigger and bigger.
>
> -8yrs, Bothwell

Dry fuels were also associated with an increased rate of fire spread:

> Ralph: And if you have lots of dried grass or whatever or dry leaves all over the place the fire can spread and stuff.
>
> -10yrs, Warrandyte

Green fuels, by contrast, were perceived as either less susceptible or entirely resistant to ignition:

> Justin: Green trees won't catch alight.
>
> -6yrs, Bothwell

> Melek: Green [fuel] isn't good for fires, the fires can't quite burn that fast if it's green.
>
> -8yrs, Macedon

> Mike: Green grass is really hard to catch on fire.
>
> -10yrs, Bothwell

As will be shown in Chapter 6, keeping grass and other vegetation green during a bushfire event was a key strategy for reducing exposure to bushfire impacts.

To summarise, children were well aware of the essential role of fuel in the biophysical process of bushfire. Trees and surface fuels were both identified as being highly flammable. Accordingly, native bushland areas and forest areas were perceived as the prime location for bushfire activity.

Importantly, children understood the dryness of fuel as an important determinant of flammability, associating dry fuels with an increased likelihood of ignition and an increased rate of fire spread.

5.2.2   Ignition

The second element that children perceived as integral to the biophysical process of bushfire was *ignition*. Two distinct categories of ignition emerged from the data. The first category, termed *primary ignition*, encapsulates children's knowledge of how a bushfire would start. The second category, termed *secondary ignition*, encapsulates children's knowledge of how a bushfire would spread through the landscape. This section discusses both types of ignition and children's knowledge of their role in the biophysical process.

Primary ignition

Children identified a wide range of mechanisms that would cause primary ignition. These were encapsulated by two main sub-categories: natural ignition and human caused ignition. The two main types of natural ignition were lightning strikes and spontaneous ignition from the sun's rays. The four main types of human caused ignition were discarded cigarette butts or matches, the sun shining through fragments of glass debris, human use of fire (e.g. bonfires, campfires, agricultural fires, prescribed fires), and arson. Extracts depicting these ignition types are presented in Tables 5.1 and 5.2 respectively.

Table 5.1: Natural causes of bushfire ignition

Lightning strikes	The sun's rays
Briony: How does a bushfire start? Do you know? **Justin:** Yes. By the lightning **Briony:** Does anyone know how the lightning starts the bushfire? **Justin:** Yes, when it strikes the ground it hits stuff and it starts (5yrs, Bothwell).	**Penny:** Okay, well [if] there's hay not under shelter and the sun's reflecting on it, a little bit of fire might come and then it might be a big bit of fire (5yrs, Bothwell).
Briony: How would a bushfire start? **Luke:** Hey, I know how you can start a bushfire without a match or anything, when the lightning strikes it might hit a tree and it might fall down and start a fire (7yrs, Macedon).	**Pierre:** I've got two cats so like maybe like they will drop fur that um sun can shine on and when the sun shines on fur it makes fire (7yrs, Warrandyte). **Briony:** How could a bushfire start around Macedon? **Rob:** By the really, really, really hot sun. The sun would be like [gestures shining down] (7yrs, Macedon).
Briony: So, where would a bushfire come from if it came? **Kurt:** It would come from the ground or something. There might be some wood and then lightning comes on it (7yrs, Macedon).	**Kurt:** Maybe a bull ant could burn and then it catches on fire or something from the sun (7yrs, Macedon). **Carly:** When it's a really hot day the sun usually catches onto a leaf and it burns (7yrs, Macedon).
Briony: How do bushfires start? **Ismail:** There was like a couple of days ago, well, not a couple of days but this year sometime, there was a really big thunderstorm and lightning hit the tree and stuff (7yrs, Macedon).	**Ellie:** If the sun reflects over the trees or on paper or something it can light a fire (8yrs, Warrandyte). **Lucas:** When it's really hot and um there isn't much water and things can just start burning from the sun's rays (8yrs, Warrandyte).
Briony: How do bushfires start? **Joe:** We've got a tree in our place that got struck by lightning **Briony:** Really? Did it catch on fire? **Joe:** Yes, and half the tree's gone (9yrs, Warrandyte).	**Pam:** Usually bushfires are on hot days because the sun catches on the trees, as everyone knows. **Briony:** So the sun can catch the trees on fire? **Pam:** Yeah, easily (9yrs, Warrandyte).

Table 5.2: Human causes of bushfire ignition

Cigarette butts or matches	Glass fragments	Human use of fire	Arson
Briony: How do bushfires start? **Anna:** People chuck cigarette butts out the window and they start bushfires and stuff...It could catch like on the driest grass and that starts fires easy (8yrs, Bothwell). **Lang:** If someone lights a match and they put it out but it's still got a little bit of flame left and they throw it behind them in the bush it could light up the bush (9yrs, Warrandyte). **Briony:** When do bushfires usually happen? **Joe:** People are being silly and they've got matches and they drop matches (9yrs, Warrandyte). **Briony:** How do bushfires start? **Dave:** With cigarettes... **Kat:** People chuck 'em out their windows (11yrs, Bothwell). **Briony:** Do you know when bushfires usually happen? **Dell:** Sometimes people throw cigarettes out their car windows (11yrs, Huonville). **Briony:** So how does a bushfire start? **Brian:** If you throw a cigarette out and you don't stamp on it (10yrs, Bothwell).	**Briony:** How do bushfires start? **Fiona:** Broken glass. The sun goes through the glass and it starts lighting up (9yrs, Huonville). **Briony:** How do bushfires happen? **Emilee:** If the sun reflects at glass (5yrs, Bothwell). **Briony**: So what is a bushfire? **Zach:** Um well it's like when somebody leaves like a glass bottle in the sun, it could cause a fire (6yrs, Macedon). **Briony:** Okay so how do bushfire's start? **Eamon:** If there's a piece of glass and the sun is really hot and it burns the grass (7yrs, Warrandyte). **Carl:** If you leave a magnifying glass out or a glass bottle in the grass then the sun can come down and then the flames will go swoosh (8yrs, Warrandyte) **Dan:** Sometimes when you get a magnifying glass and shine it on the ground or a stick, it catches on fire (9yrs, Huonville).	**Miley:** Someone could have a mini bonfire or something and no-one could be watching it and then it could go out of control (6yrs, Macedon) **Mena:** Maybe there's lots of leaves on the ground and somebody is having a fire and they're not watching it and it can catch on fire (8yrs, Warrandyte). **Briony:** How might a bushfire start? **Dell:** If you're out camping and you light a fire and you accidently leave it (11yrs, Huonville). **Pete:** Sometimes if the fire brigade, they sort of burn down a couple of trees and it went out control and so it just kept on spreading (9yrs, Warrandyte). **Briony:** How do they start? **Jason:** Probably bits of burn-offs that haven't been put out (9yrs, Huonville). **Briony:** How do bushfires start? **Lee:** Just freak accidents like you're burning off crops and it just gets out of control. **Dave:** You could burn a paddock off and all the roots could catch on fire and skip into the next paddock and it flares up (11yrs, Bothwell).	**Cam:** Well If you lighted a branch where if was brown, if you lit it, it would light the branches and then get onto the tree and if the trees were close then it could go on to the next tree and the next tree and the next tree. That's if you were very naughty (7yrs, Macedon). **Pam:** Someone can put a bushfire by purpose, it doesn't have to be by the sun or anything, someone can just light the tree or sometimes it can be by other reasons not just buy itself (9yrs, Warrandyte). **Sacha:** People deliberately light it somewhere...just because they're drunk and they just want to draw attention to themselves. **Mika:** And they take drugs and all that. **Briony:** Why do they do that? **Sacha:** Just trying to draw attention to themselves and get noticed (9yrs, Huonville). **Dell:** People deliberately light fires for fun and then it gets worse (11yrs, Huonville).

As the extracts in these tables illustrate, children's conceptions of primary ignition were strongly influenced by their personal experiences, particularly their experiences with the use of fire for recreational or agricultural purposes. Children were also aware of how irresponsible or deviant actions can cause ignition. They strongly disapproved of the irresponsible use of recreational fire and the careless management of agricultural fires or prescribed burns. They also strongly condemned deliberate acts of arson, which was understood as an illegal activity.

Secondary ignition

As previously noted, the term secondary ignition refers to children's conceptions of how a bushfire spreads through the landscape. Two distinct processes of secondary ignition emerged from the data: ignition via chains of direct flame contact and ignition via embers or sparks. Ignition via chains of direct flame contact dominated children's explanations of fire spread and a large majority of children described fire spread purely in these terms. As the descriptor implies, the process involved the ignition of one fuel source through direct contact with the flame generated by a nearby fuel source. This process is clearly articulated in the following extracts:

Melek: Well if there was a tree around and one tree's leaves got caught on fire and the leaves were all on to another tree and it would catch that tree on fire and just go around all the trees.

-8yrs, Macedon

Larry: Over at Middle Gully there's a lot of trees and that fire, like the flames might go down the tree onto the grass and stuff and then it might go over the road because there's a couple of leaves on there.

-8yrs, Macedon

Briony: If there was a bushfire in the state park how would that spread?
Joe: If it grew too big it would catch the trees and if the tree was close to the other tree it [the flame] would go onto the other tree and that would go onto the other tree.

-9yrs, Warrandyte

Pete: The fire might hit a tree and then if there's another tree very close to it, it might get it and just spread.

-9yrs, Warrandyte

The process of ignition via direct flame contact was also pervasive in children's descriptions of how a fire would spread around the property depicted in Figure 4.7:

Penny: Because the log is sort of like wood and it's in a grassier area so it could leak to those leaves and then there's a tree which could catch onto that tree and then all those trees.

- 7yrs, Warrandyte

Mai: Well see those leaves? Well, if that was like starting from over there, then it could catch onto there and get caught onto the trees and it could like go from that onto all those other bushes to that tree and then it could fall over and have all flames on it and like go onto the leaves.

-11yrs, Huonville

Inherent in children's conceptions of this ignition process was the notion that if fuel sources were too far apart to facilitate direct flame contact, the chain of ignition would be broken and the fire would not progress any further. This belief is clearly portrayed in Haidy's proposition that if there were no trees on the property depicted in Figure 4.7, the fire would stop at the perimeter:

Briony: How is the fire spreading, how does it move?
Haidy: Along the ground
Haidy: The trees keep moving [falling down]
Haidy: So they keep falling down that way and it keeps going to the tree because it keeps pushing it to the next tree.
Briony: Okay, so what if there weren't any trees here or here [In the picture]?
Haidy: Well then you won't have a fire there. It would just stay in one spot.

-6yrs, Warrandyte

Cate depicted a similar process when she described how a fire would spread from house to house through her neighbourhood, before running out of fuel at the end of the street where the chain of ignition would be broken and the fire would stop:

Cate: It would probably like jump to each house and it might go like till the end of the road and like then like to Leah's house and then like it would probably stop because there's like two roads there so it would only go on like one road which is really bushy and like another road which is like all road and stuff, like it's not really bushy.

-9yrs, Warrandyte

In cases where fuel sources were considered too far apart to enable direct flame contact, children described a process whereby falling burning trees would facilitate the process. In one of the most vivid examples, Pierre used a dominoes metaphor to explain how a fire would travel from the Warrandyte State Park to his neighbourhood:

Briony: How would the fire get from the State Park to your house?
Pierre: We've got a forest here and then the road is up here and the service road's here and we've got a mini forest here and if one tree falls down it will most likely be like dominoes and hit them all down.

-8yrs, Warrandyte

It is important to emphasise that most children understood fire spread solely in terms of direct flame contact. However, a small number of articulated a process of fire spread that involved embers or sparks ignite spot fires ahead of the main fire front. Children's conceptions of ignition via embers or sparks are depicted in the following extracts:

Amy: An ember is like a little flame thing that's flying around and when it lands in something it starts a big fire.

-9yrs. Macedon

Ben: Embers are those red things that come off the fire. Don't really know how to explain it.
Tom: Aren't they like the bits of wood that fly off or something.

-11yrs, Macedon

Ben: Leaves could possibly catch on fire and then like fly off and get onto the trees and then catch the trees on fire.

-11yrs, Macedon

For children with an understanding of ignition via embers or sparks, a break in the chain of ignition via direct flame contact was not deemed sufficient to wholly prevent fire spread because an ember or spark could traverse the break and light a fire on the other side, as Larry explained to Ismail:

Ismail: You never know how it will get over to Middle Gully because we've got a big space between the roads.
Larry: Yeah but a spark could fly off a tree and go and like land over there and then it would like start a fire and then go VOOM!

-8yrs, Macedon

As will be shown in the subsequent discussion pertaining to conditions of exposure, children's knowledge of secondary ignition had important implications for how they understood the creation of hazard impacts, particularly property damage and destruction and, as will be shown in Chapter 6, it also had important implications for the process of building resilience.

5.2.3   Weather

The third element that children perceived as essential to the biophysical process of bushfire was *weather*. The three facets of weather deemed most important to the process were *temperature, rainfall* and *wind*. This section presents children's knowledge of the role of each facet and they would interact with other elements, such as fuel and ignition, to generate and sustain the biophysical process.

Temperature

The children in this study closely associated bushfires with high temperatures, mainly because "*when it's hot, things are easier to light*" (Scout, 11yrs, Warrandyte). This connection between hot weather and bushfire events is illustrated in the following extracts:

Briony: Alright, so when do bushfires happen?
Rob: On really, really, really hot days.

-7yrs, Macedon

Briony: Do you think there could be bushfires around Huonville?
Mika: We'll have to wait and see.
Sacha: If it gets really, really hot then yes but if it's not, I don't think so.
Mika: You have to wait and see.

-9/10yrs, Huonville

Briony: Do you know when bushfires usually happen?
Paul: When it's a really hot day, like 30 degrees.
Mai: Yeah, when it's hot.

-11yrs, Huonville

Emerging from this connection between high temperatures and bushfire events were expectations of increased bushfire activity during the summer months:

Briony:	When do bushfires happen?
Justin:	And I know, in summer.
Emilee:	In summer.
Justin:	Because it's a hot day, because it's hot.

-5/6yrs, Bothwell

Lexi:	In summer they happen.
Briony:	Why do they happen in summer?
Scott:	Because it's hot.

-6yrs, Macedon

Briony:	And are bushfires something that you think about?
Flynn:	Yep.
Briony:	Why?
Flynn:	Because its summer and that's when you have higher risk of bushfires.

-11yrs, Macedon

When asked if there could be a bushfire in their locality during the coming summer, children responding in the affirmative often cited extreme summer temperatures as a contributing factor:

| Briony: | So could a bushfire happen around here this summer? |
| Ismail: | Yes. Because it's gonna get really hot over summer and because it kinda happens with spring because spring starts getting hotter and when you get closer to summer, like it's starting to get hotter. Summer's more hot, really hot. And summer, it's hotter than winter and all that because winter's really cold when not many [bushfires] happen. |

-7yrs, Macedon

Briony:	What do think about the bushfire risk here this summer?
Mike:	High.
Brendan:	High.
Briony:	Why?
Mike:	Cos it's always really, really hot and dry.

-10/11yrs, Bothwell

Expectations of increased bushfire activity during the approaching summer were vividly articulated by children in Bothwell. Following an uncharacteristically warm winter and autumn, several children were anticipating a particularly hot summer and, consequently, predicted a high level of bushfire activity for that period:

Briony:	Do you think there could be a bushfire around here this summer?
Dave:	Yep.
Maxine:	Yeah. Easy, probably.
Lee:	Probably heaps of them.
Lee:	Because it's been hot in winter and that and it gives you a meaning that it might be real hot in summer, yeah, so we'll get something like 25, 26 degrees in summer.
Dave:	And it depends on the weather like this year. Like now when we've had all this hot weather.
Briony:	So how about this summer?
Lee:	It should be real hot because it's been pretty warm over the year in autumn and that and winter and that.

-10/11, Bothwell

The most common reason given for increased in fire activity during the summer months was that high temperatures dry out fuel sources, which was perceived as facilitating the ignition process:

Briony: Why do they happen in summer?
Zach: Because it's hotter and everything's dry and because it's really dry, it makes a fire.

-6yrs, Macedon

Briony: Why are there more bushfires in summer?
Fiona: Because the sun is a hazard for fires because it dries out the grass which lets the fires go in.

-9yrs, Huonville

Whilst the most common reason for increased fire activity in summer related to the drying of fuels, one child also suggested that summer weather was more conducive to the production of lightning, which would increase the potential for primary ignition:

Briony: What season do you reckon is the most dangerous for bushfires?
Kurt: Summer.
Briony: Why in summer?
Kurt: Cos it's hotter.
Bec: Cos it's hot.
Kurt: And there might be some lightning because the clouds get hot and make the lightning.

-7yrs, Macedon

It must be noted that several children did not perceive the summer temperatures in south-eastern Australia as being hot enough to generate major bushfire activity. Cate, for example, did not think there would be a bushfire in Warrandyte because she associated bushfires with hotter locations:

Briony: So do you think there could be a bushfire around the Warrandyte area?
Cate: Maybe no...There's more in like hotter places like in… somewhere else.

-9yrs, Warrandyte

Similarly, Mark perceived a higher likelihood of bushfires in the northern parts of Australia, where temperatures are characteristically higher:

Mark: They happen in the more warmer parts country mostly.
Briony: Where? Where do you think would be the most fire prone part?
Mark: I think around the Northern Territory because it's quite hot.

-11yrs, Warrandyte

Several other children in Macedon and Warrandyte also perceived a high likelihood of bushfires in the north of the country, closer to the equator:

Briony: Where do bushfires happen?
Cam: Well mostly….
Rob: Up in Queensland. Well, up in the high bits or near the line in the world.
Briony: The equator?
Rob: Yeah
Cam: Yeah, near the equator
Briony: Are we near the equator?
All: No.
Rob: We're near the bottom
Cam: Maybe up the top of Queensland or something.
Rob: Yeah that's Darwin, that's a hot place.

-6/7yrs, Macedon

Carl:	In Queensland [there could be a bushfire] because it's really close to the round thing around the world. What was it again? The round thing around the world?
Briony:	The equator?
Carl:	Yeah, the equator. It's closer to the equator.
Briony:	And what does that mean?
Carl:	There's more hot sun and there could be broken glass and it could start the tropical place up on fire.
Guy:	And I should know because I've been there in a car!

<div align="right">-8yrs, Warrandyte</div>

Rainfall

Children perceived *rainfall* as an extremely important factor in the biophysical process, with low rainfall being strongly associated with an increased likelihood of bushfire activity. Tia (9yrs) in Macedon, for example, was expecting a high likelihood of bushfire activity around Macedon during the approaching summer months because *"there hasn't been that much rain"*. Conversely, high rainfall was associated with a decreased likelihood of bushfire activity. As Dave (11yrs) in Bothwell explained, a wet summer would delay the onset of bushfire season: *"If we've had a real wet summer,* [bushfire season] *don't come in for a bit"*. Underpinning these kinds of predictions was the notion that rainfall prevents the curing process, thereby reducing the flammability of fuel sources and, by extension, impeding the processes of both primary and secondary ignition. This relationship between rainfall, fuel moisture and ignition is clearly illustrated in the extracts below:

Briony:	What season do you reckon is the most dangerous for bushfires?
Kurt:	Summer.
Bec:	Cos it's hot and sometimes the plants they get more browner.
Briony:	Like drier do you mean?
Bec:	Yeah, 'cos they don't have enough water.

<div align="right">-7yrs, Macedon</div>

Briony:	So why do you think bushfires happen in places like this?
Tia:	Maybe because there are so many places that could burn. It's like lots of places to burn and it's not very wet, it's not like Queensland where it's always damp. It's quite dry here.

<div align="right">-9yrs, Macedon</div>

Mark:	If it's been raining there won't be a bushfire because the rain will make all the grass and everything wet and then it can't burn.

<div align="right">-11yrs, Warrandyte</div>

Many children also noted the extreme drought conditions that prevailed in their area and they associated these conditions with an increase in the likelihood and severity of bushfire events:

Briony:	So who thinks there could be a bushfire around here?
Pierre:	Maybe because the weather's getting hotter and the drought is getting worse so it's most likely to start down in Australia... Bushfires are most likely to start now because the drought's starting to get worse.
Lucas:	And so everything is easier to burn.

<div align="right">-7yrs, Warrandyte</div>

Briony:	So do you think there could be a bushfire this summer?
Sacha:	Yep, because it's the drought.
Ellie:	Yeah, we're in a drought.

<div align="right">-8/9yrs, Warrandyte</div>

> Dell: We get big droughts...Well, we've got lots and lots of trees and sort of dried out properties and everything because we can't get enough water, so it is quite immune [sic. susceptible] to fires.
>
> -11yrs, Bothwell

Several participants in Bothwell came from generational sheep farming families whose livelihoods had been directly affected by the drought. As the children explained, the prevailing drought conditions had not only forced farmers to sell off livestock but had also made the area more susceptible to bushfires:

> Lee: And it's only rained about a few times
> Dave: Yeah it hasn't rained much.
> Kat: Yeah, there's only been a couple of days.
> Dave: It's been a drought down at Oatlands and they had to sell all the sheep.
> Maxine: Yeah, so did my dad.
> Lee: They had the big Oatlands sale.
> Maxine: Biggest in years apparently.
> Lee: And it was on T.V.
> Briony: So what does the drought mean for bushfire risk?
> Maxine: Everything dries out so it's much easier to catch alight.
> Dave: It's all dead.
>
> -11yrs, Bothwell

Interestingly, however, these children also perceived the drought as reducing bushfire activity in the area: feed shortages had forced sheep stocks to graze more heavily on existing pastures, thereby reducing surface fuel and reducing the likelihood of bushfire activity:

> Dave: But with the drought this year, we haven't had no grass fires cos there's no grass cos the sheep have just eaten it to the ground cos they've got nothing else to eat.
> Lee: And now it's started to grow back when we've had a little bit of rain now.
> Max: So we've been very lucky with the drought cos all the sheep have eaten everything.
> Briony: So what does that mean?
> Maxine: Well, there's no grass so it's more unlucky for bushfires to start.
> Dave: And grass fires and that.
>
> -11yrs, Bothwell

Thus, the relationship between rainfall and bushfire was not always straightforward but mediated by other factors.

Wind

The final facet of weather that children perceived as playing an integral role ina bushfire event was wind. As evidenced by the following extracts, children strongly associated wind with bushfire activity:

> Sacha: Well on a really, really, really, hot day the bushfire danger would be higher.
> Briony: How would you know the bushfire danger was high?
> Sacha: Because it's really hot and windy.
>
> -9yrs, Huonville

Briony: So when does bushfire season start around here?
Mika: Probably summer.
Dan: Summer.
Sacha: Sort of spring and summer when it's hot and windy and dry.

<div align="right">-9yrs, Huonville</div>

Briony: Okay, so when's the danger period for bushfires around here?
Debbie: In summer
Stuart: Yeah, especially in February because a lot of the fires happen around then.
Debbie: Yeah, and it can get quite windy and really hot.

<div align="right">-11yrs, Macedon</div>

Children's conceptions of the role of wind in a bushfire event were related to its ability to facilitate secondary ignition, or fire spread:

Pam: Wind helps the fire a lot because it spreads it.

<div align="right">-6yrs, Macedon</div>

Briony: How would the fire get from the shed to the house?
Dell: It spreads.
Briony: How does it spread?
Dell: Cos of the wind.

<div align="right">-11yrs, Bothwell</div>

Briony: If there was a bushfire in the State Park how would that spread?
Sean: Because there's too much wind around here.

<div align="right">-9yrs, Warrandyte</div>

Children recognised wind as facilitating both types of secondary ignition. First, it was understood to facilitate ignition via a chain of direct flame contact by extending flame length, thereby enabling flame contact with more distant fuel sources:

Luke: Well, what happens is that, seeing as everyone has lots of trees in their backyard, the fire would be burning and if it's windy it would blow long with the wind and it would light onto another tree.

<div align="right">-10yrs, Warrandyte</div>

Sacha: Bushfires mostly start when it's really, really hot and a bit of bush catches on fire and then it's windy and then it blows it.
Mika: Yep and when the wind comes, the wind just blows the fire [the flame] longer and it spreads everywhere.

<div align="right">-9/10yrs, Huonville</div>

Mark: Um when it's windy, the bushfires can cause even more bushfires to happen
Briony: Yep, why's that? What does the wind do?
Mark: Because the wind blows the flames side to side and up and down and it catches on more trees.
Larry: And it starts spreading and it gets bigger and bigger and more dangerous.

<div align="right">-11/12yrs, Warrandyte</div>

Second, it was understood to facilitate ignition via embers and sparks by blowing these entities onto other fuel sources:

<div align="right">133</div>

Briony: How does the fire spread?
Hugo: It spreads because it's so hot and the winds blowing. The wind blows the fire and then a leaf goes down there and so then there's another fire and then that leaf goes down and there's another fire.

-6yrs, Warrandyte

Briony: Can you think of any other ways that a bushfire could make it from the bush to Tamsen's place?
Dee: The wind.
Briony: What would the wind do?
Dee: It could blow some of the stuff on fire over to the other stuff.
Briony: What kind of stuff gets blown around?
Dee: The bush debris on the ground.
Steph: Leaf litter.

-11yrs, Huonville

To summarise children's knowledge of the role of weather in a bushfire event, they generally understood fire as arising from a combination of high temperatures, low rainfall, and wind. These elements were perceived as playing an important role in facilitating both primary and secondary ignition, thereby increasing the likelihood and severity of bushfire activity.

5.4 Conditions of exposure

The children in this study did not view all people and properties as being equally susceptible to hazard impacts. Rather, susceptibility to impacts was perceived as being contingent upon various *conditions of exposure* which included *dangerous locations, dangerous buildings* and *low levels of preparedness.* These conditions of vulnerability are depicted schematically in Figure 5.3.
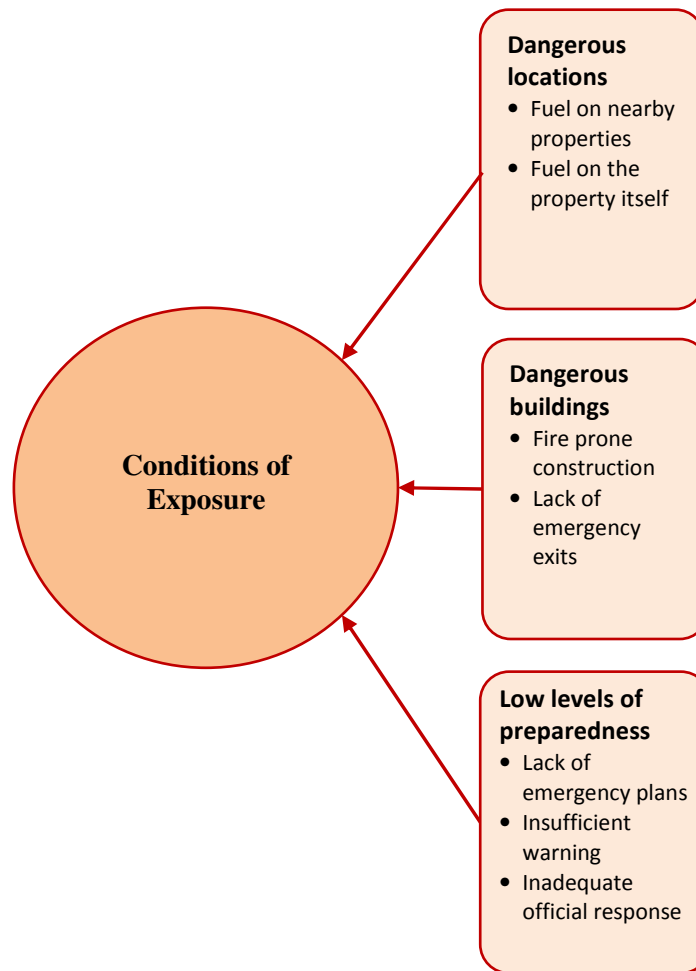
Figure 5.3: Conditions of exposure

The aim of this section is to present children's knowledge of these various conditions and explore their conceptions of how these conditions would interact with the biophysical process to expose people and property to hazard impacts.

5.4.1   Dangerous locations

Notwithstanding a few exceptions, all of the children in this study believed that there could be a bushfire somewhere in their local area. However, they did not believe that every person or property would be directly exposed to hazard impacts. This is because exposure to impacts was perceived as being conditional on living in a *dangerous location.* As discussed earlier, the biophysical process of bushfire was conceived as being highly contingent on the presence of fuel. Accordingly, it was the presence of fuel that took precedence as the defining characteristic of dangerous locations and identifying dangerous locations involved evaluating levels of fuel on neighbouring properties as well as fuel on the property itself. The following sections discuss children's perspectives on dangerous locations in detail. In doing so, they provide a comprehensive account of children's knowledge of dangerous locations and how they would interact with the biophysical process to cause hazard impacts. The section concludes by highlighting that whilst children perceived dangerous locations as

increasing exposure to bushfire hazards, they also perceived living in dangerous locations as having significant benefits.

Fuel on neighbouring properties

Many children perceived fuel on nearby or neighbouring properties as increasing the exposure of their own. This was especially true for children living near or adjacent to large tracts of native bushland or forest. As reflected in the following extracts, these children generally perceived their properties as 'unsafe' or 'high risk':

> Briony: If there was a bushfire, do you think your house would be safe?
> Tina: No. We only have about this much room [gestures 4 metres] between our house and the forest, so it will probably get to our house really easily.
>
> -6yrs, Warrandyte

> Fiona: I don't think we would be safe because we've got lots and lots of bushland around our place.
>
> -9yrs, Huonville

> Briony: So if a bushfire happened around the area where you live, do you think your house would be safe?
> Jason: I don't think so because just over our back gate we have lots and lots of bushland.
>
> -11yrs, Huonville

> Solomon: When we moved here from Melbourne we had to think about the high bushfire risk because we live right next to a big forest.
>
> -11yrs, Macedon

Children also described how fuel on neighbouring residential or commercial properties would expose their own properties to bushfire hazards. Mark in Huonville, for example, described how his next door neighbours' failure to undertake basic garden maintenance was endangering his own property:

> Mark: I reckon I could get fire danger because our next door neighbour's house, well, like we're kind of surrounded by all kinds of places, like these people, their yards always lovely and nice and there's probably not much happening there, but then there's the Smith's who live there and they never mow their lawn, it's about ten feet high, I'm totally serious!
>
> -11yrs, Huonville

In another example, Dell in Huonville, described how the heavily vegetated golf club nearby and the wood mill next door were increasing her property's exposure to bushfire events and making her feel unsafe:

> Dell: Down near my house there's a golf club thingy and there's tonnes of trees and so our house isn't very protected from bushfires. I also don't feel safe at our house because there's a wood mill right next to our house as well.
>
> -11yrs, Huonville

It is important to note that heavy fuel loads on nearby or neighbouring properties did not always equate to perceptions of danger. Whilst children generally perceived fuels on nearby and neighbouring properties as increasing their exposure to bushfire hazards, it is necessary to emphasise the highly

variable and subjective nature of these perceptions. Whereas some children deemed a tract of bushland several hundred metres away as being close enough to endanger their property in a bushfire event, other children perceived it as being distant enough to preclude exposure. In Warrandyte, for example, Craig believed that there could be a bushfire in the Warrandyte State Park, but that his property was located too far from the park for it to be exposed to such an event:

> Briony: So if there was a bushfire in one of the State Parks do you think it could come anywhere near your house?
> Craig: Probably not.
> Briony: Why not?
> Craig: You know how everyone goes right to home; well I go left and well, there's not that many trees down that way.
> Briony: So do you live in Warrandyte?
> Craig: Yeah. [Gives name of street] in Warrandyte
> Briony: So you don't think that a fire in the park could affect your place?
> Craig: No, because we don't really have a State Park near where we live.
>
> -9yrs, Warrandyte

However, based on information provided by Craig it was possible to locate his property in relation to the State Park, which was found to be only several hundred metres away. This placed his property well within the range of exposure to ember attack, at the very least. Indeed, according to the CFA, Craig's property, along with the majority of Warrandyte's residential areas, was located in an "extreme fire risk zone" (2010)[1].

Craig's somewhat misconceived sense of safety was not unique: numerous other children also perceived low levels of potential exposure to bushfire events despite living in extreme or high risk areas. One of the most striking examples was provided by Lina in Warrandyte, who identified her property as having a low level of danger due to a lack of trees nearby. However, on a visit to Lina's house to interview her mother, it was observed that the remnant bushland of Warrandyte State Park was located approximately 30m from the back door. Yet, Lina did not perceive this as 'close' and thus dismissed the possibility of being exposed a bushfire event:

> Briony: Do you think there could be a bushfire near your house?
> Lina: Not really, because there's not much trees that are close to our place.
> Briony: So you don't think a bushfire get anywhere near you?
> Lina: Probably not.
>
> -9yrs, Warrandyte

Several children living near heavy fuel loads, such as those that characterise the Warrandyte State Park, did not believe their property would be exposed to a bushfire event because a non-flammable, natural or man-made barrier around the perimeter would prevent a bushfire from encroaching upon it.

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[1] It is important to note that this study did not employ any formal method of geo-referencing. However, when a child volunteered their home address, or I visited their home to interview their parents, it did provide an opportunity to gain a deeper understanding of how they conceptualise their own personal risk. Taking advantage of such opportunities to enrich a theoretical model is entirely consistent with the grounded theory approach (c.f. Glaser & Strauss, 1968; Strauss & Corbin, 1990).

Children identified a variety of barriers that would perform this function, including dirt roads, rivers, and fences. Their perspectives on how these barriers would prevent a bushfire from travelling onto their properties are aptly represented in the extracts below:

Bec: My family isn't really alert by fires. We don't even care because we know that there's not gonna be one near us.
Briony: But haven't you got bush over the road from your house?
Bec: Yeah but the bush is there and then there's like this fence and the fire can't get through there, because it's metal.

-7yrs, Macedon

Briony: If there was a fire in the state park, do you think it could come anywhere near your house?
Joe: Not near my house. My house is over the river so it would have to go over the river so it wouldn't get that close.
Sean: Yeah it wouldn't get there.
Briony: Because you're on the other side of the river?
Sean: Yeah and it's more water and water can put out fire and its more safety.
Briony: What if it started on your side of the river?
Joe: Then we're in trouble!

-9yrs, Warrandyte

Mark: Well near my house, like not that far away, there's sort of a small river going past and it would probably stop there if it came from that way. We also live on a dirt road so it would be hard for it to spread to our place.
Briony: Why's that?
Mark: Because there's not that many trees surrounding the road and it can't jump 20 or 30 metres every few seconds.

-11yrs, Warrandyte

As can be inferred from these extracts, the notion that a non-flammable barrier would prevent a fire from spreading onto the property was based on the notion that ignition via a chain of direct flame contact is the sole means of secondary ignition. Such notions were pervasive in the data and, as will be shown in Chapter 6, they had important implications for children's approaches to mitigating the hazard.

Fuel on the property itself

In identifying dangerous locations, children also attended to the available fuel on the property itself. In the interviews, children invariably viewed the multiple fuel sources on the property depicted in Figure 4.1 as increasing its exposure to bushfire events. As the extracts below suggest, the fuel sources perceived as particularly problematic included the trees, bushes, grass, wooden debris, leaf litter surrounding the house, leaf litter on the roof and in the gutters, and the firewood stacked beside the house:

Briony: Do you think this house would be safe in a bushfire?
Penny: Nope. Because there's heaps of trees and logs and you can easily burn them down.

-5yrs, Bothwell.

Briony: What do you think about this house?
Dell: It's not very safe is it?

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Briony: What's unsafe about it?
Greg: Well there's leaves on the roof, there's wood right next to the house, and there's piles of
          leaves everywhere.

                                                                              - 10yrs, Bothwell

Maxine: Okay, um, long grass, that's particularly bad because if that dries out it's gonna increase
          your chance that the fire will come through and catch alight.

                                                                              -10yrs, Bothwell

Briony: Have a look at this picture. Do think that house would be safe in a bushfire?
Dee: No, because of the trees and there's lots of big trees hanging over the house and the logs are
          stacked against the house.

                                                                              - 11yrs, Huonville

Many children described how their own properties were similarly characterised by trees, surface fuels,

and bushland, all of which were viewed as contributing to high levels of exposure in a bushfire event:

Briony: If a bushfire started around Bothwell, do you think your house would be safe?
Penny: No, because there's trees in the backyard so swoosh! Fire everywhere!

                                                                              -5yrs, Bothwell

Ismail: If you have dry leaves around your house, it can catch really easily and if you've got a lot,
          well, the house would catch on fire.

                                                                              -7yrs, Macedon

Nick: At my house, there's a jungle of trees everywhere and broken down trees all around our
          house, so it's very dangerous.

                                                                              -8yrs, Warrandyte

Briony: Have a think about your house now and have a think whether there's anything that makes
          your house dangerous.
Mandy: We've got trees pretty close to our house.
Brendan: And we've got a big hedge, we've got plants everywhere basically.

                                                                              -10yrs, Bothwell

Briony: Is anything that makes your house dangerous?
Mandy: We've got trees pretty close to our house.
Brendan: And we've got a big hedge, we've got plants everywhere basically.

                                                                              -10yrs, Bothwell

Dell: My house is not very safe because there's millions of trees around and our fence things
          made out of wood and it's fallen over coz of the wind and there's tonnes of dry leaves
          everywhere.

                                                                              -11yrs, Huonville

Conversely, children perceived a lack of trees and fuel sources on their properties as reducing their

exposure to a bushfire event, as articulated by Tamsen:

Briony: How about at your place Tamsen, do you think a bushfire could come near your place?
Tamsen: No, because we don't have any trees. The trees are a few paddocks away.

                                                                              -11yrs, Huonville

Dell and Paul, also in Huonville, articulated a similar sentiment:

> Briony: How about your house Paul, could it be affected?
> Paul: Where we live now, I don't think there's much chance cos there's hardly any trees and if there are they're very small, tiny.
> Dell: Same with my house. There's like 3 acres with not much trees around.
>
> -11yrs, Huonville

In Macedon, Lexi (6yrs, Macedon) drew a comparison between the location of her current house and that of her new one, both of which were located in the high risk zone. Whilst she perceived the former location as *"dangerous because we have bush on our block"* and *"our bush is very messy"*, she perceived the latter as safe, owing to a lack of trees:

> Lexi: When I move to my new house I'll be safe there because there's no trees there.
> Briony: Okay so do you think that house will be safer than your house now?
> Lexi: Yes, because there's no trees.
>
> -6yrs, Macedon

A similar contrast was drawn by Ismail and Melek:

> Briony: So where the dangerous spots are do you think?
> Larry: In places with lots of trees.
> Ismail: Like on the mountain where there's quite a lot of trees.
> Briony: So what do you think about around here? Do you think this is a danger spot?
> Both: Nope.
> Ismail: Because there isn't that much trees around the school, but there's a lot on the mountains.
>
> -7yrs, Macedon

It is worth noting that both Lexi's new house and the Macedon Primary school are both located in what the CFA refer to as a 'high-risk zone'. This serves to illustrate the subjective nature of what constitutes 'a lot of trees' and how children's perceptions can differ from those of the fire authorities.

In terms of actual hazard impacts on property, children believed that houses surrounded by trees, bushland and other fuel sources would have a very high likelihood of burning down:

> Briony: What do you think would happen if there was a bushfire?
> Haidy: My house will get burnt really quickly.
> Briony: Why?
> Haidy: Because all the trees are around it.
>
> -6yrs, Warrandyte

> Larry: In a bushfire, my house could burn down because we've got a lot of garden around it. On one side we've got trees that are really tall and the other side we've got heaps and heaps of flowers. So yeah, it'd burn down.
>
> -8yrs, Macedon

Mai: Our house, like where we live, we're surrounded by heaps of big trees.
Dell: I think her house could catch on fire very easily, that's just my opinion because she's got lots and lots of trees around her house, like close and then she's got paddocks and paddocks and paddocks and even more paddocks around her house.
Briony: And what's in the paddocks?
Dell: Trees!

-11yrs, Huonville

Importantly, however, it was only fuel in very close proximity to the house that was implicated in the process of actual house ignition and subsequent property damage and destruction. This is because children generally attributed these impacts to the process of ignition via direct flame contact. All fuel types, including trees, grass, and leaf litter, were perceived as having the capacity to ignite a house, but only if they were in close enough proximity to enable direct flame contact with the building:

Steph: The tree can catch on fire and make the house catch on fire.
Briony: So how could the tree make the house catch on fire?
Steph: Because it can. It can make the house catch on fire because the leaves can touch the house and the…well it's touching the chimney so it could burn the chimney up.

- 7yrs, Huonville

Penny: The fire could spread to the leaves and then the leaves could spread to the house and the house could spread to the tree.

-9yrs, Warrandyte

Debbie: If the fire started on that tree, it's kind of leaning over the house and it's kind of touching the chimney so that would easily catch alight.

-11yrs, Macedon

Extracts depicting children's explanations of house ignition in terms of direct flame contact with various fuel sources are presented in Table 5.5.

Table 5.4: House ignition as a result of direct flame contact

Trees and plants	Grass and leaf litter	Woodpile
Haidy: The flowers! They could catch on fire easily. **Haidy:** And they're near the house and they might burn on the house (6yrs, Warrandyte). **Pam:** These plants...they would catch on fire. **Miley:** And then if they're right next to the house, the house would catch on fire (6yrs, Warrandyte). **Kurt:** The trees would catch on fire and get the house. If that branch hit that house there or if there's a branch like right on top of the house or like touching the doorway there, it could catch on fire and go through the house (7yrs, Macedon). **Larry:** Say that's my roof and that's my house, there's bush all over here and there's quite a big piece of bush up here on the roof and it curls around, all around there, well if that caught on fire, the roof would and then that pole and then our house (8yrs, Macedon). **Ellie:** Right next door to our veranda there's trees, like right next door there's like trees right there and if they caught on fire the veranda would catch on fire (10yrs, Warrandyte). **Lang:** Well the trees spread right up to our house, there's a lot of trees right there that could catch to our house(11yrs, Warrandyte).	**Dan:** Mine's got grass here and the house is here and it could like catch the house on fire (9yrs, Huonville). **Briony:** Can you see anything else that you think makes that house unsafe for bushfires? **Haidy:** Yes, the leaves [on the roof]...They can burn on fire from the trees and then the house would get on fire (6yrs, Warrandyte). **Penny:** If those leaves next to your house were on fire, the fire might spread so then it might get onto the leaves and then to your house (8yrs, Warrandyte). **Lucas:** If the tree burns the leaves or the trunks and the fire will go into the grass and then go into the house and the house will crumble down and hit the grass and keep burning (8yrs, Warrandyte). **Mika:** Well, if you've got grass and your house is here, if the grass catches on fire and it's really close to your house, that's when you have to be concerned because like it's really close and if it spreads all up to the other part of the grass it could catch on fire to the house (10yrs, Huonville). **Dave:** You could have a big area like all cut down but it still could be dead grass there and it'll just creep across the top of the grass and probably get into your house and burn it down. (11yrs, Bothwell).	**Dave:** Well, the mushrooms could catch alight pretty easily and if they catch alight they'll catch the logs alight and if they catch the logs alight the fire will be big enough to start burning the house (11yrs, Bothwell). **Larry:** And there's wood up against the house which means it could catch onto the house (8yrs, Macedon). **Cam:** If there's a fire on the logs, the house might get on fire from there (7yrs, Macedon). **Briony:** Is there anything else that you think makes that house dangerous? **Haidy:** Yep, there's little bits of wood here [next to the house] and if they catch on fire it could go on the house and then it could get burnt (6yrs, Warrandyte). **Ana:** I know the wood is dangerous! Briony: Why? Analyse: If that fell down [points to tree] and fell on the wood, the wood would get on fire and burn the house down (11yrs, Huonville).

Children's conceptions of house ignition via direct flame contact were also evidenced by several instances in which plants or trees were perceived as being too far away to facilitate ignition. Liz, for example, described how some trees several metres from the house were too far away for ignition to occur. If they were touching the house, however, ignition would be possible:

Briony: Have you got any trees Liz? At home?
Liz: Yeah but they're pretty far away but some of them are just well that wall to the other wall [approximately 5 metres] and that's about as close as they get.
Briony: Do you see those as being a danger if a bushfire came?
Liz: Not as much.
Sacha: Well if they were touching the house they would be a danger but if they're not then [shakes head].
Briony: Why? What would happen if they were touching the house?
Sacha: Well if there was fire on it, it could easily just catch the house on fire.

-9yrs, Warrandyte

Mitchell expressed a similar idea:

Mitchell: There are some bushes at my place but they're too far away from the house to catch it on fire. Yeah, they're not very close.

-Mitchell, 8yrs, Warrandyte

It was explained earlier that children perceived wind as facilitating ignition via direct flame contact by extending the length of flames, thereby enabling direct flame contact with more distant fuel sources (see 5.2.3). It was in this same way that wind was implicated in facilitating house ignition:

Briony: Why would it be dangerous for the house to have those trees around?
Joe: Because it would make the fire bigger and it would be closer to the house and the house has a better chance to burn down
Sean: Yeah. When the fire comes up and the wind blows and the fire touches your house and the house goes on fire.

- 9yrs, Warrandyte

Brian: If the winds blowing, it could blow onto your house easy.
Briony: What would blow onto your house?
Dave: Flames.
Maxine: Flames.

-10/11yrs, Bothwell

It was also explained earlier that children perceived burning trees as facilitating via direct flame contact by falling horizontally onto other fuel sources. This same process was commonly identified as a cause of house ignition. For the children in this study, the consequences of a burning tree falling on the house were unequivocal - the fire would carry on through the house and destroy it:

Melek: This tree is a danger because if it caught on fire and fell and hit the house, then the fire would carry on into the house and it would be really, really bad.

-8yrs, Warrandyte

Steph: If there's a tree standing in the fire and near the house and the tree catches alight and it accidently falls and then the house catches on fire.

<div align="right">-11yrs, Huonville</div>

Although children's explanations of house ignition were dominated by the concept of ignition via direct flame contact, a small number of children did exhibit an understanding of house ignition via embers or sparks. Children's knowledge of house ignition via embers or sparks is reflected in the following extracts:

Greg: There's the extension and the hedge is there and if the fire caught the hedge alight it'd probably spark the gutter and stuff like that and it'd catch on fire... if any sparks got into the gutter and the leaves were still in there, they'd get the leaves on fire and they'd get the roof on fire and then the house would burn down.

<div align="right">-9yrs, Bothwell</div>

Tamsen: A stick or a leaf that might be alight will fall onto your house and it might be big enough to light your house on fire.

<div align="right">-11yrs, Huonville</div>

Wind was also perceived as playing an important role in this process because it would blow embers several metres through the air and deposit them on rooves or in gutters where they would ignite leaf litter or other debris and then ignite the house:

Maxine: If there was a bit of straw there, [wind] could lift up the straw if it was still alight and it could chuck it onto a gutter or something.
Dave: A tree could be burning and the winds blowing and the sparks could be flying off of it and that and could get in the gutters and that.
Brian: And that's what starts house fires cos you don't clean out your gutters.

<div align="right">-10/11 Bothwell</div>

Finally, it must be noted that although children generally perceived properties located in heavily vegetated areas as being highly exposed to bushfires, they also recognised several benefits of living in these kinds of environments. Several children expressed a genuine appreciation for the natural, albeit high fire danger, environment in which they lived:

Briony: Where do you live?
Haidy: I live in the bush.
Briony: And do you like it where you live?
Haidy: Yep, because there's a lot of trees.

<div align="right">-6yrs, Warrandyte</div>

Josie: People in the city are lucky because they've got no trees.
Larry: No, they're bad, they're bad!
Josie: Yeah, because they've pollution everywhere.

<div align="right">-9yrs, Macedon</div>

Children's appreciation of, and respect for, the natural environment was important because, as will be shown in Chapter 6, it influenced the extent to which they were willing to alter the environment for the purpose of mitigating bushfire hazards.

5.4.2 Dangerous buildings

The second major condition that children believed would expose them to hazard impacts was conceptualised as *dangerous buildings.* Dangerous buildings were not only perceived as having a greater chance of burning down, they were also associated with death and injury because they would fail to provide a safe shelter from the fire and expose its occupants to hazardous flames, smoke and falling debris. The two major subcategories comprising children's conceptions of dangerous buildings were *fire prone construction and design* and a *lack of emergency exits.* Both of these sub-categories and their implications for exposure to bushfire hazards are explained below.

Fire prone construction and design

As demonstrated in the preceding discussion a key determinant of exposure to hazard impacts was the presence of fuel on and around the property, particularly fuel in direct proximity to the house. However, children did not perceive house ignition as being determined solely by the presence of fuel. Holding fuel loads on and around the property constant, some houses were perceived as being more susceptible to ignition than others, with levels of high susceptibility being attributed to *fireprone construction and design*. To determine whether the construction and design of a house was fire prone or not, children engaged in a process of assessment in which they attended to every structural component of the house including exterior walls, rooves, doors, windows, balconies, and verandas. If any one of these components was deemed to be constructed from flammable materials or had gaps or openings through which a fire could enter the house, the house would be identified as fire prone and highly susceptible to ignition. The aim of this section is to present children's knowledge of fire prone construction and design and the way in which it would interact with the biophysical process of bushfire to create the potential for hazard impacts.

Flammable construction materials. As was made clear in earlier discussions of the biophysical process, children perceived wood as a highly flammable source of fuel. Hence, buildings with wooden exterior walls were invariably perceived as highly susceptible to ignition:

Briony: What would happen if the bushfire came near your house?
Bronte: My house would burn. Because it's mostly made out of wood and wood can burn easily.
Haidy: Yep, I reckon mine would too, because it's only made out of wood.

- 6yrs, Warrandyte

Briony: Why do you think it would burn down Jay?
Jin: Well, it's wood and I kind of think, well, you know, why it wouldn't burn down!
Tia: If there was a fire it would probably choose to go to my house.
Briony: Why?
Tia: Because it's just pure wood and it's just really thin and it's easy to burn.

-9yrs, Macedon

Dell: Our house is wood so it would just really go up in flames.

-11yrs, Huonville

Briony: So what do you think would happen to the house?

Lang: Well my house is made of wood and some brick so it would catch alight pretty   easily. Yeah, it would go down pretty fast because all the outside of our house is wood.

-12yrs, Warrandyte

Children tended to understand the process of a wooden house burning down as one in which the fire would burn through exterior walls and continue on through the house:

Tamsen: If you have a weatherboard house it could burn through the walls and then go inside.

- 11yrs, Huonville

Whereas children invariably perceived wooden houses as susceptible to hazard impacts, their perceptions relating to brick houses varied considerably. Some children believed that houses constructed of brick would be resistant to ignition:

Briony: What do you think about this house? Do you like it?
Hugo: Yeah, cos it's made of bricks.
Tao: Because it won't catch on fire.
Hugo: Because it won't fall down.
Tao: And it won't catch on fire.

-6yrs, Macedon

Ismail: Well, the house would catch on fire but it's only if there's wood or something because bricks don't really burn.

-7yrs, Macedon

Ethan: Brick is like little stones so it's like gravel and like gravel can't burn. So, if your house is made of brick, if the fire comes past it will hit the brick and it won't go through the bricks.

-8yrs, Warrandyte

Briony: And how about your place Be, what do you think is going to happen to it?
Tom: Our house is made out of bricks so it wouldn't burn.

- 10yrs, Macedon

Flynn: Well our barn would burn down but our house might not because our house is just all bricks on the outside and our barn is all wood on the outside.

-11yrs, Macedon

There were other children, however, who perceived brick houses as being highly exposed to damage and destruction. Some children believed that brick houses would ignite in the same way as wooden ones:

Briony: Are there any other dangerous things that are bad for bushfires?
Pam: And there's logs on the walls like this [woodpile]
Briony: What's wrong with the logs on the wall?
Pam: If they could catch on fire that could catch the bricks and then the bricks would burn.

-6yrs, Macedon

Others believed that brick houses would blow up, melt, or crumble and collapse:

Jin: My house would like just collapse down and it would make a really big sound...cos the fire could like just get to the um brick and it could like and it could of just moved it, burnt a bit of it so it just breaks and make it ash or breaks and then the house would just go bang and then just go sort of [fall over].

-6yrs, Macedon

Briony: And what's gonna happen to your house Scott?
Scott: It will get blowed up because it's made of bricks
Jin: It's not gonna blow up.
Scott: Yes it is because rocks blow up.
Jin: But there's no bomb to blow at em'.
Scott: I know but when it goes on them it burns, when the fire goes on them.

-6yrs, Macedon

Melek: Mud brick houses wouldn't go on fire they would just melt.

-7yrs, Macedon

Briony: What do you guys think? Do you think a brick house would burn?
Sacha: Probably not but it'd get pretty hot and it would probably collapse.

-9yrs, Huonville

Briony: So do you think the house could catch on fire?
Sacha: Yeah, I think the bricks would melt because they're mud.
Briony: So is your house made out bricks?
Sacha: Yeah.

-9yrs, Warrandyte

Perceptions relating to the susceptibility metal houses also varied. Some children perceived metal houses as completely resistant to hazard impacts:

Briony: Cam, what would happen to your house, if there was a bushfire?
Cam: Well, it would pretty much stand up properly.
Briony: Why do you reckon your house would stay standing?
Cam: Cos it's got metal and metal doesn't usually really burn.

-7yrs, Macedon

Other children, however, believed that metal would melt and provide a point through which a fire could enter the house:

Pete: There's like people next door to my house so the wind could catch on my house and then because there's trees right next to my house on the side then the fire could travel across the top of the trees over the fence and onto my neighbour's roof and because my neighbours roof is metal it would just all melt which would let the fire go inside.

-9yrs, Warrandyte

In addition to assessing the flammability of walls and rooves, children also considered the flammability of other structural components of the house, such as eaves, doors, and windows. For example, although the house in Figure 4.7 was constructed mainly of brick, a material which many children perceived as being resistant to hazard impacts, most children perceived the house as being susceptible to ignition due to the exposed wooden eaves:

Briony: What you think would happen to this house in bushfire?
Justin: It might get all burnt down. Just the roof bit [points to section of wood] because the rest is all brick and brick can't burn and then it will go into your house like go into the inside.

-5yrs, Bothwell

Fiona: This house could catch alight. This bits wood right? [points to section of wood]. If that catches alight, it like falls down and the fire could get inside the house.

-9yrs, Huonville

Briony: How would the fire get into the house?
Max: Well, it could burn a hole through the roof over here [points to section of wood] because that is plain wood.

-11yrs, Macedon

Wooden doors were also widely perceived as rendering a building susceptible to ignition:

Jade: The door, because it's wooden and if that burnt down it could into the house.

-7yrs, Warrandyte

Fiona: The door is kind of a hazard because these leaves could lead to the door and make it catch alight. But the reason it could catch alight easy is it's wooden.

-9yrs, Huonville

Claire: The door to go into the veranda that's wood too so if the veranda caught on fire, it could catch on the door and then around that door there's wood so it could start going inside.

-10yrs, Warrandyte

Mark: Well the only thing if it went through our house the only way it would get in is through the wood doors and the wood.

-11yrs, Warrandyte

Windows were widely perceived as rendering a house susceptible to hazard impacts because they would smash or melt, thereby enabling a fire to spread through the house:

Briony: How would the fire get from the wood to the house?
Haidy: Well, it could actually break the window and it will catch the curtains alight and then it would start catching the couch alight and then it would start catching the whole house alight.

-6yrs, Warrandyte

Penny: The window could melt and it would get into the house.

-8yrs, Warrandyte

Briony: What are the big dangers at your place Ethan?
Ethan: Probably nothing because my house is on the wood and then there's this big, big brick wall covering it and then there's the garage so nothing really. No! No! The door! The door! The glass door! That's the danger! Because the flame might break the glass and go up the stairs.

-8yrs, Warrandyte

Louis: The window [could be] shattered from the heat and also when they shatter, then the flames might come in and burn the curtain and blow up the computer because our computer's right next to this huge window.

-11yrs, Macedon

Philip: I think windows have a chance of melting because windows are made of well originally they're like ice. Like, originally they have to be melted to turn them into windows.

-12yrs, Macedon

A number of children also identified the cracked window of the house depicted in Figure 4.7 as compromising the strength of the window which would increase the chance of a fire breaking through into the house:

Dell: With the cracked window if you had a fire outside your house the heat could crack your window more and it could break and that's how the fire could get inside.

- 11yrs, Huonville

Sacha: The window's already cracked and if the fire comes really close the windows already cracked and it will crack more and go inside the house. Yeah, cos of the heat.

-9yrs, Warrandyte

The final way in which children believed a house could be made susceptible to ignition was by having open doors or windows or other gaps or holes in the exterior of the house. As the following exacts illustrate, these were seen as providing a direct entry point through which flames could enter:

Steph: Well my fireplace near my room doesn't have a top on it so [the fire can] get through my room.

-7yrs, Huonville

Olive: If the logs near the window were on fire and the window was open the curtains could easily catch on fire and then the bed and then yeah, it goes on forever.

-8yrs, Warrandyte

Ethan: If you have a garage here and you have a garage door here it will get through the garage if the garage [door] is not shut.

-8yrs, Warrandyte

Dee: If the window was opened up it would catch the curtains on fire if it was a windy day and it was hot.

-11yrs, Huonville

Dell: Flames could go under the door.

-11yrs, Huonville

One child also pointed out that an open door would provide an entry point for embers:

Briony: Steph, any ideas on how the fire gets inside the house?
Steph: If you leave the door open and a leaf flies in and then goes boom!

-11yrs, Huonville

Through this analysis of children's perceptions of fireprone construction and design, an even clearer picture of children conceptions of property damage and destruction begins to emerge. With the exception of a few children who described it as a function of embers or sparks, house ignition was generally conceived in terms of a) the flames of the fire front either igniting exterior walls or rooves and burning the house from the outside in or b) the fire melting a hole in the roof or finding an existing entry point such as an open door and burning the house from the inside out. As will be shown

in Chapter 6, children's knowledge of the mechanisms underlying property damage and destruction had important implications for their approaches to both mitigating the hazard and preparing for a bushfire event.

Lack of emergency exits

For the children in this study, one of the major causes of bushfire related death and injury involved getting trapped in a burning house due to a *lack of emergency exits*. As reflected in the following extracts, children were extremely concerned about getting trapped in burning houses as this would expose them to a myriad of dangers including exposure to burns, smoke inhalation, and crush injuries, all of which were associated with death and injury:

> Carly: Your house could catch fire and you might not be able to get out and the roof and stuff might fall on you and you would probably die.
>
> -7yrs, Macedon

> Briony: So how does someone die in bushfire?
> Jade: If you stay in your house too long.
> Olive: Actually, it's when they get trapped by fire all around them and they can't get out.
> Jade: And a fire could go on top of the house and fall down.
>
> -8yrs, Warrandyte

> Briony: How does someone actually die, what's like the main cause when someone dies in a bushfire, what has happened to them?
> Tom: Getting trapped inside the fire, inside the house.
> Briony: Getting trapped where?
> Sila: Inside the middle of the house, just trapped.
>
> -10yrs, Macedon

> Briony: How do people die in bushfires?
> Scout: Being trapped in a house...Suddenly a door collapses and there's fire coming in from that way and then they might start running somewhere else and realise that another door is being blocked off by fire and they can't escape.
> Lang: And that's how they end up dying.
>
> -11yrs, Warrandyte

Children's fears of getting trapped in burning buildings was a central theme in the data and, as will be shown in Chapter 6, these fears had major implications for children's approaches to making a bushfire plan, with many children viewing the decision to shelter inside a house during bushfire event as leading inevitably to death or injury.

5.4.4 Low levels of preparedness

The third condition that children perceived as increasing exposure to bushfire hazards was related to *low levels of preparedness* for bushfire events. Low levels of preparedness were generally associated with an inability to respond to a bushfire threat in a timely and appropriate way, which would increase exposure hazard impacts. Sila in Macedon, for example, had been informed by her teacher that a key cause of bushfire deaths in the Ash Wednesday disaster had been a complete lack of preparedness:

Sila: Well, Mrs White says one of the bad things was that nobody was really prepared for the fires and because it was a really hot day, they were all wearing just summer clothes and some people were wearing thongs and so they weren't prepared and lots of people died because they didn't even know that there was a fire and most of the teachers went to the EMA [Emergency Management Australia] car park and sat there. It was really scary, that's what Mrs White said to me, and it sounded like a train.

-10yrs, Macedon

Low levels of preparedness were also identified as a key determinant in the damage and destruction of property:

Damon: You just need to be prepared for a bushfire because if it's coming into the bushfire season, then you've got to be prepared for it, because if you're too late, then you could probably have your whole house burnt down.

-11yrs, Huonville

Briony: What if there was a fire and some houses burnt down and others didn't. How could we explain why those houses didn't?
Steph: They prepared properly.

-11yrs, Huonville

Children identified several factors that would impede a household's capacity to respond effectively to a bushfire threat, including *a lack of emergency plans*, *no warning systems*, and *inadequate emergency services*. Children's perspectives on the specific roles of these factors in exposing people to bushfire hazards are presented below.

A lack of emergency plans

Children identified a *lack of emergency plans* as a factor that would severely undermine a household's capacity to respond to a bushfire event, undermining the safety of people and the protection of property. Some children described how not having an emergency plan could result in family members becoming separated and having to risk their safety to find each other:

Ali: If you didn't have a plan some of your family could be out the back and some could be out the front and the people that are out the front could think they have to go and get you because you're inside and then outside and you risk your own life. So it's really good to have a plan.

-10yrs, Bothwell

For many children, the worry and fear associated with bushfires derived from not knowing how to respond to a bushfire emergency:

Briony: What do you think it would be like if a bushfire came through?
Amanda: Really scary.
Briony: Why would it be scary?
Amanda: Because you wouldn't know what to do.

-10yrs, Bothwell

One of the most notable examples of the worry and fear caused by not having an emergency plan was provided by the case of Jess (9yrs, Macedon). Jess's mother and grandparents had directly experienced the Ash Wednesday bushfire disaster in Macedon in 1983. After receiving very little warning of the approaching fire front, her grandfather had stayed to defend the home whilst her mother and grandmother had attempted to flee in a vehicle. Not far down the road, they lost their way in the smoke and flames and were forced to shelter in their vehicle as the fire front passed over.[2] Jess's mother, Ali, had been very open with Jess about the family's Ash Wednesday experience. As Ali explained, *"She asks me lots of questions and I've told her all about '83 and what happened to us"*. Knowledge of her family's Ash Wednesday experience had given Jess an acute awareness of what can happen when people are unprepared for a bushfire event. However, as Jess explained in a voice filled with apprehension and fear, an internal household conflict over the decision to stay or go had prevented the family from formulating a definitive bushfire emergency plan:

Jess: I don't have a fire plan because my Nanna wants to stay and fight the fire but most of the family wants to just go and pack and get away from it.
Briony: So do you think that will be resolved before there's a bushfire?
Jess: I certainly hope so but they keep fighting about it, like which way it's gonna go, like if they're gonna get out or stay. Because my Poppy saved the house, the old house a few years ago when my mum was young.
Briony: So does he want to stay?
Jess: Well, he's not really in the family anymore because he died and no-one agrees on anything.
Briony: But your nanna wants to stay?
Jess: Yep. But I wanna get away from it, like far away from it, so we're safe.

-10yrs, Macedon

By contrast, when families did have definitive emergency bushfire plans and the children were both aware of that plan and confident that plan would ensure their safety, bushfire-related fears and anxieties were much less apparent. The experience of Larry, for example, stands in stark contrast to the experience of Jess. Larry's family had not only developed a plan and talked about it together but had put it in writing for future reference:

Briony: Is anyone worried about bushfires? Do you ever think about them?
Larry: No, I'm not because our family's got a fire plan and stuff.
Briony: Alright so how about your plan Larry, can you tell us about your plan?
Larry: Well I'm not really worried because we've got a big pump that pumps all the water from our dam and we've got a big concrete wall surrounding it so it won't melt and we've got a big shed to go in.
Briony: Okay, and why is the shed safe?
Larry: Because it's all filled with metal and it's got a big shutter door and another door to escape if it does come in.
Briony: And who have you talked about the plan with?
Larry: We've got a big sheet of the plan, well all our family has talked about it really.

-8yrs, Macedon

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[2]Jess's mother's Ash Wednesday experience is vividly recounted in the opening pages of this thesis.

As will be shown in Chapter 6, making an emergency plan was key strategy in preparing for a bushfire event.

Insufficient warning

The second factor that children believed would impede a household's capacity to respond effectively was an absence of warning systems for alerting people to a bushfire threat. Children readily identified situations in which people might not be aware of a bushfire approaching until it was too late and the fire had already reached them. As the following extracts demonstrate, situations such as these were associated with a high likelihood of death or injury:

> Briony: What's your understanding of how someone dies in a bushfire? How does that happen?
> Tom: They wouldn't realise it and when it finally hit their house and they were like surrounded by it, they might not realise.
>
> -10yrs, Macedon

> Briony: Okay, so what are the other causes of death in a bushfire?
> Carly: Sometimes like glass or a tree falling on you like when you're asleep and someone doesn't know.
>
> - 8yrs, Warrandyte

Children also noted how a lack of warning would reduce the amount of time available for responding to a threat, which would undermine efforts to protect one's home. For example, Ana and Debbie in Macedon described how both of their fathers had installed bushfire sprinkler systems around their homes, but without adequate time to prepare, these would be of little use:

> Ana: We've got a sprinkler at home, and like once dad turned them on at home and it covered the whole house and like it's just covered in water
> Debbie: Yeah on really hot days we do that but if it kind of came out of the blue then we wouldn't really have much protection.
>
> -11yrs, Macedon

In a similar vein, Will noted that it would be more difficult to suppress a fire without sufficient warning:

> Mitchell: If there was a big bushfire and nobody had seen it…
> Will: That would be a bigger problem because then no-one would know about and it'd be like a couple of acres away and then if no-one knew about it would be too hard to stop.
>
> -8yrs, Macedon

As will be shown in Chapter 6, establishing warning systems to enable timely and effective responses to bushfire threats was a key component of preparing for a bushfire event.

Inadequate official response

For many children, exposure to hazard impacts was a function of the capacity of public emergency services, particularly the fire brigade, to protect households and communities during a fire event.

Children often attributed hazard impacts to shortfalls in the level of the protection provided by the fire brigade:

Briony: Okay so if a bushfire did start, how close could it come to your house?
Cam: Very close.
Rob: Unless the fire engine comes and puts it out before it gets to your house.

-7yrs, Macedon

Briony: So what would happen if there was a bushfire?
Steph: You could die.
Briony: How?
Steph: The fire could reach you before the fire brigade does.

-9yrs, Warrandyte

Briony: Have you ever seen pictures of after a bushfire, and there's like a whole heap houses   that are all completely burned down and then there'll be some houses that are still standing and they're fine, like they didn't get burned at all. How does that happen?
Steph: The fireman like that house.
Briony: So maybe firemen were able to come and protect those houses?
Steph: Yeah, because they're the only ones who were smart enough to ask them to protect   that specific house.

-11yrs, Huonville

Children had high expectations of their local fire brigades. They generally expected that in the event that their property was threatened by fire, the fire brigade would provide dedicated fire fighting support on their property, which would serve to negate any other conditions of exposure, such as living in a dangerous house in a dangerous location:

Briony: So what do you think would happen to your house?
Olive: Well, I live in a very bushy area but I think it wouldn't burn down that much because we live right near the main street of Warrandyte.
Briony: So what does that mean?
Olive: Well, hopefully the fire brigade would get there quicker.

-8yrs, Warrandyte

Tia: I'm not really scared or anything because we're pretty much in the town.
Briony: So what does it mean that you're close to town? Why's that important?
Tia: Because um there's not as likely to be um….
Amy: Burnt down.
Tia: Yeah and if there's a fire….
Con: Lots of houses will be there and people to help.
Tia: Yeah lots of people to help and all the fire people are in town.

-9yrs, Macedon

Not only did children expect the fire brigade to provide dedicated fire fighting support to individual households, they also suggested that the fire brigade would have the capacity to extinguish a bushfire before it posed a significant threat:

Briony: So, who thinks a bushfire could come near their house?
Gus: No, because then they would squirt it out easy.
Briony: Who would?
Gus: The fire brigade.

-6yrs, Warrandyte

Briony: So, if there was a bushfire that started around Huonville, do you think the town would be safe?

Sacha: Yes, because by the time people realise there's a fire, lots and lots of people would have called the fire brigade and then if it was really close they would probably send out fire trucks but if it was just getting there they'd probably water bomb it.

-9yrs, Huonville

Mika: The fire brigades are really special to us because if it's any fire anywhere they could put it out.

-10yrs, Huonville

Mark: Like in Warrandyte I reckon if we did have a fire it would be small because I reckon that the fire people would quickly get there and put it out because you can smoke from anywhere in Warrandyte.

-11yrs, Warrandyte

As will be shown in Chapter 6, children's expectations relating to the capacities of the fire brigade strongly influenced their perspectives on preparing for a bushfire event, particularly in realm of making an emergency plan.

5.5   Concluding remarks

This chapter has shown how children understood that bushfires have the potential to cause widespread human, material, economic, and environmental losses and impacts. However, a key finding to emerge from the analysis was that children did not view bushfires as impacting on people and property in an indiscriminate fashion. Rather, impacts were attributed to the interaction of bushfire as a biophysical process and particular conditions of exposure that put people and property in harm's way, and then impede capacities to respond. Perceiving vulnerability involved identifying one's own susceptibility to endangerment and loss in terms of these natural and human components of bushfire hazards.

Not all children perceived themselves as vulnerable to hazard impacts. However, those who did expressed worry, fear and uncertainty about the prospect of a bushfire in their area, primarily because of the potential for losing their house, their treasured possessions, their family, their pets, or their own life. Importantly, perceiving one's own vulnerability was intimately tied to one's understanding of bushfire as a biophysical process, particularly in relation to the processes through which bushfire spreads in the environment. Of even more importance, however, was that children often perceived the conditions of exposure that make people vulnerable as being determined by the actions and decisions, or lack thereof, of people. By perceiving vulnerability in this way, children opened up substantial opportunities for doing something to reduce that vulnerability and build resilience to bushfire hazards. Children's strategies and approaches to this are the focus of the following chapter.

CHAPTER 6: BUILDING RESILIENCE

This guy needs to get his lazy bum off the couch and do a bit. Clean the gutters out. Get someone in to prune his tree or cut the tree down, completely cut the whole tree down. And he needs to fix his shed because a spark or something could get into them leaves and the leaves would catch the shed on fire and then his whole bloomin' house will burn down.

- Dave, 11yrs, Bothwell

6.1   Introduction

A fundamental component of grounded theory analysis is an explication of the core process in which people engage to deal with the social psychological problem as they perceive or experience it (Glasser & Strauss, 1969; Strauss & Corbin, 1994; Charmaz, 2006). As discussed in Chapter 5, for the children in this study, the social psychological problem was *Perceiving Vulnerability* which involved being aware of the potential for a bushfire in the area and believing that such an event would impact adversely on life, property and the environment. To deal with the problem of *Perceiving Vulnerability*, children engaged in the two-stage process of *Building Resilience*. The first stage of this process was conceptualised as *mitigating the hazard* and involved *creating safer locations*, *fireproofing houses,* and *educating the public*. The second stage was conceptualised as *preparing for a bushfire event* and involved *establishing warning systems*, *deciding to stay or go*, and *making an emergency plan*. The core process of *Building Resilience* is depicted schematically in Figure 6.1.
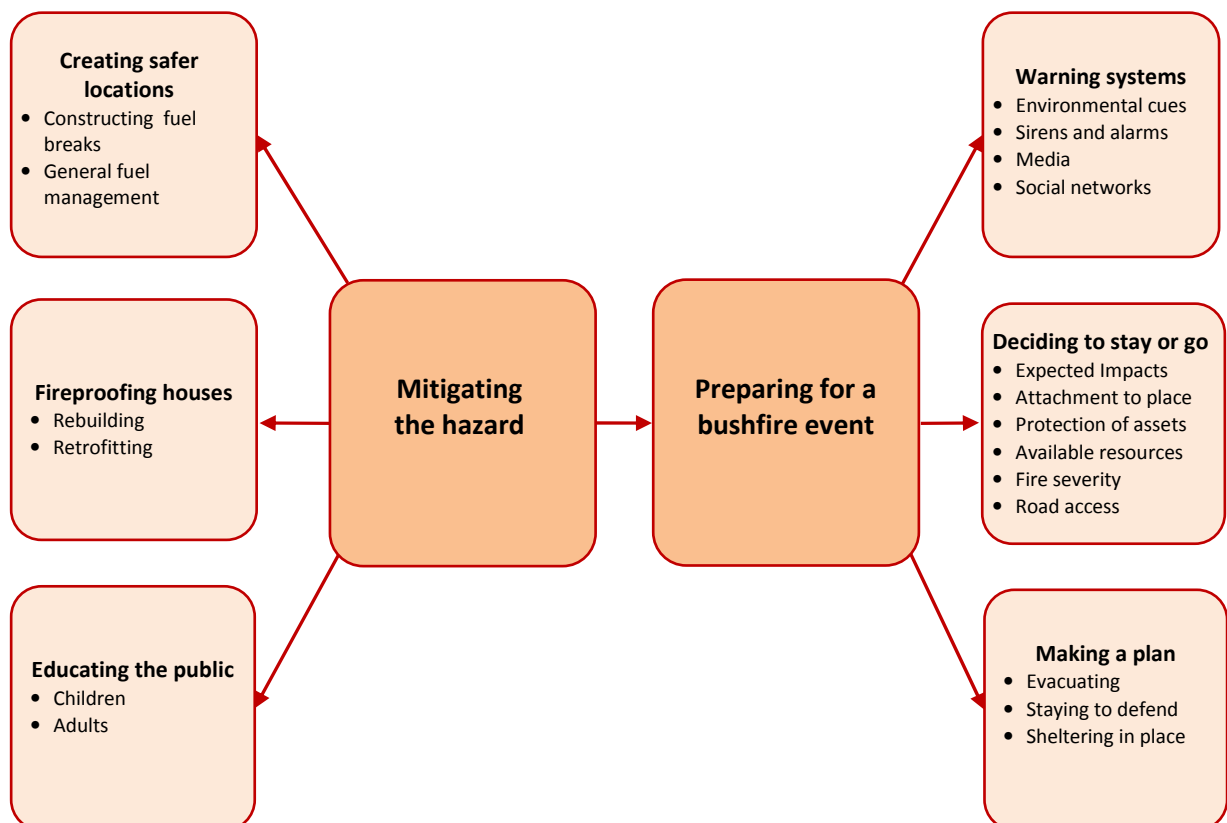
Figure 6.1: The core process of Building Resilience

This chapter presents the core process of *Building Resilience* as conceived by the children in this study. In doing so, it highlights how children's strategies for building resilience were heavily influenced by their knowledge of the biophysical process of bushfire and how it interacts with conditions of exposure to create hazard impacts. It also draws attention to the physical, social, and economic constraints that children believed would impede the implementation of resilience building strategies.

6.2 Mitigating bushfire hazards

The term mitigation was defined in Chapter 2 as any action that is taken to minimise the adverse impacts of hazards and disasters (Twigg, 2004; UN-ISDR, 2009). Whilst they may not have employed the technical term of mitigation, the children in this study identified a variety of actions that could be undertaken in advance of a bushfire event to reduce adverse impacts on their families and communities. These strategies were both structural and non-structural and fell under the three main categories of *creating safer locations, fireproofing houses,* and *educating the public.*

6.2.1 Creating safer locations

The strategy of *creating safer locations* involved changing or modifying existing land use practices or implementing new ones in an attempt to reduce exposure to bushfire hazards. For the most part, the goal of a creating safer location was to prevent a bushfire from reaching the house or any other valued asset. Children identified two major ways in which this could be accomplished: *constructing firebreaks* and *general fuel management.*

Constructing firebreaks

In fire management parlance, a firebreak is a gap in vegetation or other combustible material that acts as a barrier to slow or stop the progress of a bushfire (CFA, 2011). The children identified firebreaks as a primary means by which to prevent bushfires from reaching their properties and they identified four major approaches to constructing them: using ploughs, rakes or shovels to create strips of non-combustible mineral soil; laying paths of non-combustible tile, stone, or brick around the house; encircling the property with walls or fences made out of non-combustible brick or metal; and strategically positioning rivers, waterholes, or other bodies of water around the property. Extracts exemplifying each of these approaches are presented in Table 6.1.

Table 6.1: Approaches to establishing firebreaks

Removing fuels down to the mineral soil	Laying paths of non-combustible tiles, stones, or bricks	Making rivers, waterholes and other water barriers	Build non-combustible walls and fences
Melek: Well I don't think that it would get much close to the house, because we're on a big hill and we've cleaned around it and it's just mainly dirt and stuff. That's why we get rid of all of the stuff because if there's just dirt then the fire can't spread because dirt isn't like that good for fires because they can't spread around it (7yrs, Macedon).	**Nina:** We have these little tile things so it can't get to the house and we've got them all around the house. I don't think they can burn (9yrs, Warrandyte).	**Ellie:** Maybe you could have a river around the house so the fire couldn't get over: it can't jump the river. **Zach:** Oh yeah a river around the house, yeah like a river around it. That's what I'm doing. **Briony:** Okay, but what if the bushfire jumps the river? **Ellie:** It can't jump the river (6yrs, Macedon).	**Briony:** How are you going to save the house from the bushfire? **Emily:** Put a wall around it (6yrs, Macedon).
Carl: Yeah and we need to dig up the soil so the wet soil can touch it so the fire can't get any closer to the house (8yrs, Warrandyte).	**Debbie:** We put kind of like a stone track around [the house] so it might like stop at our house because the stone track hopefully should stop it. (11yrs, Macedon). **Stuart:** And it's harder for it to travel around your house (10/11yrs, Macedon).	**Amy:** We've got a pool so I think that might make it safer because it's got water in it and that could put the fire out. **Briony:** So, how would the pool put the fire out? **Amy:** Well, if it went down like low it would like go down and then across into the pool (9yrs, Warrandyte).	**Greg:** Put a wall of mud bricks all around your house. So it's sort of like, not a fence, but it's got all these mud bricks all around your house. But not wooden, concrete or something (7yrs, Macedon). **Hannah:** You could build a brick wall cos it doesn't really get through brick walls that much (8yrs, Bothwell).
Lee: I've got a break around my house. You just need to get a plough and just go along, and then you can get a digger, you'd want room length like this, and just dig it out so it's dirt. And if a fire comes from outside of the break, when it reaches the break, there's nothing for it to burn there. So, it should just stop (11yrs, Bothwell).	**Tom:** Around the house there's like all these stones. **Briony:** Like gravel? **Tom:** Yeah. **Briony:** And how will that make your house safer? **Tom:** Cos it's like fire can't really burn gravel and it's the whole way around the house so it's harder for it to actually get to the house (11yrs, Macedon).	**Cate:** Make a water hole in front of your driveway so when the fire comes it should hopefully get sucked up into the water hole and stop the fire (9yrs, Warrandyte).	**Ben:** You could build like a tiny mud wall and the bottom of it travels so you could build a little mud wall and it couldn't get through too much (8yrs, Bothwell). **Dan:** You could put like a fence around it that's real strong that can't catch alight. You could put a brick wall around it (9yrs, Huonville).
Philip: We've also got a rake sort of thing and you just make piles of dirt with it so it just takes away all of the material so it can't keep going along the ground (12 yrs, Macedon).	**Lang:** Instead of having all this grass out the back of the house Dad's put brick tiles to keep the fire far away (11yrs, Warrandyte).	**Steph:** You could make a wall about this big but it's an aquarium, like a big aquarium thing that goes along and then it wouldn't burn (11yrs, Huonville).	**Scout:** Set gates up around the house, metal ones because it would be harder for the fire to get through gates. **Briony:** Like a metal fence? **Scout:** Yeah, to stop it from getting to the house (11yrs, Warrandyte).

Whilst the value and importance of constructing firebreaks was widely accepted by the children, their perceptions of the overall efficacy of this strategy varied according to their assumptions about fire spread. Children with an understanding of ignition via embers or sparks viewed firebreaks as a useful but not entirely failsafe strategy for preventing a fire's progress, because an ember or spark could traverse the break, thereby igniting a fire on the opposite side:

> Solomon: Well if you've got the wall it wouldn't be able to get over the wall because of it's made of bricks. But if it did go over the wall, like if some coals came over the wall and burned over the wall, then there would be two sides.
>
> -9yrs, Bothwell

> Lee: You plough the firebreak and then if a fire comes through it can't jump it unless a spark comes over.
>
> -11yrs, Bothwell

However, children who viewed fire spread solely in terms direct flame contact considered firebreaks an impenetrable barrier beyond which a bushfire could not pass. For example, when Emily (6yrs) in Warrandyte suggested putting a river around the perimeter of her house I asked her what she would do if the fire jumped the river: her response was unequivocal, "*It can't jump the river! It's water!*"

For some children, perceiving a firebreak as a failsafe strategy for preventing fire spread negated the need for other risk reduction measures. Mika, for example, was so confident that the fence surrounding her house would prevent a fire from spreading onto her property that she perceived little need to reduce the risk in any other way:

> Briony: So have you done anything to make your house safer?
> Mika: No, because we got a little backyard and we don't have to worry about that because we've got a fence and then the yard.
>
> -10yrs, Huonville

Thus, children's views on the efficacy of firebreaks were substantially influenced by their knowledge of fire behaviour and this had important implications for their attitudes toward the need for additional mitigation strategies.

General fuel management

In addition to constructing firebreaks, children recognised the need to conduct general fuel management around their properties. The two main approaches to general fuel management involved reducing the amount of fuel around the property and keeping vegetation green and lush so as to reduce its flammability.

Children identified four major approaches to general fuel reduction around their properties:

- Cutting down trees and pulling out plants.

- Raking up leaf and timber litter and removing it from rooves and gutters.

- Mowing grass.

- Moving wood piles and other flammable items away from the house.

Extracts demonstrating children's knowledge of these fuel reduction strategies are presented in Table 6.1. As reflected in these extracts, the primary aims of fuel reduction were to limit the spread of fire around the property, as well as prevent house ignition via direct flame contact.

A less frequently mentioned, yet clearly articulated, method of fuel reduction was prescribed burning. As described in Chapter 2, prescribed burning involves the controlled use of fire to achieve planned land management objectives, including fuel reduction to aid the control of unplanned fires (OESC, 2005). Several children of varying ages exhibited an understanding of this fuel reduction strategy:

Gus: The bushfire engines have already put a fire in the bush at the back of my house just so it won't burn next time.
Briony: So do you think a bushfire could come near your house?
Gus: Yeah, but if it did there would be only burnt wood in the bush to burn.

- 6yrs, Warrandyte

Paul: Our place that we sold, it had a lot bush and stuff there and we hardly ever had a fire, so we got the fire fighters to actually light a fire and they could burn it off so when an actual real fire started then it wouldn't burn as much.

-11yrs, Huonville

Although children readily identified the importance of removing vegetation for mitigating the hazard, they also identified several factors that would prevent or deter them from implementing this strategy. Some children felt that the removal of vegetation would reduce the aesthetic value of their property:

Briony: Do you think your parents understand the risk of having those trees close to the house?
Mandy: Yep.
Briony: And why do you think they haven't done anything about it?
Mandy: Because it makes your house look nicer.

-11yrs, Bothwell

Stuart: We left one tree.
Briony: Why did you leave that tree?
Stuart: Cos it looks good.
Anna: Yeah, you need at least one tree.

-11yrs, Macedon

Table 6.2: Strategies for fuel removal

Clearing trees and plants	Mowing grass	Removing leaf/ timber litter	Moving woodpiles
Miley: We've got a lot of some stuff, some gardens, that's near the house and we just need to cut the rose bush down so that if it burns, it won't catch onto the house (6yrs, Warrandyte).	**Scott:** I took the grass away because it will burn the grass (6yrs, Macedon).	**Penny:** Put the leaves over here because it's safer because it's further away from your house (5yrs, Bothwell).	**Josie:** And you like need to cross out the woodpiles cos like cos that would like catch to the house (10yrs, Macedon).
Justin: I know what you've gotta do: Cut all the trees down (6yrs, Bothwell).	**Jade:** I would cut some of the grass so it wouldn't be that long (7yrs, Warrandyte).	**Zach:** I'd take away the leaves cos like they can make the fire too (6yrs, Macedon).	**Justin:** Chuck the logs into the shed because that's where it's safer (6yrs, Bothwell).
Dell: The front of our block is all trees and out the back of our block is our house and our shed so we could cut down some of the trees at the front so it doesn't spread from the front to the back (11yrs, Huonville).	**Jane:** Mow the grass so it doesn't catch on fire because then it wouldn't spread (9yrs, Warrandyte).	**Tia:** We've been clearing around the place, like cleaning up all the sticks and bunches of leaves and stuff cos then there won't be any fuel for the fire (9yrs, Macedon).	**Pete:** My dad he cuts a lot of wood… **Mark:** And you try to keep it away form the house and that (11yrs, Huonville).
Lina: Cut down some trees so that you don't make more of a fire and when it burns it might fall on your house and your roof will catch on fire (9yrs, Warrandyte).	**Sila:** My dad's been like mowing the grass so it's shorter so it will have less of a chance to catch on fire (9yrs, Macedon).	**Ellie:** Scrape away all the leaves and put them in another area that's not close to the house and get up on the roof and clean out the stuff from the gutters (9yrs, Warrandyte).	**Ben:** My dad and my mum, they put stuff in different places to stop the fire. Like they were thinking about getting heaps of firewood because it's cheaper now and they were gonna put it next to the house but then they thought it would probably burn and make it even worse and then they thought of putting it way outside of the house somewhere else (11yrs, Macedon).
Bec: We used to have a couple of trees but my dad just chopped them off at the roots so the back doesn't get burnt (7yrs, Macedon).	**Mark:** Well, we just try and keep the lawns down and use the catcher and kind of stick it in a concealed area (11yrs, Huonville)	**Fiona:** For the leaves, you should get rid of them, like put them out of the gutter (9yrs, Huonville).	
Brendan: I'd cut all the trees near the house down cos we've got them leaning up against our house (10yrs, Bothwell).	**Scout:** Make sure you don't have out of control grass cos if there's too much grass then it's just gonna light up (11yrs, Warrandyte).	**Brian:** Clean the gutters in case there was a fire near your house it don't get your house on fire (10yrs, Bothwell).	**Cam:** These logs, I'm putting them into a woodshed here (7yrs, Macedon).
	Ford: We should mow our grass a bit more. The last time we mowed it was like September and now it's already like that long [one metre] (11yrs, Warrandyte)	**Pete:** We've got a lot of dead leaves, we rake that up and we burn it off and just keep it under control (11yrs, Huonville).	

Other children were concerned that cutting down trees would deplete natural resources upon which human and animal survival depends:

> Greg: Well cutting down trees is a bad thing; it destroys all the oxygen for all the animals.
> -8yrs, Macedon

> Debbie: I left two trees because with no trees it would be hard to breathe so I'd leave some trees.
> -11yrs, Macedon

Some children also identified physical barriers that would prevent them from undertaking particular fuel reduction activities. For example, several children who recognised the importance of cleaning leaf litter out of gutters had not done this on their own properties due to access issues and safety concerns:

> Carly: You should clean the gutters each week but we don't do it because our house is like really tall and we can't get up.
> -7yrs, Macedon

> Mary: We haven't cleaned the gutters out because I don't think dad's game enough to climb up on the roof because it's like that type of roof [steep pitched roof].
> -11yrs, Huonville

Living in a rental property was another barrier to fuel reduction. For example, Brian's reported how his landlord had prohibited the removal of several large trees along the boundary fence:

> Brian: Well, we've got trees lined up around our fence, a few gums and pines and we can't cut them down because our boss [landlord] said we can't cut them down.
> -10yrs, Bothwell

Children also reported how their neighbours had impeded fuel reduction along property boundaries. Dell described a situation in which the neighbours had refused to cut down several trees that were extending over their property boundary and posing a significant fire risk to her own house:

> Mary: I think Dell's house could catch on fire because there are lots of trees.
> Dell: That's the next door neighbour's house and they don't want to cut their trees down. Well, our next door neighbours, he has lots of trees that tower over our house and dad asked him to cut them down but he wouldn't let us.
> -11yrs, Macedon

Thus, whilst children generally recognised the need to reduce the amount of fuel on and around their properties, they also identified several physical and social barriers that would prevent or impede this process.

The second approach to general fuel management involved preventing vegetation from drying out. It will be recalled from Chapter 5, that green vegetation was perceived as being much less flammable than dry vegetation. Accordingly, children identified keeping vegetation green and lush as a key

strategy for creating safer locations. This process generally involved watering lawns and other plants over the bushfire season:

> Melek: We could squirt lots of water around our garden by making lots of green because green isn't good for fires, the fires can't quite burn that fast because it's green.
> -7yrs, Macedon

> Brendan: We've been watering our grass for last the last three weeks because it's been really dry.
> Briony: So why have you been keeping it wet?
> Brendan: So it doesn't come dry.
> Mike: Green grass is really hard to catch on fire.
> -9/10yrs, Bothwell

Importantly, for some children, preventing vegetation from drying out was a useful alternative to fuel reduction when this had been prevented or impeded by one of the barriers outlined earlier. For example, Brian's (10yrs, Bothwell) landlord had prohibited the removal of any trees on the property, so his family *"put[s] sprinklers on them all the time to keep them really green."* Importantly, however, children perceived barriers to this strategy as well. As noted earlier, the children in this study were growing up in a period of extended drought and were highly aware of the need to conserve water resources. Thus, several children in the more drought affected areas pointed to the constraints on keeping grass and other vegetation lush over the bushfire season:

> Larry: You probably wouldn't want to have the sprinklers on all the time though because you have to be pretty careful with wasting water.
> -12yrs, Warrandyte

6.2.2 Fireproofing houses

The second major strategy for mitigating the hazard was *fireproofing houses.* This strategy involved modifying existing houses or building new ones using construction materials and design features that would reduce the building's susceptibility to ignition:

> Dee: You can get fireproof houses. It's got material made out of things that don't catch on fire easily.
> -11yrs, Huonville

The two major approaches to fireproofing houses were *rebuilding* and *retrofitting,* each of which are described in detail below.

Rebuilding

As the name suggests, rebuilding involved demolishing an existing house and building another in its place. This new house would be built from materials that the child perceived as non-flammable, primarily bricks, stone, or metal. Extracts exemplifying this approach to fireproofing houses are presented in Table 6.3.

Table 6.3: Rebuilding with non-flammable materials

Justin: I know, push your house down and then make a brick one
Briony: Oh, why should I make a brick one?
Justin: Because bricks can't burn (5yrs, Bothwell).

Julia: You need to build your house with wood inside and bricks on the outside.
Briony: Why?
Julia: Because I don't think fire can burn through bricks (6yrs, Warrandyte).

Pierre: Well you could turn your house into…instead of it being wood you can change it to be brick not so that the fire can't get in (7yrs, Warrandyte).

Greg: Technically if your house is made of mud bricks it wouldn't burn, right? So you could just make a new house out of mud bricks (8yrs, Macedon).

Mika: And what about if we take this house away and build another one.
Sacha: Yeah, like a steel one (9yrs, Huonville).

Pete: Maybe you could rebuild your house over again with rocks and stuff.
Joe: You could knock it down and make it out of bricks because fire doesn't burn bricks (9yrs, Warrandyte).

Amber: If you were building a house and if you were building it with wood then you could change your plan and make it out of bricks instead (11yrs, Warrandyte).

Briony: How could you stop your house burning down in a bushfire?
Mary: I'd build my house out of bricks so it doesn't burn (11yrs, Huonville).

Importantly, however, children also recognised the prohibitive expense associated with such an exercise and very few children identified rebuilding as being within their household's economic means:

> Brian: If you had heaps of money you could just knock down your old house and build a new one: a brick one.
> Scott: Yeah, but what if you don't have enough money? Then you're pretty much stuffed.
>
> -10yrs, Bothwell

> Mike: Maybe you could get your dad to build a new house; out of bricks.
> James: Well, I actually don't think we can do that because we've already spent ten grand on our renovation so my dad isn't probably going to have more money.
>
> -11/12yrs, Warrandyte

Thus, whilst it was commonly perceived as the ideal mitigation strategy, for most children, rebuilding was only considered a viable means of hazard mitigation in the hypothetical world of the interview scenarios.

Retrofitting

In hazard management, *retrofitting* is defined as the reinforcement or upgrading of existing structures to become more resistant and resilient to the damaging effects of hazards (UNISDR, 2009). Amongst the children in this study, retrofitting was a popular approach to fireproofing houses. As noted in Chapter 5, children commonly identified timber doors, eaves, window frames or other structural components as highly flammable. In accordance with this perception, children invariably suggested replacing these timber components with a non-flammable material, such as metal or brick:

> Emily: Cut that bit of roof off [timber eaves] and then build a brick one.
>
> -5yrs, Bothwell

> Luke: Hey, how about we make the door a brick door?
> Rob: Yes, let's make it a brick door.
>
> -6/7yrs, Macedon

> Lang: Can we cut that bit of the roof off and make it something else if we really want to? And guy's maybe we to like cut off that [timber eaves] and make it something like metal or something. Okay, that's metal.
>
> -8/9yrs, Warrandyte

> Briony: Is there anything you could do to reduce the risk?
> John: Change the door. But how could you change it?
> Ben: Well you could get a new one, like some sort of fireproof door.
>
> -11yrs, Macedon

Similarly, windows, which were generally considered prone to breaking or melting, were identified as prime candidates for retrofitting. One strategy involved replacing them with stronger, safer glass:

> Pam: I think that windows can catch easily with fires, can't they? But you can get these double windows.
> Nina: Double glaze.
> Pam: And that's very strong those windows. You can just take out your old windows out and put your double glazed windows in.
>
> -9yrs, Warrandyte

Another strategy involved bricking up windows all together:

> Melek: I'm putting bricks over these windows. There! No more windows!
>
> -7yrs, Macedon

Children also suggested installing metal window shutters that could be pulled down over windows in the event of a fire:

> Luke: What else do we want? I know! The windows with the shutters! I'm gonna do that.
>
> -6yrs, Macedon

John: We put metal shutters on because the house isn't exactly designed the best so it needs more protection.

Ben: Because the fire could probably melt the glass or something.

John: Yeah it avoids that.

-11yrs, Macedon

Another common retrofitting strategy involved installing sprinkler systems on the roof, or the exterior walls of the house. In the event of a fire, these could be turned on, the house would be covered in a protective layer of water, and house ignition would be prevented:

Nick: What [sprinklers] do is there's like little hatches all over the house and you press the button and the water goes all over. There's like little hatches all over the house and you press the button the hatches open and out pops a gush of water and   the fire can't get it.

-8yrs, Warrandyte

Sean: I would get automatic sprinklers which means that whenever hot fire hits it's gonna go automatically and I'll put one on the walls just in case and that'll stop it.

-9yrs, Warrandyte

The final approach to retrofitting involved sealing any gaps in the building exterior through which embers or flames could enter the house:

Sila: What about the cracked window? The fire can go through okay so fix it.

-10yrs, Macedon

Max: We've got all these little vents around the house, that have fairly big gaps and we're gonna go under the house and put mesh on the inside so sort of like little embers don't go in because under the house, there's usually like wooden floors and stuff and they catch on fire.

-11yrs, Macedon

Additional extracts reflecting children's knowledge of the above approaches to retrofitting are presented in Table 6.4.

Table 6.4: Retrofitting existing structures

Replacing wooden doors	Strengthening windows	Installing window shutters	Installing rooftop sprinklers
Carl: We should make our door out metal (8yrs, Warrandyte). **Briony:** Can you think of anything else you could do to make the house safer? **Larry:** I'm gonna turn the door into bricks (8yrs, Macedon). **Briony:** Okay, so see if you can think of anything else you could do to make the house safer? **Larry:** I'm gonna turn the door into bricks (8yrs, Macedon). **Josie:** You gotta fix up the door. **Jessie:** Yeah that's like wood so it would need to be something else that wouldn't catch (9yrs, Macedon). **Brendan:** If you had a like a tin door or something like that like on a shed that probably wouldn't burn as easy (10yrs, Bothwell).	**Kurt:** Let's make the windows stronger. **Bec:** You can't [means can't draw it]. **Kurt:** Yes you can, do that [colours the windows black]. **Bec:** You do a thicker line… we're making these thicker windows so they won't break as easily (7yrs, Macedon). **Briony:** Is there anything you can do to stop glass from smashing? **Mike:** Depends what kind of glass you get and stuff (9/10yrs, Bothwell). **Briony:** So is there anything you can do to stop the window from smashing? **Dee:** Get safety glass (11yrs, Huonville). **Larry:** Smash all your windows and put something that's not flammable there (8yrs, Macedon).	**Rob:** Put metal shutters on the windows because they block the fire in case it melts the windows (7yrs, Macedon). **Sila:** We should put roller shutters, big rollers for the windows (9yrs, Macedon). **Tom:** Draw in some rollers [shutters] for the windows (10yrs, Macedon). **Josie:** How about we put those blades [shutters] on the roof that Mr Ewels has. **Jessie:** Blades? Oh yeah, I remember them. You know the yellow things on top of the windows, that's the blades. It shuts when it's hot. They can feel the heat, it's like a sensor **Luke:** Yeah we need to put metal blades on those windows there (10yrs, Macedon).	**Lucas:** Install sprinklers all over the house Have 14 each for one square metre (9yrs, Macedon). **Con:** We've got lots of sprinklers that dad's installed and on our house we've got lots of sprinklers (9yrs, Macedon). **Tom:** Put sprinklers on the roof (10yrs, Macedon). **Ben:** We could put those things along [the roof], those firey things, sprinklers **Tom:** Yeah, that could help (11yrs, Macedon).

Importantly, a number of children also perceived economic barriers to retrofitting. Children were aware that sprinkler systems and metal window shutters are expensive and whilst they perceived these measures as useful, the financial costs involved were considered prohibitive:

Debbie: I think we should get some like sprinklers and like stuff like that but they're too expensive.

-11yrs, Macedon

Briony: So could you put shutters like that on your house?
Kurt: No
Briony: Why not?
Bec: Because Mr Black said it costs a lot of money.

-7yrs, Macedon

Renting was also perceived as a barrier to retrofitting. As Louis explained, even though his family didn't have enough money to install roof sprinklers, they wouldn't be able to anyway because they don't own the property:

Louis: Well in our house, we are renting a house so we can't really do much like put sprinklers on the roof and we can't change it much. We don't have enough money so we can't really change it much even if we did own it.

-11yrs, Macedon

Thus, as was the case with rebuilding, children identified economic constraints that would impede the extent to which they could retrofit their properties. Indeed, sprinkler systems and window shutters can cost several thousands of dollars, which would be beyond the economic reach of many Australian households.

6.2.3   Educating the public

The third and final strategy for mitigating the hazard was *educating the public*. Children often identified levels of public knowledge and awareness as an obstacle to mitigating bushfire hazards. As the following extracts illustrate, children had observed low levels of preparedness in their community and attributed this to a lack of knowledge and awareness about the risk:

Ralph: A lot of the people down our way they don't think about the risks of a bushfire so they don't think to do these things.
Larry: Yeah they think "Oh it's not gonna happen anyway, it's not gonna be me"
Ralph: Yeah so they don't bother. Yeah they're like "What are the chances of that" so people just keep putting it off and they don't do anything because they don't really think about the risks.

-11/12yrs, Warrandyte

Brian: You may not think that like…People that don't have a fire before, they might think "Oh yeah we're lucky" and they don't clean out the gutters and one day their house catches alight. Yeah, so like mostly you gotta know to dig out your gutters.

-10/11yrs, Bothwell

Children also suggested how they could take an active role in raising levels of awareness and knowledge within the community. For example, Damon proposed that if he saw that a neighbour's property was unprepared, he and his family could try and help them understand what they could do to prepare for a bushfire event:

Briony: Yep, is there anything else that you can do?
Damon: Well, if we notice that our neighbours haven't done anything, we would probably ring them just to tell them about what to do and just to be prepared for a bushfire.

-11yrs, Huonville

Children also identified a need for their own bushfire education. Some children reported that they had received bushfire education as part of the school-based fire safety programs delivered by the CFA and TasFire. For the most part, however, the school-based programs delivered by fire agencies had focussed on house fire safety and there was a distinct tendency for children to assume that the mitigation and preparedness strategies they had learned in this context were directly applicable the bushfire domain. For example, when asked if they had learned anything about bushfires in their fire safety lessons, children commonly recited concepts relating to house fire such as '*Stop, Drop, and Roll*', '*Get down low and go, go, go*', and '*Making an escape plan*'. Thus, there was a strong tendency for the children in this study to misinterpret their house fire education for bushfire education. This misinterpretation is clearly articulated in the following extracts:

Briony: So have you learnt anything about bushfires at school?
Emily: Yeah, if you are close to fire you should just get down low and go, go, go.
Alyssa: Well if there's a fire in your house, you get down low and go, go, go and roll if there's fire on you. Then you go to the telephone and you call 000.

-8yrs, Warrandyte

Victoria: What happens is we do this bushfire course at school and we get this emergency plan that we fill in.
Briony: Is that for a bushfire or a house fire?
Jordan: Bush.

-9yrs, Huonville

Maddy: I learned most of my bushfire stuff at school. Because in Grade 1 and 2 we went to the fire brigade down there and they told us about the escape plan and all that stuff.
Phillip: And there's like this teacher who comes about once a year or something and he teaches us all about just fire stuff and he gave us all this fire stuff.
Clara: Yeah and he talked about the heaters and everything how you should stand back.
Maddy: And about electric blankets and how you should turn them off when you're not using them.

- 11yrs, Huonville

Briony: So where have you learned what you know about bushfires?
Harry: In Grade 2 we went to the fire station.
Jared: We've had the CFA come in.
Briony: Can you tell me a little bit more about what the CFA talk about when they come in?
Harrison: Well they talk about how to survive in a fire.
Jared: Stop, drop, and roll and things like that.

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Harrison: Yeah stop, drop, and roll.
Jared: And wasn't it something about go, go, go, or something?

<div align="right">-11/12yrs, Warrandyte</div>

The extracts above demonstrate how children commonly overlooked the distinction between house fire education and bushfire education, which resulted in children overestimating their level of bushfire knowledge and dismissing the need for any further education in this area. For example, when asked if she would benefit from additional bushfire education, Amanda (10yrs, Bothwell) responded, *"No, we've pretty much learnt everything from Fireman Greg"*. Yet, her articulated knowledge of bushfire hazards suggested that it was house fire, not bushfire, that had been the focus of Fireman Greg's lessons. Thus, although children readily identified the importance of bushfire education, those who misinterpreted their house fire education as being applicable to the bushfire context did not identify any gaps in their knowledge, nor any need for levels of bushfire education to be increased.

However, when children did make the distinction between house fire education and bushfire education, they judged their access and exposure to latter as highly inadequate. This was most clearly articulated by Luc, Pam and Nina (10yrs, Warrandyte) who explained how the education they had received from the CFA at school had been heavily focussed on house fire safety. Feeling that house fire safety had been covered in sufficient detail, these children believed that it was time for the focus to shift to bushfires. They argued that this was particularly important given the high levels bushfire risk in the area and the fact that they had reached an age where they were sometimes left unsupervised at home which meant that they needed to know how to respond to bushfire event:

Briony: So what have you learned about bushfire safety at school?
Pam: Well we've mainly learnt about in the house, we haven't really learnt about the bushfires.
Luc: We've had the house fire things.
Pam: And we've been in the CFA truck thing.
Nina: But I think we should learn more about bushfires.
Luc: Because that's more what's gonna happen around Warrandyte because it's more bush.
Pam: If we lived in the city we'd learn more about house fires because there's not as much bush.
Briony: But why do kids need to know?
Pam: Because they might be home alone.
Luc: Yeah, and we may as well know now, because sometimes my parents will go out for an hour or two just to pick up my sister from swimming or something and then if there's a fire, if I don't learn what to do, I won't know what to do.
Pam: Our school has been to the CFA and been taught about things inside the house but they need to explain to us about bushfires. Because there's no point going there again when we've already learnt a lot of things about being in the house when there's a fire. Now we just need to know about bushfires.
Luc: Yeah. We've learnt about house fires but we don't know about bushfires and like what to do if you're alone.

<div align="right">-10yrs, Warrandyte</div>

These children felt that they had been intentionally marginalised from bushfire education and that this was increasing their risk. As they explained, this marginalisation stemmed from their status as children:

> Luc: If I went up to my parents and said "Can you tell us what to do if there's a bushfire nearby?", they'd probably just laugh at me and walk away.
> Briony: Why?
> Luc: I don't know. They'd probably just think "You're too young. You don't even need to worry about it".
> Nina: Yeah, cos no-one ever believes us!
> Pam: Yeah because we're just kids and they think "Oh yeah, they don't know anything". But like what if there is a bushfire? What then? People should worry   about bushfires more but they don't.
> Nina: Every kid should know.
>
> -9/10yrs, Warrandyte

To remedy this situation, the children suggested taking the matter to the Junior School Council - a student representative body which provides a forum for students to raise issues that concern them:

> Briony: So how could you change things, you know, like get more bushfire education at school?
> Pam: If I was the Junior School Councillor I would say something, but I'm not.
> Briony: So what can you guys do?
> Pam: I know! We can tell them!
> Luc: We'll tell them! And then the Junior School Council people can tell the school and then he can bring along someone to teach us about bushfires!
>
> -10yrs, Warrandyte

Thus, when children did make the distinction between house fire and bushfire, they perceived a serious need for more education on the latter, so that they would know how to respond appropriately to a bushfire event.

6.3   Preparing for a bushfire event

The second sub-category of building resilience was *preparing for a bushfire event.* It was noted in Chapter 2 that preparedness is one of the key components of disaster risk reduction (Twigg, 2004). The children in this study also identified preparedness as a key strategy for reducing the impacts of bushfire hazards on life and property:

> Sila: On Ash Wednesday, everyone wasn't prepared, so they weren't ready so that's why so many people died. So the best option is to be prepared all the time.
>
> -10yrs, Macedon
>
> Briony: What can people do to protect their house from a bushfire?
> Dean: Well, if there's a special fire season which there probably is, they can be prepared for it if it's coming into the bushfire season, then you've gotta be prepared for it cos if your too late then you could probably have your house burnt down.
>
> -11yrs, Huonville

The three main components of preparedness to emerge from the data were: *establishing warning systems; deciding to stay or go;* and *making an emergency plan.*

6.3.1   Establishing warning systems

The first component of preparing for a bushfire event involved *establishing warning systems* that would inform the community of a potential bushfire threat. Children considered warning systems important because, as will be recalled from Chapter 5, a lack of warning was associated with increased exposure to bushfire hazard impacts, particularly death and injury. Children identified a range of mechanisms or processes through which bushfire warnings could be provided, including *environmental cues, sirens or alarms, the media*, and *social networks.*

Environmental cues

The *environmental cues* that would accompany a bushfire event were frequently identified as important signs of an impending fire threat. Many children expected to be warned by the smell of smoke and the sight of smoke or flames. They also expected to be warned by the sounds of the fire crackling or trees falling down. Several children also suggested that an approaching bushfire would sound 'like a train'. Indeed, the sound of an approaching bushfire is often described in this way. Children also cited a rise in the ambient air temperature as a useful warning mechanism with several children suggesting that if a bushfire was approaching, it would begin to 'feel hotter'. Extracts depicting the wide range of environmental cues that children believed would provide warning signs of an approaching bushfire are presented in Table 6.5.

Table 6.5: The use of environmental cues for bushfire warnings

Smoke	Flames	Temperature	Noise
Briony: How will you know if there is a bushfire coming? **Lana:** See smoke (5yrs, Bothwell). **Hugo:** If you see steam it will be coming out from the fire. All the steam, big globs of steam in the air (6yrs, Warrandyte). **Jane:** Well, you could probably smell the smoke (9yrs, Warrandyte). **Pete:** By smelling the smoke and stuff (9yrs, Warrandyte). **Isla:** You can smell the smoke (10yrs, Warrandyte). **Dave:** It's like the smoke goes up and then everyone can see it (10yrs, Bothwell). **Paul:** All the smoke would be up in the air and you could sort of see it (11yrs, Huonville).	**Kirsty:** You would see smoke and smell it. But it's not always smoke. It could because you see a flame (6yrs, Warrandyte). **Haidy:** We would see red, red flames. And you could look outside and see if it was coming (6yrs, Warrandyte). **Jason:** I would see probably orange and red and yellow flames coming towards the town (9yrs, Huonville). **Ellie:** You'dsee the fire in the trees **Bella:** You look outside and stuff (10yrs, Warrandyte). **Larry:** I'd know if I saw some flames in the air (8yrs, Macedon). **Jane:** Well you could probably see the fire if it's really high (9yrs, Warrandyte).	**Briony:** Troy, how would you know? **Troy:** Because you would get really hot (6yrs, Warrandyte). **Briony:** How will you know if there's a bushfire coming? **Melek:** Because you can feel all the heat, you can feel all the heat (7yrs, Macedon). **Carl:** It would get really stuffy and you would think it's really hot (8yrs, Warrandyte). **Cate:** You can feel how hot it is and if it's really hotter than your normal hot days you would probably think that there would be a bushfire near you (9yrs, Warrandyte). **Sacha:** It would begin getting really hot (9yrs, Warrandyte). **Ford:** It would probably feel a lot hotter than it did that day (11yrs, Warrandyte).	**Dee:** You could hear it maybe if a tree fell down or something (11yrs, Huonville). **Bec:** If you can hear crackling sound or if it gets hotter. **Kurt:** Yeah, sometimes fires make a [whistling noise] because sometimes the wind blows it (7yrs, Macedon). **Guy:** I could hear the crackles of the fire or the trees falling down (8yrs, Warrandyte). **Tom:** We'll probably hear it because they said it sounded like a train (10yrs, Macedon). **Scout:** You can kind of hear it. It sounds like crackling trees. **Lang:** Yeah and trees falling and all that (11yrs, Warrandyte).

The extracts presented in Table 6.5 raise the important issue of warning lead times. Not receiving a warning until the fire is within earshot or flames are readily visible from the lounge room window undoubtedly reduces the amount of time available to respond. Yet, this was not readily identified as an issue by the majority of children in this study. Nevertheless, there were several children who described how the observation of environmental cues could be facilitated or enhanced. Hilltop locations, tree-houses, leaving doors open, or simply being outdoors were all identified as increasing opportunities for the early observation of environmental cues:

Tao: We have a tree-house and we can hop up it and we can look out for fire. I could go up in my tree-house and see.

-6yrs, Warrandyte

Tia: We can see fires from my grandma's place. We can just see any fire. We're facing the Mount and we can just see any smoke anywhere.

- 9yrs, Macedon

Tom: At our house all our doors are usually open as well and usually in summer we're in our pool so we'll probably see it in summer.

-10yrs, Macedon

Sirens and alarms

Another frequently identified warning mechanism involved the sounding of sirens and alarms. Among the various kinds of sirens and alarms identified, domestic fire alarms were the most common:

Mika: Well, we have a fire alarm in our house so if the fire's really close it will go beep-beep-beep.

-9/10yrs, Huonville

Domestic fire alarms were perceived as being particularly useful if a fire occurred at night while the family was asleep:

Sila: Well, if it's at night we have smoke detectors in every room. At night, the smoke detectors are good, because they're right above our heads where we sleep, so it would just be ringing in our ears and we would probably wake up.

-10yrs, Macedon

As was found to be the case with environmental cues, children acknowledged that domestic fire alarms would not sound until the fire was in close proximity of the house but this did not seem to undermine the perceived value of warnings from this source:

Briony: Okay, so where will the fire be when the alarm goes off?
Troy: It will be near across the road.

-6yrs, Warrandyte

As noted in Chapter 2, information about domestic fire alarms forms a substantial component of the school-based house fire education programmes that are routinely delivered in Victorian and Tasmanian schools. It can be reasonably speculated that children's knowledge of domestic fire alarms had its origins in their exposure to these programs. As will be shown throughout the remainder of this chapter, exposure to these programs exerted a strong influence on children's knowledge of preparing for a bushfire event, particularly within the realm of making an emergency plan.

Children also identified the siren at the local fire station as an important warning mechanism. This was particularly the case in Macedon and Warrandyte where children expected the siren to sound in the event of a bushfire threat:

> Stuart: If there was a fire the siren would go off. Outside the fire brigade thing, they have a siren which alerts everyone.
>
> -11yrs, Macedon

> Mark: Well, they've got a fire station near us and you can hear the fire siren easily from our house.
> Ford: Our fire station is just down the road so we'd also hear the siren.
>
> -11yrs, Warrandyte

However, children also raised issues about the reliability of the fire siren as a warning mechanism because when it sounds *"it's usually just a drill"* (Mark, 11yrs, Warrandyte). Therefore, interpreting the siren as a bushfire warning would require an additional warning from some other source, such as an environmental cue:

> Mark: Well, usually the siren goes off once every week or something, and well, usually it's a drill and we don't really do anything about it because we always know that it's not really around us because if it was around us you'd smell the smoke and see it and everything.
>
> -11yrs, Warrandyte

The need to supplement warnings from sirens with other warning mechanisms such as environmental cues was also observed in children's responses to fire alarms at school. In both Macedon and Warrandyte, children routinely reported that if a bushfire was approaching the school, the fire alarm would sound and emergency procedures would be instigated:

> Briony: What if you were at school? How would you know?
> Haidy: We hear the announcement It's something that goes da-da-da-da and then someone talks. They say ee-or-ee-or when it's coming. And then we would go to where we usually have to go where there's a fire.
>
> -6yrs, Warrandyte

However, when the school fire alarm sounded in the midst of an interview with Hugh and Harper (6yrs, Warrandyte), both children climbed up onto the desk and peered out the window: *"No fire. No fire that I can see"* said Hugh; *"Nope. No fire out there"* said Harper. And, with that, they both sat

down and continued on with their drawings. A similar response was observed when the fire alarm sounded during an interview with Solomon and Jai (11yrs, Macedon). These boys agreed that unless a threat was confirmed by people running through the halls yelling "*Fire! Fire!*", there was no need to respond. Thus, although children frequently identified sirens and alarms as potential warning mechanisms, there was also evidence that they would require additional environmental cues for such warnings to be taken seriously.

The Media

The media was one of the most frequently cited mechanisms for receiving warnings. Several children in Victoria were familiar with ABC Radio, which is the official emergency management network through which all official bushfire warnings are disseminated (ABC, 2009). They were also familiar the specific band-width for this station:

> Briony: Do you know what radio station will tell you if there's a bushfire?
> Kurt: 774.
>
> > -7yrs, Macedon

> Connor: The local radio will tell you [if there's a fire] and you can listen to 774 and that's really good.
>
> > -9yrs, Macedon

> Briony: How would you get a warning that the fire was coming?
> Stuart: If you put it on the ABC radio channel it will keep you updated on the fires.
> Briony: What channel is it do you know?
> Stuart: 774.
>
> > -11yrs, Macedon

Rod also explained how his family had a radio permanently tuned to 774, exclusively for the purpose of receiving bushfire warnings:

> Rod: Well, we've got a radio, a bushfire radio, we've got one that's dedicated to that so if there's a fire we switch it on and there's the radio.
>
> > -12yrs, Warrandyte

In contrast to sirens and alarms, the bushfire warnings and information broadcast over 774 were viewed as highly reliable and there was little evidence that a radio warning would need to be confirmed by some other warning mechanism. As the following extract from Con suggests, trust in the warnings from the ABC were strongly related to the specificity of the warnings provided:

> Con: Well, we went to the beach once and our house nearly got burnt but thanks to the radio station it warned us when it was coming 'cos the [Macedon] ranges were under threat and so that's the good thing, it tells you the places.
>
> > -9yrs, Macedon

Several children were also familiar with 'scanners' – specialised radio systems that transmit communications between emergency management agencies, such as fire brigades, police and ambulance - which recognised as a reliable warning mechanism:

Joe: I know! You can get some of those radio things and the fire brigades speaking and you can hear what they say and you can hear where the fire is and what's going on and how close it is.

-9yrs, Warrandyte

Television was also identified as a potential channel through which a bushfire warning could be received, and once again, several children made explicit reference to the ABC:

Briony: How else could you find out?
Kurt: On the TV. It should be ABC News 24 on the TV.

-7yrs, Macedon

Finally, several children were familiar with the internet as a potential source of warnings. These children described a website that can be presumed to be the CFA incident summary page, which provides real time summaries of fire location, size, and status:

Miley: All the time when we see a fire truck we look on the computer and every time we hear a siren we look on a computer to know where the bushfire is.

-6yrs, Macedon

Briony: How would know a bushfire is coming?
Lucas: On the internet the CFA's got those pictures [maps] of where the fires are.

-8yrs, Macedon

Social networks

Social networks were perceived as a particularly important system through which bushfire warnings could be received. Children commonly cited friends and neighbours as key sources of information about bushfire activity in their local area:

Briony: Tom, how will your family know if a fire is coming?
Tom: Well, we're surrounded by neighbours and they would ring us.

-10yrs, Macedon

Scout: There are two canaries in the coal mine [neighbours] so if they see it then they will tell us and we'll have time to escape.

-11yrs, Warrandyte.

While most children described an informal process whereby neighbours or friends would spread warnings in an ad hoc way, two children spoke of their families' involvement in formalised warning networks known as 'telephone trees'. Telephone trees are a standard feature of CFA Community Fireguard Groups and, as described by the children in the extracts below, they involve the

dissemination of warnings amongst a group of neighbouring households in a predetermined, organised manner:

> Ralph: On my street we have… my parents they have a lot of these fire meetings and…we have this special list and everyone calls around, so that everyone knows that there could be a bushfire.
>
> -11yrs, Warrandyte

> Nina: In our street we all know each other, so what we do is, whoever sees it first, passes the message on. So if we saw it first, we would pass it on to Dale and Diane and if they see it first, then they'd pass it on to Meg and Chris and Meg and Chris would pass it on to Danny and Claire then yeah, so then we all know that a bushfire is coming and then we can all get ready.
>
> -11yrs, Warrandyte

In addition to receiving warnings from neighbours or friends, several children also expected to receive personal warnings from social actors with an official emergency response role, such as police officers or firefighters:

> Briony: So if a bushfire did get out of control, how would you know that Bothwell was going to be in danger?
> Mandy: I reckon that somebody would come around and warn us.
> Briony: Who do you think would warn you?
> Brendan: Probably the fireman station, the police and all that.
>
> -10yrs, Bothwell

Furthermore, children expected these official warnings to contain information about precisely how to respond:

> Briony: Do you think you'd be able to get any other kind of warning that you were going to be danger?
> Steph: The firemen usually send out a warning. By phone.
> Dee: By TV or door knocking.
> Steph: Someone coming up to your door and saying "Pack your bags and leave".
>
> -11yrs, Huonville

It is important to emphasise that children did not perceive themselves as passive recipients of warnings, but as active participants in their dissemination. For many children, disseminating warnings to other households under threat constituted a key element of responding to a bushfire emergency. Many children also identified a need to disseminate warnings back to the fire brigade to ensure that they too were aware of the situation. Extracts reflecting children's desire to take an active role in the dissemination of warnings are presented in Table 6.6.

Table 6.6: Children's roles in disseminating warnings

Warning family, friends, and neighbours	Warning the fire brigade
Greg: We would probably go to our neighbours and tell them that there's a bushfire coming (8yrs, Macedon).	**Scout:** I have a bike and I'm not that fast but um the CFA thing is cos we just live up there it's about 200 metres away from us so I could ride there and tell them or if the phones were burnt or something like that (11yrs, Warrandyte).
Lucas: I'd run and warn him [Oscar] and warn his family cos they might not have their radio on and then run to all the people because they might not have their radio on (8yrs, Warrandyte).	**Briony:** Yep, so you'd tell someone and then what would you do? **Dan:** I would call the fire brigade (9yrs, Huonville).
Briony: What should you do when you see a bushfire? **Ali:** If you knew someone, who lives there you could ring them to see if they know about it (8yrs, Bothwell).	**Briony:** What would your family do if there was a bushfire? **Lana:** Ring up the fire fighter things. Tell them there is a bushfire (5yrs, Bothwell)
Briony: If it was the weekend and you realised there was a fire, what would be your first reaction? **Fiona:** To tell Mum that it was coming if she didn't already know. **Jason:** Um, tell everyone that there was a fire (9yrs, Huonville).	**Briony:** What would happen if there was a bushfire in Warrandyte? **Julia:** You ring 000 because that's the fire servicetry [sic] (6yrs, Warrandyte)
Briony: What would you do if there was a bushfire and you were at home? **Dan:** I would go tell the neighbours that there was a bushfire. **Mika:** Well, I would do the same thing as his cos we've got a whole cul de sac of people living near me and mum would go and say it's a fire close by, get ready for if it gets closer to us (9/10yrs, Huonville).	**Melek:** Our dad usually has a mobile phone in his pocket all the time, so he could call the fire brigade (7yrs, Macedon).
	Gus: You'll call the fire brigade with your own mobile if you're a teenager. You'll have one in your pocket (6yrs, Warrandyte).
Josie: Call the fire department and call everybody around you. **Jessie:** You could tell everyone around you like who's close to the mountains and that and tell them that there's a fire near there and to be prepared and that (10yrs, Macedon).	**Briony:** So what would you do if you had ten minutes warning? **Dell:** You'd panic a fair bit. Like mum, mum, there's a fire, there's a fire, call the ambulance. No, not the ambulance, the fire brigade (10yrs, Bothwell).
	Briony: And what would you do if a bushfire came near your house? **Ellie:** I would call the fire brigade (6yrs, Macedon).
Ellie: You should warn your neighbours. Our neighbours are really close so I would tell the neighbours if they didn't notice the fire. **Amber:** Yeah and I would make sure that like everyone around me knew about the fire (11yrs, Warrandyte).	**Olive:** What I'd do is I'd wait for my family and while I was waiting I'd call the fire brigade (8yrs, Warrandyte).
	Scout: call the police no I mean the fire fighters because they're gonna beat up the fire (11yrs, Warrandyte).
Dee: You should ring your neighbours and tell them what's going on so that they can hose down their houses as well. (11yrs, Huonville).	**Briony**: What you will do if you find out there is a bushfire coming? **Rob:** You call the ambulance and the fire engine (7yrs, Macedon).
	Mark: Phone the fire service to make sure they know (11yrs, Huonville).

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6.3.2   Deciding to stay or go

The second key component of preparing for a bushfire event was deciding to stay or go. As noted in Chapter 2, the 'stay or go' policy is the central element of community bushfire safety policy in Australia (AFAC, 2010). The majority of children in this study were aware that in event of a bushfire emergency, residents can choose to stay on their properties and defend their homes or leave early and wait for the threat to pass. When asked what they would do in the event of a bushfire, children typically considered which of these options would most effectively mitigate hazard impacts on both life and property, and chose accordingly. A number of different factors influenced this decision-making process, including: expectations of bushfire impacts; attachment to place; concern for assets and livelihoods; access to firefighting resources; fire severity; and road access. It is important to note that no single factor emerged as being more important than the others. Rather, each factor had varying degrees of importance for each child, depending on their own unique circumstances.

Expectations of bushfire impacts

Many children based their decisions to stay or go on their *expectations of bushfire impacts*. For example, when children believed that their houses would be severely damaged or wholly destroyed, they were more inclined to go:

> Briony: And why would you leave Kurt? Why wouldn't you stay?
> Kurt: Well because it would probably burn down our house.
> -7yrs, Macedon

> Sila: The reason why I'm leaving is because our house is fully made of wood. So, if you stay it would get burnt. So, that's why it's a better idea to evacuate.
> -9yrs, Macedon

Conversely, when children believed that their house would withstand a bushfire event, they were more likely to stay. For example, after completing the hazard mitigation exercise using Figure 4.7, Paul was asked if he would stay or go. Having created a safer location and fireproofed the house, he decided that he would stay:

> Paul: You'd stay. Yeah, I've changed my mind because you'd have to stay, I mean, because you don't have anything around that's gonna burn. If you have got rid of all that nothing's going to burn, well it is going to burn but not as burnt as big as when you had all that other stuff there.
> -11yrs, Huonville

Children also based their decisions to stay or go on expectations of death or injury. Where expectations of these impacts were high, children were more inclined to go:

> Cam: I think you would drive away if there was a bushfire because if you get too close to the fire, all the smoke might get you [gestures breathing in smoke].
>
> - 7yrs, Macedon
>
> Paul: You sort of wouldn't want to stay there. If you stayed in your house, you'd probably have more chance of being killed, if it got near your house.
>
> -11yrs, Huonville

Some children framed their decisions to stay or go in terms of the reversibility of expected impacts. As exemplified in the following extracts, the notion that houses are replaceable but lives are not, was a central determinant of the decision to go:

> Briony: So would you want to leave the house then?
> Mandy: Yeah.
> Mike: House isn't important as lives.
> Mandy: You can get another house but you can't replace yourself again.
>
> - 9/10yrs, Bothwell
>
> Briony: Why would you evacuate? Why wouldn't you stay and try to save your house?
> Ellie: You could get killed. You're more important than the house.
>
> - 10yrs, Warrandyte

However, as will be shown in the following discussions of *attachment to place* and *concern for assets and livelihoods*, several children were willing to stay on their properties and risk exposure to bushfire impacts in order to protect the things that they valued.

Attachment to place

In the literature, attachment to place is generally defined as an emotional bond or link between people and specific places (Hidalgo & Hernandez, 2001; Shumaker & Taylor, 1983; Hummon, 1992). In this study, a number of children described their decision to stay in terms of this construct:

> Joe: Why would I stay? Because I like my house.
>
> -9yrs, Warrandyte
>
> Josie: We'd stay because it's our home and we love it.
>
> -10yrs, Macedon

Importantly, it was not only an attachment to houses that motivated children to stay. For Colin, it was an attachment to the native bushland on his property:

> Colin: I wouldn't leave. I'd try to stop all the bush from burning cos I'm really attached to it.
>
> -11yrs, Huonville

A strong emotional attachment to farm animals also provided a reason to stay. This was most clearly depicted by James, who viewed his pet goats as members of the family:

> James: I'd wanna try and save my place cos I've got animals. Like goats and all that.
> Briony: How important are those animals to you?
> James: They're like my brothers.
>
>   - 12yrs, Huonville

Assets and livelihoods

Several children also wanted to stay and protect their homes because they perceived them as having substantial economic value:

> Jin: I'd really like to protect the house because it's got so much valuables and it's so expensive.
>
>   -8yrs, Macedon

> Pete: You wouldn't want to leave your beloved house that you payed like thousands for.
>
>   -11yrs, Huonville

When asked if she would stay or go, Tia (9yrs, Macedon) said that she would leave her own home and go and save her Grandmother's home. From Tia's perspective her own house was *'not worth saving anyway. It's like really run down'*. By contrast, the substantial amounts time and money that had been invested in her grandmother's farm, made it an important family asset worthy of protection:

> Tia: We'd forget about our house and try and save my Grandma's because its way more valuable... and it's really old and she's spent a lot of time on it and she's set up the farm really well. She's got animals that are worth a lot of money.
>
>   - 9yrs, Macedon

Children living in rental properties did not exhibit the same interest in staying to defend as children living in family owned homes. For example, Louis renounced responsibility for defending his family's rented home, delegating it instead to the owner:

> Briony: What do you think Louis, would you want to go or stay?
> Louis: Since it's a rented house, the owners would have to sort of do it themselves.
> Philip: Yeah if it's rented it's like, "That's your problem!"
>
>   -11/12yrs, Macedon

He later capitulated that since he and his family were friends with the owners, they would probably stay and help. Yet, his initial viewpoint illustrates the role of property ownership in the decision to stay or go.

Children also highlighted the role of livelihoods in the decision to stay or go. For example, Con expressed an intention to leave his primary place of residence to go and defend the family farm, which he referred to as 'the block':

Con: We'll go and help at the block because our block's more valuable and it's got a house that costs half a million dollars and there's lots of sheds and we've got lots of animals.

- 9yrs, Macedon

In a later discussion, Con described how the farm was not only a valuable asset, but also served as the family's primary source of income: *"That's how we're making our living right now"*. This potential loss of livelihood further cemented Con's resolve to stay.

Access to firefighting resources

Another major factor influencing the decision to stay or go was *access to firefighting resources*. When properties had been outfitted with hoses, sprinklers, and water supplies, children were more inclined to stay:

Briony: Why would you stay?
Lucas: What's the point of having all the sprinklers and everything if you're not going to stay?
Josie: Yeah!
Rod: I think we should stay because we're prepared.

-9/10yrs, Macedon

Conversely, if firefighting resources on the property were deemed inadequate, children were more inclined to go:

Briony: And what do you want to do, stay or go?
Jessie: I wanna get away from it, like far away from it so we're safe and because of the drought and that, we don't have much water and we're getting tanks, so if we do stay, we'll have a little more water we can use.

-10yrs, Macedon

Expectations of the firebrigade

An additional issue affecting children's decisions to stay or go was related to their expectations of firebrigade support and assistance. For some children, the decision to stay or go was contingent on the firebrigade dispatching a firetruck or other firefighting resources to the property to assist in the effort to stay and defend:

Dave: You'd go outside and get the hose ready and like buckets of water and that and when the fire started comin' at ya, people could ring the fire brigade and you could start puttin' it out before the fire trucks get there.
Briony: What if you had to rely on yourself?
Dave: Get some clothes and your swag and move out.

-11yrs, Bothwell

As will be shown in the impending discussion of *making a plan*, many children had high expectations that the fire brigade would be able to provide direct support to individual households.

Fire severity

Whilst some children indicated that they would decide to stay or go in advance of a bushfire threat, several children suggested that, upon receiving a warning, they would make an assessment of *fire severity* and make their decision on that basis. Whereas small or slow moving fires would prompt a decision to stay, large, fast moving fires would prompt a decision to go:

> Lee: It depends how big the fire was. If the flames were really on top of the trees and burning flat out, I'd leave, but if it was just a pretty low slow moving one, I'd see about fighting it.
> -11yrs, Bothwell

> Amber: It really does depend how big the fire is because if it's small…
> Bella: Small enough to defend...
> Amber: Yeah, you would obviously stay home and defend your house but if it's really, really big then you maybe go somewhere away from the house. It depends how big the fire was and like if it was really big you wouldn't want to stay.
> -11yrs, Warrandyte

6.3.3   Making an emergency plan

The third component of preparing for a bushfire event was *making an emergency plan*. Many children recognised the need to have an emergency bushfire plan: they also recognised the need to develop this plan in advance of an actual bushfire threat. As Taylor (9yrs, Macedon) put it, *"People need to have plans. Before there's a fire, they need to have plans"*. For the children in this study, formulating an emergency plan appeared to play an important role in reducing children's bushfire-related fears because many of their fears derived from a lack of knowledge about how to respond to a bushfire emergency (see Ch. 5.4.4). There was substantial evidence in the data that having a bushfire emergency plan helped to allay these fears. For example, when asked if he was worried about bushfires in his area, Jared (8yrs, Macedon) responded, *"No, I'm not because our family's got a fire plan and stuff"*. In a similar vein, Michaela (11yrs, Macedon) admitted that she sometimes avoided thinking about bushfires because it frightened her. Yet, she expressed a desire to develop an emergency plan with her family, explaining that, *"I want to know what I would have to do because then I would feel a bit more relaxed"*.

One of the most lucid examples of how having a bushfire plan ameliorated bushfire-related worry and fear was articulated by Jess (9yrs, Macedon). As may be recalled from the previous chapter, Jess was extremely worried about bushfires because, despite having experienced the Ash Wednesday bushfire disaster first-hand, her family did not have a definitive bushfire plan (see Ch. 5.4.4). Knowing what her family had experienced on Ash Wednesday, Jess was unwilling to accept her family's lack of emergency planning and had formulated her own plan with a local friend:

> Jess: I have a friend from Mount Macedon and she goes to that school and we always think about what we're gonna do if there's a fire and we decided that we're just gonna get on a bus and just run away from it.
>
> -10yrs, Macedon

Formulating this plan with her friend seemed to have given Jess an increased sense of comfort and control in what was an otherwise highly uncertain situation.

Having emphasised the importance that children placed on emergency bushfire plans and the role of these plans in the amelioration of bushfire-related worry and fear, children's approaches to making bushfire plans will now be presented. The types of plans identified and formulated by the children fell into three main categories - *evacuating, staying to defend*, and *sheltering in place*. Approaches to formulating each type of plan will be discussed in turn.

6.3.3.1   Evacuating

For the children in this study, formulating a plan to evacuate consisted of four separate phases: *deciding what to take, choosing a safe destination, identifying triggers to leave*, and *managing barriers.* As will be noted in the discussion that follows, there was considerable variation within each phase, particularly in relation to choosing a safe destination and identifying triggers to leave. It will also be noted that children's evacuation plans were strongly influenced by their pre-existing knowledge of house fire escape plans.

Deciding what to take

In anticipation that the house might burn down in their absence, children wanted to ensure that their personal belongings would be safe. However, they also recognised that in a fire emergency, they would not be able to take everything and would need to be selective. Thus, in planning to evacuate, children went through a process of *deciding what to take*. Children chose a variety of items, such as special toys, sporting trophies or medals, and photographs. For most children, however, it was pets that took first priority. Table 6.7 presents a series of extracts representing children's general preferences for what to take. It will be noted that the quotes relating to pets reflect an emotional attachment that surpasses that of the other material items.

Table 6.7: Items to take in the event of an evacuation

Pets	Toys and electronics	Photographs	Sentimental items
Pam: I would save my pets. **Miley:** Yeah we're taking our pets. I've got two cats and four chooks (6yrs, Macedon). **Amy:** We take Pixie, Spike and Kalu - our cats - because it would be hard for us to let them go because our cat loves us *so* much. (9yrs, Warrandyte). **Cam:** Well I've got 15 animals and I would take them because I would feel very, very, very, very, very, very sad without them (7yrs, Macedon). **Amber:** Your pets! You would definitely take your pets! (10yrs, Warrandyte). **Briony:** What would you take? **Max:** My animals because our cat, she is fairly old… we would probably put the animals in the car (11yrs, Macedon) **Sila:** We'd have to take our dog (10yrs, Macedon). **Dell:** We'd just chuck all the puppies in the car. Doesn't matter if it gets dirty because the dogs, you know, they're afraid of fires (10yrs, Bothwell).	**Briony:** What would you pack? **Lexi:** My best toys and my other toys too that I like (6yrs, Macedon). **Penny:** I would get my IPod because that's too beloved (7yrs. Warrandyte). **Lucas:** I'd get my Nintendo (8yrs. Warrandyte). **Steph:** I'll bring some of my toys. I'll bring every single toy I love and my teddies (7yrs, Huonville). **Stuart:** Well, we'd probably get ready to get into a car and stuff and grab some of our favourite things **Briony:** What would you grab? **Stuart:** Maybe some of my toys and that (11yrs., Macedon). **Briony:** What would you take? Flynn: Well just my gameboy and my MP3 (11yrs, Macedon).	**Carl:** I'd have to take all of my toys and photos (8yrs, Warrandyte). **Max:** I would probably take photographs because we've got a big box of just like old photo albums and stuff (11yrs, Macedon). **Ellie:** My mum would take most of the photo albums because it's got tonnes of photos of when they went overseas (10yrs, Warrandyte). **Briony:** Okay, so what would you take with you? **Philip:** Like photo albums: stuff that's precious to you (12yrs, Macedon). **Mary:** Dad would probably grab a big boxfull of photos so that we would have memories just in case it did catch alight (11yrs, Huonville). **Steph:** I'd get my special photos off my wall. Special photos of my Dad and Nan and Pop (11yrs, Huonville).	**Pierre:** [I'd be] collecting all my stuff because my stuff is important to me. Especially my medals I won in basketball (7yrs, Warrandyte). **Flynn:** Just [take] stuff that you've had for a long time or that means a lot to you (11yrs, Macedon). **Sila**: You need [to take] special stuff such as like something that's really old and special to you and yeah that's all (10yrs, Macedon). **Amber:** You might take something really special of yours. Like something that's been passed down through your family. **Bella:** Something you've had since you were little (10yrs, Warrandyte). **Amber:** I've got a Pikachu pillow that I've had since I was two so I would really like to take that because it's really special and there's this ring which has got grapes on it and I would take that because my Grandma passed it to my mum and my mum passed it to me (11yrs, Warrandyte).

Although most children planned to pack their special items when threatened by a bushfire emergency, several children reported that they had already assembled a 'firebox', the essence of which is described below:

> Dell: We've got a firebox in case we have to just get away. You get a cardboard box and put all your really valuable stuff in it and just a purse with a couple of dollars, in case your house is burnt. Just baby stuff and you know, photos and a couple of old books and stuff that's valuable.
> Briony: So is your firebox something that you always have ready to go?
> Dell: Just in case. We pack it so it's ready.
>
> -10yrs, Bothwell

Children also had ideas about how they could make advanced preparations for taking their pets. Some children suggested training dogs or cats to come when called, whilst others noted the importance of having cages for transporting animals in the car:

> Nat: You could train you dog so that he comes when you call him.
>
> -7yrs, Bothwell

> Amy: We've got special cages to take our cat in the car and we're gonna get more so we can take our other cat.
>
> - 9yrs, Warrandyte

There is little doubt that children were deeply concerned about losing their pets and valuables in a bushfire. However, it seemed that deciding what to take provided a certain sense of control and empowerment. Discussing what to take provided them with an opportunity to think about what was really important to them, and knowing that these things would be spared if the house did burn down seemed to provide a sense of security and comfort.

Choosing a safe destination

The second stage of planning to evacuate was *choosing a safe destination*. In general, destinations were chosen on the basis of their perceived exposure to a bushfire event. However, the variation in children's choices was considerable. Several children chose a destination out of the area in a distant town or city, where the home of relatives or friends would provide a safe refuge until the fire threat had passed:

> Ismail: Well if it was coming towards our way, we would kind of like leave the house and go to Keilor to our Grandma's house and stay at our Grandma's house.
>
> -7yrs, Macedon

> Pete: The safest place for us to go would be to hop into our car and drive off to my mum's best friend's house up near NSW, about 5 minutes to the end of Victoria. It's in Kerang. So we would go up there and that's the safest place.
>
> -9yrs, Warrandyte

Mandy: We'd probably go to town: to Hobart. We'd probably go to Kingston cos that's where our family is, most of our family.

                                                          - 10yrs, Bothwell

However, children choosing destinations in distant towns or cities were the exception and the vast majority of children chose destinations much closer to home. Jessie, for example, suggested going to the local shops which she perceived as being 'far away' from any potential bushfire threat:

Jessie: Well probably I would go to the shops up there because that's like far away from it, like far, far away from it so we aren't near and it doesn't get me.

                                                    -10yrs, Macedon

Similarly, Hugo (6yrs, Warrandyte) devised a plan in which he would *"run to the kindergarten"* approximately 800m from his home - a distance that he perceived as being *"far, far away"*.

Several children also considered the home of a local friend or neighbour as being a safe distance from any potential bushfire threat:

Zach: You'd go to your next door neighbour, who you know. No, no, no, like two houses up the street cos if you go to your next door neighbour it could catch onto their house as well.

                                                    - 6yrs, Macedon

Lucas: I'd run to...have you seen a kid called Oscar here? Yeah well he's my friend and I'd run to his house because his house is further away from the State Park than my house.

                                                -8yrs, Warrandyte

This tendency to choose nearby destinations seemed to reflect a lack of knowledge about the potential aerial extent of a bushfire event. That these children perceived locations so close to their homes as being 'far away' from any potential threat reflects an assumption that bushfire events are small scale and highly localised. This assumption is further reflected in the following extracts in which children identify the end of the street, the front gate, the letterbox, or the farthest reaches of the backyard as safe destinations:

Briony: Where do you go to in the car?
Rob: Somewhere far away from the fire.
Briony: How far away?
Rob: I know! To your mailbox!

                                                  -7yrs, Macedon

Dan: My escape plan will be if there was a fire you'd quickly get out and take your car up to the end of the driveway so you don't get burnt.

                                                  -9yrs, Huonville

Elle: If it's coming towards us we've got a very big backyard so we have to run all the way up the backyard and we have to make sure everyone's safe.

                                                  -10yrs, Warrandyte

Mark: I think if it was near our house we have to go down to the front of our house.
Lana: You have to go to the mailbox.
Mark: Yeah, straight to the mailbox.

-11yrs, Warrandyte

Implicit in these extracts is the assumption that the bushfire threat would be isolated to the house. This assumption is clearly articulated in the extracts below:

Haidy: I'm gonna run up to my prickle bush.
Briony: Why?
Haidy: Because that's the place farest away from the house.

-6yrs, Warrandyte

Cam: I would go to the letterbox because it's the safest place and it's far away from the house.

-7yrs, Macedon

Jemma: Well, I've gotta make sure my brothers go to the letterbox. Well, not exactly to the letterbox, up to the dam because our letterbox is too close to the house.

-10yrs, Warrandyte

Ellie: Well, we don't have a very long driveway, so we'd just make sure everyone was out of the house and we'd go to our next door neighbour's house because our letterbox isn't like that far away from our house.

-11yrs, Warrandyte

The pervasive tendency for children to choose letterboxes or other destinations 'away from the house' seemed to be an artefact of school-based house fire education programmes that require children to formulate house fire escape plans that include choosing a 'safe meeting place' away from the house. When asked if they had a family bushfire plan, it was very common for children to automatically recount the details of these house fire escape plans:

Briony: How many of you have a bushfire emergency plan with your family?
Maddy: We've got our meeting place we do.
Phillip: Mum said that, like in my old house you'd knock over the like flyscreen, jump out that then go round the paddock and meet at the front gate.
Briony: Have you got an emergency plan Maddy?
Maddy: Yep. If I was trapped behind the door I would climb out my balcony but only when there's a fire and not sneaking off with boyfriends or anything.

- 11yrs, Huonville

To determine whether the application of house fire escape plans to the bushfire context was the result of a simple semantic misunderstanding, the children were specifically asked if these plans were for bushfires or house fires. A common response, as illustrated in the extract below, was that a house fire plan could be appropriately applied in both types of fire emergency:

Cate: Well, if when we see a fire we all run out to the letterbox and mum says is everybody here and like there's only four people um, then she goes back in and finds them if they're still asleep

Briony: And are those plans for a bushfire or a house fire do you think?

Cate: Both.

-9yrs, Warrandyte

Thus, children did not always discern the distinctive nature of bushfire and house fire emergencies, nor did they always recognise the need to develop alternate plans or choose different destinations for each situation.

In addition to choosing destinations away from the perceived fire threat, children also chose destinations according to their perceived capacity to withstand the impacts of a bushfire as it passed over. Several children suggested evacuating to a nearby fire resistant building and sheltering there until the fire threat subsided. As the following extracts demonstrate, children's choices were informed by their conceptions of fire resistant construction and design:

Haidy: You'd run to a brick house so it can't burn.

-6yrs, Macedon

Lina: Maybe if there's like a brick house somewhere that doesn't ever catch on fire, you could go there.

-9yrs, Warrandyte

Ford: Well I'd probably evacuate to the fire station because it's a complete brick building.

-11yrs, Warrandyte

Some children also drew on their knowledge of buildings that had survived previous bushfires. In Macedon, for example, some children were aware that the local hotel had provided a safe shelter for many local residents on Ash Wednesday:

Luke: We'd run to the hotel. We'd go to the hotel because that's what happened last time, everybody went into the pub up there and that didn't get burnt down.

-7yrs, Macedon

Nearby rivers and local swimming pools were also commonly identified as safe destinations because '*fire can't burn water*' (Lucas, 8ys, Warrandyte). In choosing rivers or swimming pools, these children did not consider the potential impacts of radiant heat, smoke or ember attack: direct exposure to flame was the primary concern and the water was viewed as providing a protective haven from this hazard:

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Luke: I think you'd drive to the swimming pool.
Rob: And stay under until the fire's gone past.
Briony: Why would you go there?
Luke: Well, if the fire got in the water, it could put out the fire.

- 6/7yrs, Macedon

Briony: So Erin, what would you do if you could see the smoke and the flames?
Erin: Well yeah I'd probably run as well. Down to the river. Because we're like just before the river and there's this part that you could just get in it.

-9yrs, Warrandyte

Flynn: Maybe if someone else's house had a pool you could go there and then if they had the fire coming, you could just swim in that the whole time cos it won't burn.

-11yrs, Macedon

Thus, in choosing a safe destination, children drew on their knowledge of the biophysical process of bushfire and how it interacts with conditions of exposure to endanger people. Importantly, where children's knowledge of these conditions and processes was misconceived, they chose destinations that would be highly likely to leave them exposed to death or injury.

Identifying triggers to leave

The third stage of planning to evacuate was *identifying triggers to leave.* This involved identifying the specific sign or signal that would trigger an evacuation. At one end of the spectrum, the trigger to leave was a fire encroaching on the property. At the other end, it was a high fire danger day. Each point along this spectrum is discussed in detail below.

As noted earlier in the discussion of warning systems, many children expected very little warning of an approaching bushfire. In particular, children relying on domestic fire alarms did not expect to receive a warning until a fire had almost reached the house. For these children, the sounding of domestic fire alarms would represent a trigger to leave:

Briony: When would you go?
Julia: As soon as you hear the fire alarm.

- 6yrs, Warrandyte

Sila: We evacuate when we hear the smoke detectors going off.

-10yrs, Macedon

Environmental cues, such as smoke and flames, were also identified as triggers to leave. As will be recalled, children did not usually expect to observe these environmental cues until a fire was in close proximity to the property. For these children, environmental cues would represent a trigger to leave because the fire would only be a few minutes away. For example, several children in Bothwell expected only ten minutes between seeing the first plumes of smoke and the fire arriving at the property. Hence, seeing smoke would represent a trigger to leave:

Briony:	So how would you know that a fire was coming?
Greg:	You'd see smoke and stuff and it'd be in the air.
Briony:	So how much warning do you think you get?
Dell:	I reckon about ten minutes if it was sort of an average windy day...
Briony:	So what would you do if you had ten minutes warning?
Lee:	Get the dogs out get on my motorbike and ride away
Dell:	Get the valuables, cos we have a fire box... Probably just stick the dog in there too and just get out of the house.

<div align="right">-10/11yrs, Bothwell</div>

Importantly, when this group of children were asked what they would do if they received a warning several hours in advance of a fire's arrival, they did not identify an opportunity to leave early. Rather, they suggested a 'wait and see' approach in which they would get their valuables and pets ready and then wait for the fire to come within a certain distance of the property:

Briony:	What about if you had a couple of hours warning? What then?
Lee:	Yeah, I'd still get all me stuff, just get all me valuable stuff ready and get me bikes warmed up, if it's coming our way, and then when it gets real close we'd go.
Briony:	How close would it have to be for you to leave?
Lee:	In front of the house there are two paddocks, one that's about a hundred metres up to the house and once it gets to there, I'd probably start moving.

<div align="right">-11yrs, Bothwell</div>

This 'wait and see' approach to identifying triggers was pervasive amongst the children in this study. Additional extracts depicting this approach are presented in Table 6.8.

Table 6.8: Depictions of the 'wait and see' approach to identifying triggers

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Briony: Okay so Guy, you turn on the radio and there is a bushfire warning. It says that there is a bushfire coming towards this house. What do you do?
Guy: You get ready
Briony: What does getting ready mean?
Guy: You pack your bags and then tell your family and they can pack their bags and then when the fire comes then you run out of the house
Briony: When do you run out of the house to the car? How close is the fire when you do that?
Guy: Close
Briony: How close?
Guy: On the house (8yrs, Warrandyte).

Briony: Okay, so how close to your house, would it have to be for to you want to leave?
Mike: We're on the second street so probably only just on the side of the road over there.
Briony: Okay, if it was actually on your street then you'd wanna go?
Mike: Nah, probably the street before that.
Mandy: Down the main road from me.
Brendan: If it was behind our house yeah, in that bush bit, I'd probably just get some stuff that I like and just take it and go (9yrs, Bothwell).

Briony: What if the fire was still over up in the hills, what would you do then?
Brendan: Just leave it for a while.
Mike: Just stay. Stay and see what happens.
Briony: While you were waiting, what would you be doing?
Brendan: Just watching the fire to see how close it gets.
Mandy: Get most of your stuff so you can go when it comes like really close to you (9/10yrs, Bothwell).

Briony: How about you Ana? What would you do if there was a bushfire coming?
Ana: Um well I'd probably just wait up the top of the driveway just to like wait for it to get there and like even before it gets to the actual house like if it's burning like a bit of the property we would probably call the fire brigade and I would want to leave (11yrs, Macedon).

Briony: From the point when you get the warning, that there is a bushfire that is a threat to your area, what do you do?
Debbie: We'd probably go to the garage cos that's on the driveway and that's made of like rocks and stuff or we would get in the car and probably go to my grandma's house or something
Briony: Alright and under what circumstances do you get in the car?
Debbie: If like you could see everything and it was like really close, then we'd probably go.
Briony: So if it was getting close then you would go in the car?
Debbie: Like if you could see it then yeah, probably (11yrs, Macedon).

Underlying the 'wait and see' approach was the assumption that it was only worth leaving once it was absolutely certain that a fire was going to reach the property. Several children explained how a fire in the area would not constitute a trigger to leave because the fire service might suppress the fire before it reached the property or the wind could blow the fire in another direction, both of which would negate the need to evacuate. Thus, to initiate an evacuation there would need to be a clear indication that the fire was actually going to reach the property, as Scout explained:

Briony: If a fire is about three hours [from] your house, is that the time when you would leave, when its three hours away?
Scout: No! No way! Um, if it got way close like there [on the edge of the property], I'd start packing my belongings and stuff because fires happen all the time and you don't know if

it will come because the wind blows and then it goes in an entirely different direction... [or] the CFA could help put it out by that time.

Briony: Alright, so what would you do when it gets to here? [on the edge of the property].

Scout: Run!

Briony: Why wouldn't you go back here at that three hour mark, why would you wait until it was close?

Scout: Well, as I said, we don't know if it's controlled there and but if we do know that it is coming closer, then we would go.

-11yrs, Warrandyte

Contrasting with the 'wait and see' approach was an approach best described as 'playing it safe'. In this approach, an early warning would constitute a trigger to leave, even if the fire was still some distance away and the threat was not imminent. Unlike the children opting for the 'wait and see' approach, children opting to 'play it safe', did not want to take any chances. These children tended to perceive bushfires as highly unpredictable and therefore, if an early warning was received, they would leave immediately:

Briony: What would you do if there was a fire on the mountain?

Max: We'd probably leave to go to New Gisborne because fire is very hot.

Briony: So you'd leave even if the fire was still up there?

Max: Yes. Well, just because my parents would probably not want to even take any chances.

-11yrs, Macedon

Additional extracts depicting the 'playing it safe' approach are presented in Table 6.9.

Table 6.9: The 'playing it safe' approach to identifying triggers

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Briony: If you saw the fire, so you're down at your house here and the fires up here on the mountain, what are you going to do?
Lexi: I'm going to get my car and I'm going to drive to my grandma's and my grandma's is a very long way away (6yrs, Macedon)

Briony: So if there is a bushfire on the mountain, what are you going to do?
Pam: Warn mum and dad
Briony: What are you going to do after you warn mum and dad?
Pam: Escape. Run away. (6yrs, Huonville).

Briony: If the warning on the radio tells you the bushfire is say 5 hours away. What do you do then?
Eamon: I would get a car, pack, get my clothes put them in a bag, chuck them in the car get some more chuck it in the car, shove the TV in and some doonas and some underwear and some socks and some PJ's and run to car an broom broom (7yrs, Warrandyte).

Briony: So if the fire was still up in the bush, up in the hills and it was going to be another hour….
Anna: You could probably get a blanket and run away with it.
Briony: Where would you run?
Anna: Probably to the main road or something and….
Briony: Why the main road?
Anna: Because a car could come past.
Ben: And then you shout out, "Help! Help!"(7/8yrs, Bothwell).

Briony: Is there anything else you would do if the fire was an hour away?
Sacha: I'd go, I'd go.
Dan: I'd go straight away in the car.
Mika: I'd go in the car (9yrs, Huonville).

Briony: Would you like to draw a fire up in the mountains somewhere? What are you going to do?
Tom: I don't know, probably drive away in the car.
Ben: Yeah if it's pretty far away (11yrs, Macedon).

Stuart: If we weren't at school, me and my brother and mum would go to Highpoint or something and my dad stays and does that [defends the house]
Briony: When do you do that?
Stuart: If there's a fire in the area
Debbie: Yeah if there's a fire in the area we'd do that (11yrs, Macedon).

Whilst several children indicated that they would 'play it safe' by leaving as soon as they received an early warning, only one child identified a high fire danger day as a trigger to leave. Lang explained how on high fire danger days his father sends him to a friend's house, just in case there is fire:

Lang: My dad doesn't leave us at the house with my brothers if it's above 30 degrees. If it's really hot he won't leave us if it's a hot day. And if it's not a school day but he's got to work - like you know, on school holidays - we go to Louie's house and that's my dad's partner and we stay there while he's working.
Briony: Why's that?
Lang: Because my dad is very concerned about bushfires and all that.

-12yrs, Macedon

In summary, children's triggers to leave were located along a spectrum. Where children expected short warning lead times they would leave as soon as a warning was received. If a more advanced warning was received, some children would wait until the fire came within the vicinity of the property others would play it safe by leaving immediately. Importantly, only one child identified a high fire danger day as a trigger to leave.

Managing barriers

The final phase of planning to evacuate was *managing barriers*. Children identified a number of barriers that could potentially impede an evacuation, especially when the fire was nearby or had already reached the property. To manage these barriers, children devised a variety of strategies and contingency plans that would reduce the risk of death or injury. As the following discussion will demonstrate, children's approaches to managing barriers provided important insights into their conceptions, or misconceptions, of fire behaviour and the bushfire environment.

The first major barrier identified by children was thick smoke which was associated with reduced visibility and increased exposure to smoke inhalation. Several children suggested managing this barrier by crawling beneath the smoke layer and trying not to breathe the smoke-filled air:

> Phoebe: If you're in the house, its better off to crawl outside the door to outside. So you've gotta open the door like this then you crawl back out really fast and try not to breathe the air because you go to sleep.
>
> -5yrs, Bothwell

> Briony: Scout, what if it was so smoky and you couldn't see anything?
> Scout: I'd probably close my eyes because there's no point in using them and start trying to crawl my way down the steps because then we can get out through the trees there.
>
> -11yrs, Warrandyte

Once again, in adopting this strategy, children were drawing on their knowledge of house fire safety. Indeed, in suggesting the strategy of crawling, several children recited the slogan of '*Get down low and go, go, go*' which is routinely taught in the school-based house fire safety programmes:

> Taylor: If you ever have got a fire near your house then you'll have to get down low and go, go, go and crawl to the doorway and get out quickly.
>
> -6yrs, Macedon

> Mandy: If there was a fire just outside our house I would get down low and go, go, go.
> Briony: Why?
> Mandy: Because of the smoke.
>
> -10yrs, Bothwell

Torches or car headlights were also identified as effective means by which to evacuate through thick smoke:

> Jared: With all the smoke, I'd find a torch so then you could see your way through the smoke and then like you'd run through and then you just go back and get the car and then put the headlights on and then you can see your way through the road like.
>
> -7yrs, Macedon

The second major barrier was the fire itself blocking evacuation routes to the chosen destination:

> Fiona: Maybe you couldn't go on the road because the fire was there, and if you went on the road, it would be dangerous.
>
> -9yrs, Huonville

To manage this barrier, some children proposed going around the fire. This strategy seemed to be based on the perception that the fire would be burning in isolated pockets that could be easily avoided:

> May: Well if there's a fire here and you're here, you could just go around it.
>
> -7yrs, Bothwell

> Ana: If the fire's coming from the front of the house which is over this way, then probably go around the fire, they would probably be about 6 metres away from the fire.
>
> -8yrs, Bothwell

> Claire: If the fire went up the hill, it could go in five directions: it could go there, there, there, and there and there, so it could straight to my house. But if it goes to my house, I could just go around it.
>
> -9yrs, Warrandyte

> Fiona: If the fire was on both sides, if this side and this side were alight and it was about to catch onto the log and the flowers you could just go around, so the fire was just here and here so you could just quickly go round and out through there.
>
> -9yrs, Huonville

Other children suggested going over the fire. For these children, the fire hazard would only exist at ground level, and by going over the top, it could be successfully avoided. For example, Hugh suggested building a ladder from the house to his chosen destination of the local kindergarten because this would provide safe passage over the top of the fire:

> Hugh: I need a ladder! I'll put a ladder across the fire! Yeah, I'm going to go across the fire with a ladder: the ladder is made of metal. It's a metal ladder and then I need to climb across the ladder so fast.
>
> -6yrs, Warrandyte

Other children suggested that a fire could be avoided by running in the opposite direction. These children believed that they would be able to 'outrun' the fire, which was indicative of a general tendency to underestimate the potential speed at which a bushfire fire can travel:

Briony: Okay, now let's draw the bushfire over here.
Grace: We're going to run away from the fire.
Bronte: Yeah! Out the back gate!

-6yrs, Macedon

Victoria: If say the fire was up here and the highway was down there I'd get out of the house and I'd quickly run down here and I'd get our dog as well.

-9yrs, Huonville

Maddy: I would go around the pond but if there was a fire there I would have to run the other way down the driveway and we would meet at the gate.

-11yrs, Huonville

For some children, evacuating in the opposite direction would first involve escaping through a window or door furthest from the approaching fire, once again invoking the logic of house fire escape plans:

Briony: What if you weren't able to escape, what if it was too late to run away?
Ana: Get out your window and go up the different way that the fire is. At my house, I've got a door there, there and there. So if the fire was up this side I could go through there, there, or there.

-8yrs, Bothwell

Briony: What if there was a bushfire that's coming close. See if you can come up with a plan for dealing with that situation.
Fiona: You wouldn't get out this window because that might be on fire and you wouldn't get out this window because that would be on fire and you wouldn't get out this one because that would be on fire.
Jason: But if the fire was over here you can get out down here.
Fiona: So basically, if we had all these hazards on fire we'd be out the back door. And if it was this side would be out the window, and this side out that window or straight out the door.
Jason: But if the fire was around this side we'd get out probably through one of these two windows.

-9yrs, Huonville

Mika: If it's fire near our front door we go out the back door but if it's a fire on the back door we have to crawl out mum's room.

-10yrs, Huonville

Although most children believed it would be necessary to avoid the fire using the strategies outlined above, several children suggested that if done quickly enough, running or driving through a fire front would not have any major consequences:

Ana: You could just run through the fire.

-8yrs, Bothwell

Brendan: Just get in the car and drive through the fire real fast. Because on T.V shows, every T.V. show when they go through the fire, they don't catch alight.

-10yrs, Bothwell

Thomas: You could probably just drive straight through the fire. It would probably only like peel the paint off the car and you could just drive a bit faster through the fire.

-11yrs, Bothwell

The third major barrier that children perceived as impeding an evacuation was a loss of transport due to fire damage. Children identified a range of solutions to this problem, including fleeing on foot or bicycle, or arranging for somebody else to pick them up:

Briony: How will you get to Echuca?
Fraser: Drive
Alex: But are you sure you will still have your car with you? Because it might be burnt down.
Jack: Then we could walk.
Fraser: Or we could run for our lives.

-6yrs, Macedon

Briony: And how will you get to there?
Lottie: Problem. Cars burnt.
Con: Well actually we're sort of near Newham's where our block is so if we can't drive we'll have to walk, use the bikes or walk

-9yrs, Macedon

Briony: Tamsen, how would you get to your Grandma's house?
Tamsen: By car or if your car was already burnt then someone else could pick you up.

-11yrs, Huonville

That children would be willing to evacuate when a bushfire had encroached far enough onto the property so as to destroy vehicles was consistent with the more general finding that, for some children, the risks associated with staying would always outweigh the risks of leaving, regardless of the proximity of the fire:

Briony: Have you ever heard about when too late, what the roads are like?
Morgan: They can be like really cramped and really smoky.
Briony: So what if it was too smoky for you to leave, would you still want to go?
Morgan: Yeah probably. I'd probably still wanna go because it will be safer away from the fire than being near it.

-11yrs, Macedon

There was, however, a small group of children who did recognise the dangers inherent in late evacuations:

Max: If like the fire was fairly close, you wouldn't really go on the road, because that's actually how a lot people died in Ash Wednesday; they like tried to get out of their house and run away.

-11yrs, Macedon

Philip: If [people] leave too late, chances are they can have third degree burns or smoke inhalation and that's a way of dying pretty much; you breathe in too much smoke and then your lungs don't work.

-12yrs, Macedon

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If these children could not leave well in advance, they would abandon their evacuation plans and initiate contingency plans to either stay and defend or shelter in place:

Briony: What if the fire was close?
Maxine: I wouldn't get in the car. If the fire actually caught up with you it would be too late to get out. Stay in the house, because the house is the safest place to be.

-10yrs, Bothwell

Philip: My mum has come up with a fire plan so we get all our precious stuff and then we put it into the car and then if we're gonna go, we'll take everything in the car but, if the fire's too close, we'll get everything into our front room, which is made of brick, and we thought we'd just get like wet mops and stuff to put out the fire if it's gets too close.

-12yrs, Macedon

Children's strategies for staying to defend or sheltering in place will be discussed in detail in the following sections.

6.3.3.2 Staying to defend

Children's plans to stay and defend were defined by three temporal phases: *before a fire threatens, as a fire approaches,* and *when a fire arrives.* For each phase, children proposed various activities that would have protective benefits for their properties and for their own personal safety. The variation characterising children's approaches to each temporal phase was substantial. Some children had a sophisticated understanding of staying to defend and were acutely aware of what would be required to protect both life and property during each phase. Other children, by contrast, had a more basic understanding, particularly in relation to what would be required *when the fire arrives.* The variation that emerged within each temporal phase will be discussed in detail in the sections that follow.

Before a fire a threatens

The first phase of planning to stay and defend involved a set of activities to be undertaken *before a fire threatens*. These activities were additional to those undertaken as part of mitigating the hazard (see Chapter 6.2), and consisted of activities specifically focussed on the firefighting effort, such as ensuring a dedicated water supply and obtaining specialist fire fighting equipment.

In most children's plans to stay and defend, ensuring a dedicated water supply for firefighting was a key priority. This typically involved installing water tanks or build dams or swimming pools. Extracts depicting these approaches to ensuring a dedicated water supply are presented in Table 6.7. As will be noted, several children reported that their families had already taken these measures on this own their properties.

Table 6.10: Ensuring a dedicated water supply

Water tanks	Dams and swimming pools
Carly: We have a tank for drinking water and a tank for fires. (7yrs, Macedon).	**Melek:** I'm just gonna put a dam near the house (Macedon, 7yrs).
Jane: And make sure, if you have them, that your tanks are full with water. **Liz:** We've got three water tanks. **Jane:** Same with me, we've got one small one and two really big ones. **Sacha:** We've got one. One medium sized one (9yrs, Warrandyte).	**Con:** At our block we have got like um, we've got two dams that could hold about a million or so litres. **Briony:** Okay so you've got heaps of water **Con:** Yep but hardly any of it's suitable for drinking but at least we've got lots for fire fighting (9yrs, Macedon).
Con: We've got big plastic tanks and they usually hold about a thousand litres (9yrs, Macedon).	**Con:** At our house we've got about ten dams and five springs so we've got lots of water and that and we've got lots of tanks. (9yrs, Macedon).
Briony: Have your parents been doing anything else around your house to prepare for bushfire season? **Nina:** Well dad has a big water tank (10yrs, Warrandyte)	**Maxine**: There's a dam near our house and stuff like that. **Briony:** What's the dam for? **Maxine:** Um, toilet water but if we are in need it's pretty close so we can just grab a bucket and get it (10yrs, Bothwell).
Louis: With my grandma she has a thousand gallon tank for firefighting and 500 gallons that's for drinking (11yrs, Macedon).	**Colin:** We've got a backyard here and then just down here there's a big, a dam, a pretty small dam but it's not got anything in it but we might be turning that into a pool, later on in our years and so you could drain the pool for water
Stuart: Oh, and you should probably have a water tank around **Debbie:** Oh yeah, we'll have a water tank over here (11yrs, Macedon).	**Analyse:** We've got a pool so we could use that water as well (11yrs, Macedon).
Analyse: We've got like emergency water tanks, just for like if we ran out of water or anything and we use that for fires (11yrs, Macedon).	**Ellie:** I have a water tank up the back and we are starting to build a pool (8yrs, Warrandyte).
Tom: We've got this big tank. I think it's about 50,000 gallons and then there's like a littler one which is like 30 or something and that's the fire fighting one and that's like full (11yrs, Macedon).	**Josie:** We need a dam. Draw a dam. **Larry:** I'm drawing a dam and a tank in (9/10yrs, Macedon).
Larry: Who's got water tanks here? **Ralph:** We're getting them soon. My dad says they should be coming soon. **Larry:** We've got 16, 224 litres (12yrs, Warrandyte).	

Some children also described how during the summer months their families kept baths, buckets, and rubbish bins filled with water for firefighting, in case of a fire threat:

Ethan: In summer, we have these big like rubbish bins, like that tall, filled up to the top, I've got one at the end of the house, one out the back, I've got one here, one here, one here, and one here and one here too.

-8yrs, Warrandyte

Lang: We have buckets of water surrounding our house, so we look quite weird!

-9yrs, Warrandyte

Amber: With our house, we always fill the spas and the baths up just in case the fire is actually coming.

-10yrs, Warrandyte

Solomon: Yeah, that's actually another thing my mum does, when my little brothers have a bath, she does like leave the bath water in there for the night until the next day.

-11yrs, Macedon

Lang: My dad fills up the spa and the bath because we don't use them at all. He just fills them up in summer and leaves them like that the whole summer.

-12yrs, Warrandyte

Several children emphasised the importance of ensuring a dedicated water supply before a fire threatens. They explained that during a fire event many other residents would be drawing on the mains water system, thereby reducing water availability:

Jane: Make sure, if you have them, that your tanks are full with water.
Briony: So why would you want to have that water around?
Ellie: The tap might be blocked up if lots of people are using it.
Jane: Yeah, because everyone was using it at the same time.

- 9yrs, Warrandyte

Max: Fill the bath because then you've got like a bathtub full of water because when there's a fire, you'll need water and the water pressure will go down and there won't be any water.
Briony: Why?
Max: Because how many people do you think would be trying to wet their house down? A lot of people would be trying to prepare.

-11yrs, Macedon

In addition to ensuring a dedicated water supply, children also identified the importance of obtaining firefighting equipment. As presented in Table 6.11, types of equipment included hoses, pumps, buckets, mops, and sprinkler systems (in the ground and on the roof). It will be noted that several children's families had already obtained this equipment for their own properties.

Table 6.11: Obtaining firefighting equipment

Hoses	Pumps	Buckets, mops, and water pistols
Hugo: We have our own hose, our own fire hose and we have two tanks (6yrs, Macedon).	**Con:** We've got lots of pumps and we've got gravity pumps (9yrs, Macedon).	**Jay:** I'm doing a bucket of water cos that will be good to keep you safe (6yrs, Warrandyte),
Maya: I would go to Kingston, go to Big W, and get a big hose (7yrs, Huonville).	**Mena:** You could have like, well this is what we have, we have tank which is full of… and well if there's a fire at our house we have this pump (9yrs, Warrandyte).	**Dean:** Get a bucket ready (7yrs, Warrandyte).
Briony: Have you or your families done anything to make your house safer in case there is a bushfire? **Kurt:** They bought a fire hose (7yrs, Macedon)	**Lang:** Well can I tell you something? Well we've got a pool up the back and my dad has this pump from work and he just has to pick it up and chuck it in and there's a hose connected up (9yrs, Warrandyte).	**Ryan:** I'm not gonna go but I'm gonna get like a super… a gun, like I'm gonna get a real gun with water in it (9yrs, Warrandyte).
Lang: I know something, we can put a fire hose in there so then when a fire strikes there can be water. We can put a hose connecting up to the water tank (9yrs, Warrandyte).	**Stuart:** We have a big tank and a fire fighting pump which my dad would use (11yrs, Macedon).	**Brian:** Get heaps and heaps and heaps of buckets (10yrs, Bothwell).
Larry: If you had a water tank you should put a hose near there so you could get it away from the water tank and spray it (8yrs, Macedon).	**Mark:** You could actually put a tank kind of there and a backup tank there and your dam there you could like run a pump from there (11yrs, Huonville).	**Tenae:** You go out to Bunnings and you buy heaps and heaps and heaps of buckets (10yrs, Warrandyte).
Mena: We've got a really proper big hose that mum and dad fight the fire with to put it out (9yrs, Warrandyte).	**Josie:** Okay now let's do a tank next to the house **Larry:** And do a pump. You need a pump Lucas **Josie:** Yeah I've got a pump see.	**Tajiana:** I would probably have like all water and that and something like lots of buckets of water or something (10yrs, Macedon).
Ellie: We could just have heaps of hoses all over our house (10yrs, Warrandyte).	**Stuart:** We have a big tank and a firefighting pump which my dad would use (11yrs, Macedon).	**Billy:** We've got mops and stuff ready in case it gets too close because we know that wet mops are a really good way of putting out bits of fire (12yrs, Macedon).
Dave: We've got like big long hoses in case there is fire there and we like turn the taps on and try putting it out and that (11yrs, Bothwell).	**Lee:** We've got big tanks and they have automatic pump things and you just grab 'em and turn 'em on (11yrs, Bothwell).	**Solomon:** We've got like all the basic stuff, like a metal bucket, a mop and like a spray thing, like a spray bucket (12yrs, Macedon).
Lang: We've got fire hoses connected to some water tanks (12yrs, Warrandyte).	**Philip:** Also we've got a really powerful pump so we can spray water onto the fire (12yrs, Macedon).	

When a fire threatens

The first phase of planning to stay and defend involved a set of activities to be undertaken *when a fire threatens*. The first of these involved the preparation of firefighting resources that had been acquired in the previous phase (e.g. hoses, pumps, and sprinklers), and preparing additional water resources by filling up buckets, baths, and sinks. Extracts describing these activities are presented in Table 6.12.

Table 6.12: Preparing firefighting resources

Setting up firefighting equipment	Filling buckets, baths and sinks
Luke: You'd smell the smoke and then you'd get your hose ready and get everything ready (9yrs, Warrandyte).	**Haidy:** We could get some buckets of water (6yrs, Warrandyte).
Pete: I'm really thinking that our sprinklers should get ready and I'm getting my water pistol ready (9yrs, Warrandyte).	**Carly:** I'd run to the shed and get lots of buckets and then I'd go back to the house and fill them up with water (7yrs, Macedon).
Brian: Get some hoses ready (10yrs, Bothwell).	**Tom:** I'm gonna draw something else in – buckets of water everywhere for water backup (10yrs, Macedon).
Brian: If you wanna keep your house just get packs and packs of sprinklers and line em all up (10yrs, Bothwell).	**Ben:** You could put probably get some water ready. **Briony:** What would you put the water in? **Anna:** Buckets (8/9yrs, Bothwell).
Stuart: If we had a fire fighting pump, get it ready **Analyse:** Yeah and attach it to the tank (11yrs, Macedon).	**Joe:** Get buckets full of water and get the rubbish bins ready if you've got rubbish bins and put water in them (9yrs, Warrandyte).
Stuart: Get the hose ready (Macedon 11 yrs).	**Nina:** You'd fill up the bath **Jemma:** Yeah and the sink **Pam:** Yeah and your kitchen stuff (9/10yrs, Warrandyte).
Philip: We turn on the dam pump on and stuff (12yrs, Macedon).	**Jessie:** I would probably have like all water and that and something like lots of buckets of water or something (10yrs, Macedon).
Lang: Oh yeah, my dad would be very prepared and if there was a fire nearby he'd put the hoses out and I'd help set up the hoses (12yrs, Warrandyte).	**Brian:** Fill up all the buckets. Get heaps and heaps and heaps of buckets (10yrs, Bothwell).
Max: Get some wet sacks **Flynn:** Just a big wet rag (11yrs, Macedon).	**Carly:** Like fill all the bathtubs and everything. **Jessie:** Yeah, that's what I was to say, like get a lot of water prepared. **Josie:** Fill all the bathtubs and all the sinks (10yrs, Macedon).
Briony: How would you start to make sure that the house was going to be protected from the fire? **Philip:** Point all the sprinklers towards the house (12yrs, Macedon).	**Nina:** You'd run and then fill the bath up with cold water and then you'd get all the buckets that are in the bathroom and fill them up and get them ready (10yrs, Warrandyte).
Philip: We get mops and stuff ready in case it gets too close because we know that wet mops are a really good way of putting out bits of fire (12yrs, Macedon)	**Max:** If you've got a bucket put some water in it (11yrs, Macedon).
Will: We've got a little drum thing and it sprays water so dad gets that ready and hooks it onto the Hilux and he gets that ready (9yrs, Bothwell).	

Whilst there was a reasonable degree of consistency in children's approaches to preparing firefighting resources, there was some notable variation in terms of how they intended to use these resources to defend their homes. For example, some children suggested that a bath full of water would provide a convenient way to refill buckets that could then be thrown on the fire:

> Briony: Why do you fill the bath?
> Nina: Because then we can refill the buckets to throw.
>
> -10yrs, Warrandyte

Other children, by contrast, proposed that a bath full of water would provide a barrier that would prevent a fire from spreading into the house, not unlike the firebreaks described in the earlier discussion of mitigating the hazard (see 6.2.1):

> Jade: I have to fill the bath because the fire might burn in through the bathroom and the bath might stop it if it comes from that way.
>
> -9yrs, Macedon

> Lang: My dad fills up the bath and the sinks, because the fire can't touch those areas because they're towards the door and I don't really know why he does it but I think it's harder for fires to go over water.
>
> -12yrs, Warrandyte

Children also suggested five separate strategies aimed at preventing house ignition: wetting the house down; blocking gutters and filling them water; securing doors and windows; and sealing gaps. Extracts demonstrating children's knowledge of these strategies are presented in Table 6.13.

Table 6.13: Activities for preventing house ignition

Wetting down the house	Blocking and filling gutters	Securing doors and windows	Sealing gaps
Gus: Squirt the house because then the house wouldn't burn because there's water (6yrs, Warrandyte).	**Jared:** We put the plugs in the gutters and then we fill the gutter up with water so then the embers go in and then get put out (8yrs, Macedon).	**Amy:** Would you put the thingamabobs [shutters] down? Con: Yeah and that will sort of protect it from embers (9yrs, Macedon).	**Rob:** We'll cover up the chimney so stuff can't come down (8yrs, Macedon).
Tina: I would just get the hose **Gus:** Squirt it. Squirt the house. **Briony:** Why? **Gus:** Cos then the house wouldn't burn…because there's water (6yrs, Warrandyte).	**Lucas:** You could like fill the gutters with water. You can buy those gutter plugs. **Sam:** And then spray the hose on the roof like so it goes into the gutters (9yrs, Macedon).	**Amber:** Close all the windows **Ellie:** And lock all the doors (10yrs, Warrandyte).	**Max:** Oh, and also block up the chimney because if coals get down the chimney, there's gonna be fire inside the house probably (12yrs, Macedon).
Ethan: I would get up and wash out the house and like get water on the house so when the fire comes it doesn't burn the house (8yrs, Warrandyte).		**Flynn:** You could probably lock the windows up, well not lock them just shut them and probably block them up (11yrs, Macedon).	**Ellen:** And you could get the wet towels and put it at the bottom of your door. **Emily:** Yeah when the fire's really close. But wouldn't the fire still come in?
Greg: You can wash the roof, like make it so it's wet and make it harder for it spread (9yrs, Bothwell).	**Mark:** If a bushfires coming towards you, someone could jump up on the roof and like start to wet the gutters and everything (11yrs, Huonville).	**Briony:** Is there anything else you want to do before that fire comes closer? Stuart: Put the window shields down (11yrs, Macedon).	**Ellen:** Yeah but I think then it would take a little bit longer to get into the house (10yrs, Warrandyte).
Maxine: Get heaps of buckets of water and start chucking it all over your house. It would just be like an invisible protection wall (10yrs. Bothwell).	**Max:** When it's actually coming, you can just get a hose and fill the spouts up with the hose. Because then if like the heat like is burning wood and makes this fall down [tree] there will be some water in there to stop the fire (11yrs, Macedon).	**Steph:** You get tape or something and you put it on your windows before the fire to stop them smashing. I think you put it in streaks (11yrs, Huonville).	**Solomon:** Put wet rags under the door and then you'd just look around for cracks everywhere like any sort of hole or crack and just block it (11yrs, Macedon).
Steph: You could hose down your house and then it wouldn't get burnt (11yrs, Huonville).		**Philip:** Put two bits of sticky tape across the windows (12yrs, Macedon).	**Jared:** You put wet towels under the door (12yrs, Macedon).

For the majority of children these strategies were aimed at preventing house ignition via a direct chain of flame contact:

> Ethan: You could like get the house all wet so if like a bit of like flame or comes over and so if it hit a plant or a tree the tree might fall down and it'll hit the house so when the flame comes it'll put out like half of the flames.
>
> - 8yrs, Warrandyte

> Max: When it's actually coming, you can just get a hose and fill the spouts up with the hose because then if like the heat like is burning wood and makes this [tree] fall down there will be some water in there to stop the fire.
>
> - 10yrs, Macedon

For several children, however, these strategies were aimed at preventing house ignition via embers:

> Sam: We put the plug in the gutters so that they'll all run down the pipe and into the tank, we put the plugs in the gutters and then we fill the gutter up with water so then the embers go in and then the embers go in and then get put out.
>
> -9yrs, Macedon

> Solomon: Block all the vents because if something did get in there, it could probably come inside the house, the coals could.
>
> - 11yrs, Macedon

A final activity to be undertaken *when a fire threatens* involved ensuring the protection of valuables and pets. Children suggested a variety of strategies for keeping valuables and pets safe while they defended the property. Some children planned to put valuables and pets in a safe location inside the house:

> Mika: You have to be really careful with your pets because if the fire is really close to your house and your pets are outside in the garden and your garden catches on fire then your cat might die or your pets. So, you have to make sure your cat or your pets stay inside.
>
> -10yrs, Macedon

> Larry: I'd be getting anything that's valuable and putting it in a place that's sort of fire-safe pretty much. Like we've got this room, and it's only got like one small window up higher.
>
> -12yrs, Macedon

Other children planned to set their animals free, so that they could run away:

> Pierre: I would catch the cats and put them over the fence to my next door neighbours with about 50 acres, so that they can run off and have good life.
>
> -7yrs, Warrandyte

> Colin: My first priority would be my chickens because just back here, there's a chook pen and that's got a wooden house, it's got wooden posts and everything. So, I'd let the chickens out and I'd just let them go.
>
> - 11yrs, Huonville

Some children also suggested packing pets and valuables into the car in case they change their minds about staying to defend or they were instructed to evacuate by the fire service:

> Larry: Pack your car ready. Get your stuff ready and stick it in the car, just in case there's something that happens.
> Josie: Just in case you wanna go.
> Larry: Just in case the fire comes and you've changed your mind and everybody escapes.
> Josie: Or it gets too close.
>
> -8yrs, Macedon

> Kyla: Pack your bags just in case the fire brigade tells you to go, because they do that sometimes if it comes to close.
>
> -10yrs, Warrandyte

> Briony: Is there anything else you would do once you got that warning?
> Mark: Pack some valuable things and pets put them in the car to be prepared. So that if it does come so close that you can't help it you can just kind of... [gestures driving away].
>
> - 11yrs, Huonville

It was not uncommon for the children in this study to incorporate last minute evacuations into their plans for staying to defend. As will be demonstrated in the following discussion, for many children, the aim of staying to defend was to suppress the fire front before it reached the house and if this proved unsuccessful, they would evacuate.

It is important to note that all of the activities outlined above were generally undertaken in response to an early warning, and the process of identifying triggers that was manifest in children's plans to evacuate did not emerge in this context. Children who planned to stay and defend did not engage in the same processes of interpreting the threat as the children who planned to evacuate. Rather, plans to defend would be initiated upon receiving a warning, regardless of threat proximity.

When a fire arrives

The third phase of planning to stay and defend involved identifying what to do *when fire arrives* on the property. Children articulated two main modes of response for when a fire arrives. The first was a highly sophisticated mode that was completely aligned with the official position taken by the various Australian fire agencies (AFAC, 2010). The second was a less sophisticated, misconceived mode of response that would lead directly to high levels of hazard exposure and endangerment. Each approach is deserving of its own detailed discussion and these are presented below.

Children adopting the more sophisticated mode of response outlined a series of activities and responses that closely resembled those advocated by AFAC (2010) and the various Australian fire agencies (CFA, 2010; TasFire, 2010; FESA, 2010; NSWFB, 2010) (see 2.6.3). The small number of children advocating this mode (n= 5 in N=131) planned to extinguish spot fires around the house until

the fire front arrived, at which point they would seek refuge inside the house and wait for the fire front to pass through:

> Lucas: If it's like around the house then you start defending. You just start putting out the embers that fall near the house and like if there's any spot fires you put them out.
> Briony: What would you do when the main fire was from here to playground away?
> Lucas: You'd like go inside and you'd just sort of wait until the fire front has passed.
>
> -9yrs, Macedon

> Philip: Well, we would use the mops to try and put out the little flames and if we had really big flames we'd see if the mops could do anything or else we'd just chuck water on or we'd use the hose with pump from the dam or the other tank.
> Briony: Okay, but what if it keeps on coming?
> Philip: Okay, it keeps on coming…We'd probably run inside until the fire has passed us.
>
> 12yrs, Macedon

The children who advocated this mode of response tended to have an awareness of the dangers posed by radiant heat, in addition to those posed by smoke and flames. As reflected in the following extracts, seeking refuge inside the house was perceived as the most effective way of preventing exposure to these hazards and their associated impacts:

> Briony: Why would you go inside?
> Lucas: Because the radiant heat will...like if you're still trying to put out the spot fires and everything, the heat will get to you.
>
> -9yrs, Macedon

> Briony: Why would you go inside?
> Max: Because you're more likely to burn outside your house than inside. You've got more of a chance...you've got less chance of burning there.
>
> -11yrs, Macedon

These children also had high expectations that the adjustments they had made on their properties as part of mitigating the hazard would ensure that their homes would withstand the passing fire front:

> Phillip: Because we've had a bunch of guys come in with chainsaws and make sure if there is a fire the trees won't blow onto us. There's a lot of wood in our house but we've got one brick part that would probably save us, because the outside of our house is mainly brick and we've got metal on the roof.
>
> -11yrs, Macedon

Once they had retreated inside the house, these children planned to defend it from the inside, patrolling rooms and rooves for spot fires and extinguishing them before they got out of control:

> Jared: We'll if it's around and it hasn't actually gone into the house, we'll be running around the house looking for spot fires that could get into the roof and Dad will be in the roof looking for spot fires.
>
> -12yrs, Warrandyte

Philip: Well we'll get all the water from the bath in buckets and stuff and then if it gets too close we can get our mops and try and put it out.

Briony: What would you do if the house did catch on fire?

Philip: Definitely get our mops and put it out. We'd get the water from the bath and put it on it.

-11yrs, Macedon

Then, after the fire had passed they would return outside to patrol for embers and spot fires:

Max: If you've got a bucket, put some water in it and if you've got a mop, wet the mop and look around inside the house and then look under the house because if the fire has passed and coals or something have been able to roll down there, maybe the coals would just be sitting there burning and that could start another fire. So yeah, look outside and if the fire wasn't really there you would go around putting the small fires out. You search for even just a little bit of fire on the ground and you put it out.

-11yrs, Macedon

Philip: If we do have a fire and the fire goes passed us then we have to get under the house and make sure there are no embers under the house, after the fire's passed.

-12yrs, Macedon

Although these children did not expect their homes to catch on fire, they did articulate contingency plans for if a fire did take hold. These plans generally involved taking shelter in an alternate refuge nearby:

Lucas: I have a backup plan, if your house starts burning - and this might not happen - but like if you've got like an island in the middle of your dam you could go to your island...Because it's going to be really hot and it will be really low so you could almost walk there or you could swim, it's not going to be very far.

-9yrs, Macedon

Philip: If it did get actually in the house and towards us then we'd have to get out of the house. We've got a garage that's brick and metals so we'd probably get into that and we can still control the pump and the dam from there.

-12yrs, Macedon

This sophisticated mode of response contrasted sharply with the other less sophisticated mode articulated by the majority of children in this study. Unlike their counterparts, who planned to extinguish embers and spot fires until the fire front arrived, these children planned to fight the fire front itself. The image emerging from the data was one of the children trying to extinguish the fire front before it reached the house and if this could not be achieved, if the fire front itself could not be stopped, a last minute evacuation would be initiated. This image is clearly depicted in the following extracts:

Pierre: I'll take my bucket of water to the fence and I'll throw it at the fire and I'll try to die it down before it gets to the house so I can save the house.

Briony: Okay, now draw the fire coming closer…

Pierre: It's burning down all my grass on top of my massive tree but I've still got a bucket and I'm still trying to die it down but if I can't, if I fail, I'll run. I would go "Aaaaagggghhh" and that's me running away from the fire because it's unstoppable.

-7yrs, Warrandyte

Con: Well, because our house is sort of protected we'd try and start to put out this fire [pointing the main fire front in his drawing]. Yeah, the main fire because like we'll have spray packs on and they'll be full of water and because I sort of know how to drive a little car that we have and it's got a big water tank on there, so we can use that as well to try and put that fire out.

Briony: What if the fire kept coming?

Con: If it gets really, really, close you have to evacuate.

-9yrs, Macedon

Isla: Well, my dad's probably going to have a fire hose and he'll try and put out the fire and we would probably have buckets all around the house and we would try to put the fire out and if it got really bad we'd go to our cousin's house.

Briony: What would really bad look like?

Isla: That far away from our house [indicates a distance of approximately one meter with her arms].

-10yrs, Warrandyte

It is important to note that these children did not plan to evacuate when a fire took hold of the house, as did children adopting the more sophisticated mode of response: rather, they planned to evacuate as soon as it became clear that the fire front was going to reach the house. These children perceived the impacts of the fire front as catastrophic - they were certain that if the fire front reached the house would burn down. Hence, taking refuge in the house as the fire passed over was not a viable option:

Briony: What should you do when the fire comes very close to the door? Should you go inside?

Penny: No! Because the fire might reach into your house and then there's no way of getting out because if you're standing here and there's fire surrounding you and it's really big, how are you gonna jump over it? You're gonna be trapped. You're just gonna be trapped.

-5yrs, Bothwell

Jessie: I wouldn't go inside because if it was gonna come really close, some houses really catch on fire a lot and it would go inside and try and catch on something else and burn up the whole house. I wouldn't go so close. I wouldn't go in the house because it might catch onto the house and then it will be very danger to us.

-9yrs, Macedon

Amy: If you were thinking about committing suicide then you'd just stay in the house and die but most probably, you'd evacuate.

-10yrs, Macedon

It is understandable why some children might evacuate from a wooden house, because this type of construction was invariably perceived as a fire trap:

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Briony: Why don't you go into the house?
Pierre: Because my house is made of wood and it would just burn the house down and I'll die.

<div align="right">-7yrs, Warrandyte</div>

Less clear is why children would plan to evacuate from houses that fulfilled all of their criteria for a 'fireproof house'. For example, in an exercise that involved preparing the house in Figure 4.1 for bushfire season, Anna cleared vegetation, fitted metal shutters to windows, installed sprinkler systems on the roof, put a gravel driveway around the perimeter of the house, and set up firefighting tanks, hoses, and pumps. She then decided that because the house had been adequately prepared, staying to defend was a reasonable choice. Yet, when asked what she would do when the fire arrived, the following exchange transpired:

Ana: Well, I'd probably drive that way. I would make sure that everything was already packed into the car and if it came too close and and the fire brigade weren't there and I couldn't bare the flames or anything, I'd probably like just leave.
Briony: Why wouldn't you go into the house?
Ana: Because it could like burn down the house while you're still in it and you might not have a way of coming out.
Briony: Okay, so even though you did all that stuff to the house with the metal shutters and the sprinklers and the clearing up and everything, you're still really worried that the house wouldn't survive?
Ana: Well, it might not because if it was coming around then you wouldn't be able to get out so you wouldn't want to worry about your house very much: you just have to worry about yourself.

<div align="right">-11yrs, Macedon</div>

Further inquiry revealed that some children had very little confidence in the efficacy of the various hazard mitigation and preparedness measures they had suggested as part of reducing bushfire risk. As the following extract demonstrates, for some children, it would not matter how well prepared the house was, if a fire front came too close, it would burn down:

Briony: Okay, so you did a lot of things to make the house safer. You made it out of brick, put on window shutters and put lots and lots of sprinklers. You cut down all the tress and moved the wood away. What will happen if a bushfire comes right up near the house?
Larry: It's gonna burn.
Con: Yeah, it's probably still gonna burn. If it gets really close they have to hop in their car and go wheeeeee and drive away.
Briony: But why wouldn't you stay if you've done all that work to get the house ready for bushfire season?
Con: If it gets too close you have to leave.
Larry: Yeah, if it gets too close.
Briony: So what you're telling me is that if the fire comes up close…
Con: Evacuate.
Briony: Nothing is going to save the house?
Larry: No, absolutely not.

<div align="right">-9/10yrs, Macedon</div>

This discussion has demonstrated that although children had substantial knowledge of how to prepare to stay and defend (e.g. ensuring a dedicated water supply, obtaining specialist fire fighting

equipment, wetting down the house, filling gutters, closing up doors and windows), there was considerable variation in their knowledge of how to respond when a fire arrives. Children's perspectives on how to respond were clearly influenced by their knowledge of the fire environment, particularly in relation to radiant heat and the dangers of late evacuation. Much of the variation in children's perspectives on how to respond when a fire arrives was also explained by their previous involvement in discussions concerning their family's plan to stay and defend. This will be discussed in detail in the following chapter on contextual and modifying conditions.

6.3.3.3   Sheltering in place

Like staying to defend, *sheltering in place* involved remaining on the property. However, unlike staying to defend, which involved a range of activities that would be undertaken at various stages of a fire event, sheltering in place involved taking refuge in what was perceived to be a safe location and waiting passively for the fire to pass over. For some children, sheltering in place was a first choice among the three emergency response options. These children tended to have places on their properties or somewhere nearby that they believed would provide adequate protection from an approaching bushfire. For other children, sheltering in place constituted a contingency plan to be enacted in cases where the barriers to evacuation were insurmountable, or attempts to actively defend had failed. The types of places that children identified as potential shelters varied substantially. Nevertheless, they all shared the common characteristic of being able to provide adequate personal protection from death or injury as a fire front passed over. The types of places identified by the children fell into the three broad categories of *buildings, water,* and *underground.* Children's perspectives on the protective characteristics of each type of shelter will now be discussed.

Buildings

Children identified a variety of *buildings* that would be able to provide a safe shelter*,* including houses, out buildings (e.g. sheds, garages), and commercial or public buildings (e.g. shops, schools). For children to perceive a building as a safe place in which to shelter, they had to be certain that it would fully withstand the impacts of a fire front. As will be recalled from Chapter 5, there was substantial variation in children's knowledge of the type of building construction and design that would meet this inviolable standard. The same level of variation was also manifest in children's choices of safe shelters. Some children perceived brick houses with metal rooves and metal shutters as 'fireproof' which meant that they would provide a safe shelter during the passage of a fire front:

> Luke: You could stay in my house because they have the window shutters. You press the button to put the shutters down and then stay in the house.
> Briony: Okay, so now the fire is going to go over the house?
> Cam: I'm not worried because it's made of brick.
> Luke: And well, with mine, it's already got metal in the roof.

-7yrs, Macedon

Yet, as has already been demonstrated in the previous discussion of staying to defend, there were other children who perceived houses identical to the one described above as being susceptible to bushfire impacts. Thus, perceiving a house as a safe place in which to shelter, was a highly variable and subjective process.

When children did perceive a house as a safe place in which to shelter, they often expressed preferences for a particular location inside the house. These locations were expected to provide additional protection in the event that the house did catch alight. Several children, for example, suggested that they would hide in, or under, a non-flammable piece of furniture such as a metal bed or a woollen couch:

> Anna: I would probably get underneath my bed.
> Briony: Why would that be a safe place?
> Anna: Because my bed's made of steel and maybe the fire wouldn't get to it that much.
> - 8yrs, Bothwell

> Sila: Yeah if I stayed behind, I'd go to a place that wasn't flammable, and I'd stay there. Like in the playroom we have this couch - it's one of our couches that are not flammable and it's all woolly - and we go there because there's a fold out bed under it and so we just lift it up and fall underneath there so we'd be safe there.
> - 9yrs, Macedon

Other children expressed a preference for non-flammable floor surfaces such as tiles:

> Jade: We'd go into the hall because we've got tiles all along the hall and they're really, really cold and they would take probably a while to burn.
> -8yrs, Macedon

> Pam: We would probably go in like in a tiled place because it's...yeah... and I wouldn't go near my lounge room because it's like floorboards.
> -9yrs, Warrandyte

Several children suggested that they would seek shelter in the part of the house farthest from the approaching fire. For example, Cate suggested that if she couldn't leave, she would shelter in the TV room as far from the approaching fire as possible:

> Briony: Where would you find safety do you think? Where would be the safest place to be if you couldn't leave?
> Cate: If there's a fire here and the house is here just go to the furthest room away from the fire on the house, like ours is the study and TV room.
> -9yrs, Warrandyte

Other children suggested sheltering on the roof. Again, the rationale underlying this choice was that the roof would burn last:

Haidy: You could jump onto the roof bcause the house wouldn't get burned on the roof first.
Briony: Why wouldn't it burn the roof first?
Haidy: Because the fire is pointing to that and not the roof.
                                                                                              -6yrs, Warrandyte

Anna: Go on your roof.
Briony: Why do you think being on the roof would be safe Anna?
Anna: Because the fire might not get to the roof first.
                                                                                              -8yrs, Bothwell

Some children suggested sheltering *in* the roof for the same reason:

Craig: I know what you can do! You will go in the house and hide in the roof.
Lina: Good idea. I'll hide in the roof too.
Cate: I'll hide in the roof too.
Briony: Why is the roof a safe place?
Cate: Well, because the fire normally goes to like the house first and it doesn't normally, well it does, but it does the roof like later.
                                                                                              -9yrs, Warrandyte

Several children also suggested that their garden sheds would provide a safe shelter. For example, if faced with a situation in which they could not evacuate, these children in Huonville resolved that they would shelter in their sheds which, being constructed of metal, were considered fireproof:

Dee: I'd go in the tool shed because it's fireproof.
Briony: Why is it fireproof?
Dee: I don't know, because it's made out of fireproof…
Steph: We've got a metal shed.
Dee: Yes, that's it!
Tamsen: We would go, some of the chook shed is metal and it can't really catch on fire.
Steph: I'd go to the tool shed as well cos ours is like that [points to metal shed out the window].
                                                                                              - 11yrs, Huonville

School bushfire shelters were also commonly identified as safe places in which to shelter as a bushfire passed over. Children at Macedon were confident that the school bushfire refuge would provide a safe shelter because it had been installed with metal shutters and roof top sprinkler systems, which would protect it from hazard impacts. The children's confidence in the safety of the Macedon Primary School bushfire refuge is most aptly portrayed in the following extract:

Briony:	If your teachers gave you the job of taking care of some of the Preps who were really scared, if they said like "Okay, can you guys look after these kids?" what would you tell those preps to make them feel safe?
Jade:	I would tell them all the safety things.
Jade:	In the school, like the sprinklers and the things that come down.
Tom:	Yeah, the window guards.
Sila:	I'd say like there's no need to panic because like the schools been prepared and just like calm them down by like by reading them a happy story.

-9/10yrs, Macedon

Children in Warrandyte expressed the same level of confidence in their school's bushfire refuge. This building - commonly referred to as the 'Stonehouse'- is a 150 year old bluestone structure sited on a two acre concrete expanse. Like the refuge at Macedon Primary School, it has also has been fitted with metal shutters and sprinkler systems. Although some children did mention the metal shutters and sprinklers when describing the safety features of this building, the heavy stone construction was the primary design feature cited by the children when discussing its function as a bushfire shelter:

Julia:	The stone building is actually the safest place in the whole school because it's made out of brick and stones and it's very, very, very old.

- 5yrs, Warrandyte

Joe:	The safest place in a bushfire would be…
Pete:	The Stonehouse, because the stone could be like burnt a little bit but it wouldn't be burnt up or on fire.
Sean:	No, it's because it's really thick so the fire can't get inside because the stones are really thick.

-9yrs, Warrandyte

Several children in Warrandyte were also aware that the Stonehouse had survived previous bushfires, which had elevated it to 'invincible' status:

Lang:	If it [a bushfire] was coming from the State Park we would run into the Stonehouse.
Scout:	Because it's stone and there's no wood.
Scout:	And it's stayed there for a hundred and forty something years.
Briony:	Has a bushfire been over it before?
Lang:	Yeah. It's invincible!

-12yrs, Warrandyte

Some children in Macedon were also aware of what buildings had survived exposure to the Ash Wednesday fires and identified these as safe shelters. Riley, for example, had heard that the Macedon Family Hotel had provided safe shelter to local residents during the Ash Wednesday fire:

Riley:	I'd go to the Macedon Hotel because on Ash Wednesday everybody went the hotel and it didn't get burnt down.

-8yrs, Macedon

Thus, in identifying safe locations children also looked for evidence that the building had survived exposure to bushfires in the past.

Water

Children with swimming pools on their properties commonly identified these as safe places in which to shelter as a fire passed over. The general rationale underlying this strategy was that the water would prevent the fire from reaching them:

> Haidy: I'm going to run to my pool and I'm gonna jump in it, because then I'm not going to get burnt for ages.
> Briony: Why not?
> Haidy: Because the fire won't go there because it will burn down [Go out].
>
> -6yrs, Warrandyte

> Sila: I think that jumping in the pool would be a good idea because the water can sometimes put out a fire.
>
> -9yrs, Macedon

> Amber: I think our next door neighbours with a pool, I think their evacuation plan is to like go into the pool yeah so they don't get hurt…The pool would help cos it's all water and water puts out fire so you'd be safe in the pool.
>
> - 10yrs, Warrandyte

Similarly, children with dams on their properties identified these as safe places in which to shelter:

> Scott: [I'd] go in my dam because the fire, when it goes on my house and trees, it misses the dam because when the fire goes over it, it goes out straight away because it's water.
>
> -6yrs, Macedon

> Kurt: If you have a little dam like right in front of your house and then you can dive in…because it [the fire] wouldn't get in.
>
> -7yrs, Macedon

> Jessie: If it's like very, very close, you could go in the dam cos like the fire wouldn't go into that.
>
> - 9yrs, Macedon

The same logic underpinned children's plans to shelter in the bath. As the following extracts illustrate, several children planned to shelter in the bath because the water would prevent the bath from burning:

> Melek: My mum said if there was a bushfire at our house and it caught onto the house well mum said we would hide in the spa in mum and dad's room cos that can't burn that easily.
>
> - 7yrs, Macedon

> Ismail: Run to the bath and just start and turn on the water and sit in it, so then if the fire comes from that way the water would kind of put it out.
>
> -7yrs, Macedon

> Steph: Get in the bath because if the fire came in the house, it wouldn't be able to get you because it wouldn't be able to go in the water.
>
> -11yrs, Huonville

The logic underlying children's plans to shelter in swimming pools, dams and baths serves to highlight the prominence of direct flame contact in their conceptualisations of bushfire hazards. As the extracts presented above illustrate, the primary reason given for sheltering in pools, dams or bathtubs was that 'the fire' would not be able to enter. Little consideration was given to smoke, ember attack, or radiant heat and the degree to which pools, dams or baths would provide protection from these hazards.

There were several children, however, who did not believe that dams, pools or baths would provide adequate protection because the water would boil:

> Brian: Don't jump in the dam because the water cos it will…it's like a kettle. It will boil you.
> -10yrs, Bothwell

> Dell: I wouldn't jump in the pool, never jump in the pool.
> Briony: Why not?
> Dell: Because the outside is plastic.
> Greg: Yeah, it's plastic and then it melts.
> Dell: And then the water will get really hot.
> Lee: And it will burn you.
> -10yrs, Warrandyte

> Ford: Jump in the pool.
> Larry: But what would you do in the pool?
> Ralph: You'd hide.
> Larry: In the pool?
> Ford: Yeah like this [simulates blocking his nose and holding his breath]
> Larry: But if you stay in the pool, the pool could boil and you'd get steam fried Ford.
> - 11/12yrs, Warrandyte

Importantly, children's reasons for *not* sheltering in the pool were unrelated to the direct effects of radiant heat on the body or smoke inhalation.

Underground

A number of children reported that in the event of a fire, their families' would shelter in a cellar beneath the house. Liz and Tom both reported their family's plan was to go into the cellar, which they believed would provide a safe shelter as the fire passed over the property:

> Tom: If there was a fire…Well if the smoke detectors or anything go off or we see the fire we would go into our cellar and we will put a wet rug over us and we'll call the fire brigade and everything.
> -9yrs, Macedon

Liz:	I probably wouldn't leave the house.
Briony:	Why not?
Liz:	Well I would see if… we've got this space that's made out of… It's sort of like underground sort of so if there's a really big fire we go in there
Briony:	How do you get down there?
Liz:	There's stairs and there's not much down there.
Briony:	Is it like cellar?
Liz:	Yeah, it's sort of under the ground.

-10yrs, Warrandyte

Other children, for whom this was not the family plan, also identified cellars as providing a safe shelter:

| Jade: | You could make a little underground base so you could get under there like Dorothy had if there was a fire there. |

-7yrs, Warrandyte

| Lucas: | If you've got like a cellar or an underground bridge [tunnel] you could go in there. |

- 9yrs, Macedon

| Cate: | You could make a little room, and this isn't what we do, but you could make a little room, but like with bricks and under the ground. |

-9yrs, Warrrandyte

| Maxine: | If you had a cellar, like underground, I'd get in the cellar. |

-10yrs, Bothwell

| Helen: | If you had an underground cabin you could go in there. |
| Emma: | Like in Cooperpedy. |

- 11yrs, Huonville

Children perceived cellars as safe shelters for a variety of reasons, most of them to do with the non-flammability nature of the construction materials:

| Briony: | Why do you go into the cellar? |
| Tom: | Well, because the cellar's just cement and everything and the roof and everything and the doors wood but its steel and a bit cement on the inside of it so it won't burn. |

-9yrs, Macedon

| Briony: | Why would your cellar be safe? |
| Liz: | There's just dirt around in it [so] it doesn't really catch on fire. |

-9yrs, Warrandyte

Briony:	Why would that be a good idea?
Maxine:	Well, the cellar could be cement and…
Dave:	Fire won't burn cement.

-10yrs, Bothwell

A number of children also suggested digging a hole to shelter in. As they explained, if they could conceal themselves in a hole, the fire would burn over the top, whilst they remained safe beneath the dirt:

Briony:	Is there any way you could survive?
Ali:	Yes, you could dig a hole all around ya.
Briony:	Why do you think it would be good to dig a hole?
May:	Because the fire might be here and you're here….
Ali:	And the fire would just go straight over the top.

- 7/8yrs, Bothwell

Will:	Well, I would try to…. Because I put all this water all over the grass so it will be a lot easier to dig so I will dig down but I wouldn't dig up and then I would cover the top up with bits of wood or not wood but concrete or something solid and I would dig and I would just make a little room and then like if you hear it and then when you can't hear anything anymore you'd go back up.

-8yrs, Macedon

Dave:	[I'd] get a shovel and start digging a massive big hole and then hop in it and bury myself.
Briony:	Why would that be a good thing to do?
Dave:	Because the fire would only burn across the top of it and the dirt might get a bit hot but it'd only burn across the top of the dirt.

- 11yrs, Bothwell

Thus, children's preferences for sheltering underground were largely underpinned by the view that cement and dirt are non-flammable and therefore, would be impenetrable to a passing front. It might also be assumed that the lack of windows and other gaps in underground shelters also contributed their status as safe places in which to take refuge.

6.4 Concluding remarks

The extensive analysis presented in this chapter has highlighted how children's strategies for building resilience were heavily influenced by their knowledge of the biophysical process of bushfire and how it interacts with conditions of exposure to create hazard impacts. It has also drawn attention to the physical, social, and economic constraints that children believed would impede the implementation of resilience building strategies. The chapter has also documented the substantial variation in children's knowledge and perspectives, particularly in the realm of making an emergency plan. Documenting this variation in all of its complexity has served to illustrate the highly variable nature of children's knowledge and it raises important questions as to what can account for this variability. An in-depth analysis of children's social contexts was able to shed significant light on this issue. This analysis is the focus of the following chapter.

CHAPTER 7: CONTEXTUAL AND MODIFYING CONDITIONS

Regularities or patterns that can contribute to prediction and explanation

may be found not in the phenomenon itself but in its context.

- Hinds, Chaves & Cypress (1992, p.72)

7.1   Introduction

In grounded theory methodology, analyses of the contextual and modifying conditions that influence the experience of a phenomenon is considered an integral part of theory development (Glaser &Strauss, 1967; Strauss & Corbin, 2008; Charmaz, 2006). Glaser (1978, p.17) refers to context as 'the ambience of the setting in which a phenomenon is found and the environment in which behaviour occurs'. Strauss and Corbin (1990, p.96) have defined it more specifically as 'the particular set of conditions within which action/interactional strategies are taken'. Despite these varied interpretations of the term, there is consensus in the grounded theory literature that a phenomenon cannot be understood apart from the context in which it occurs. It might also be recalled from Chapter 3, that according to Urie Bronfenbrenner's (1976) ecology of human development, an understanding of context is integral to the development of robust and rigorous theory. His view on the matter is worth restating again in full:

> Understanding human development demands going beyond the direct observation of behaviour on the part of one or two persons in the same place: it requires examination of multiperson systems of interaction not limited to a single setting and must take into account aspects of the environment beyond the immediate situation containing the subject (Bronfenbrenner, 1976, p.2).

Thus, in keeping with the methodological tenets of grounded theory (Glasser & Strauss, 1967; Strauss & Corbin, 2008; Charmaz, 2006), the assumptions pertaining to the ecology of human development (Bronfenbrenner, 1976), and the broader social science literature (Hyndes, Chaves & Cypress, 1992), a detailed analysis of contextual and modifying conditions was undertaken. The aim of this analysis was to extrapolate the influence of the external socio-cultural and physical environment on children's knowledge of bushfire hazards.

The data pertaining to context came from a number of different sources. The first major source was the focus group interview itself. In these interviews children were routinely asked to describe 'how they know what they know' about bushfire hazards. However, this was found to be a rather ineffective means by which to gather data about context. Whilst some children were able to account for the origins of their knowledge and understanding, most had difficulty in doing so: *"I can't remember"* (11yrs, Macedon), *"I don't know"* (8yrs, Bothwell) and *"It's just basic commonsense"* (11yrs,

Macedon), were just some of the responses to my epistemological enquiries. In this study, it was much more common for information pertaining to the origins of children's knowledge to emerge *in situ,* as part of the general flow of conversation. From a methodological standpoint, this is an important finding: it demonstrates that children do not always report the origins of their hazards knowledge on demand, but reveal them as part of ordinary discourse. Thus, using questionnaires to ask children epistemological questions about the origins of their knowledge, as is standard practice in child research conducted from the hazards perspective (see 2.4.3), is unlikely to provide an accurate or complete account of how children 'know what they know'.

Important information about context was also obtained from interviews with parents. Parents provided a rich source of data on the nature of bushfire-related discussions within their families, and the nature of their child's involvement in mitigation and preparedness activities. In doing so, they provided information on the contextual factors within the microsystem that both facilitate and constrain the development of children's knowledge of bushfire hazards. These interviews also provided essential data on the bidirectional, reciprocal nature of the parent-child relationship, with analyses highlighting the influential role that children play in the promotion of family safety. Furthermore, interviews with parents also provided important data on how schools and families interact within the mesosystem to promote to adoption of protective behaviours (Bronfenbrenner, 1976; see 3.3.2).

Taken together, data from the focus group interviews with children and the individual interviews with parents indicated that children's knowledge of bushfire risk was strongly influenced by four major contextual and modifying conditions: *direct experience with fire; the school; the family;* and *the research process.* As can be been observed in Figure 7.1 below, each of these conditions were comprised of several specific contextual influences and processes.

The School
- School-based fire safety programs
- Curriculum-based bushfire education
- Bushfire mitigation and preparedness in schools

The Family
- Children's observations of family mitigation and preparedness
- Children's active involvement in family mitigation and preparedness
- Children's influence on parents

Direct Experience with Fire
- Contained fires
- Uncontained fires

The Research Process
- Influence of the researcher
- Influence of peers

Figure 7.1: Contextual and modifying conditions

These conditions influenced how children constructed the social psychological problem of *Perceiving Vulnerability* as well as the two stage process of *Building Resilience*. The role of each of these contextual conditions in the construction of children's knowledge of bushfire hazards will now be discussed.

7.2 Direct experience with fire

The first contextual condition that was found to influence children's knowledge of bushfire hazards was related to their direct experience with fire. Even the youngest participants had had some direct experience with the biophysical phenomenon of fire. The kinds of fires with which children had had direct experience were conceptualised as *contained fires* and *uncontained fires*.

7.2.1 Contained fires

For most children, direct experience with fire had been afforded by the purposeful and recreational use of contained fires on their properties and inside their houses, typically in the form of burn-offs, bonfires, camp fires, and open fires for heating the home. Experience with fire in these contexts had enhanced children's knowledge of fire by providing opportunities to observe the flammability of different types of matter, such as metal, wood, and stone:

Miley: Metal doesn't burn. When we were having this little camp fire or something to burn down the blackberries, mum used, well, plastic burns but she used a metal rake.
Briony: Because that doesn't burn?

Marian: Yeah.

Jade: The tree would burn easily because its wood and wood burns easily, like when you're making a fire inside to keep warm it could burn easily, so you have to keep putting wood in and wood in.

Joe: You know how if you have a bonfire, if you put a rock in it spits it out [won't ignite it] because it doesn't like hard things, like rocks.

Nina: When you gather sticks up when you burn off and then you put the match on and since its really hot it just goes and then it goes all red and then if you put more sticks on it will go bigger so since if the house was made of wood, it makes the fire much bigger because it has more stuff to light on fire.

Direct experience with the purposeful and recreational use of contained fires had also helped children to understand the role of moisture content in fuel flammability:

Penny: The leaves could burn easily because they're dry. Because when we had a fire, well we were just roasting sausages and we had this pit because we were doing it to the CFA rules for our BBQ and I was putting leaves on, to keep the fire starting.

Larry: If there was a fire and there was heaps of fuel and it was dry, the fire might spread.
Graham: Yeah, because we have an open fire place and if we put wet wood in, it doesn't really burn.
Mary: Yeah, it just makes this sizzle sound.
Larry: It does eventually dry out though.
Mary: Yeah, eventually.
Graham: Yeah, but at the start when it's really wet, it won't burn properly.

Direct experience with larger bonfires had also provided children with some direct experience of radiant heat. For example, Phillip described how a large bonfire at school camp had emitted so heat much heat that it was difficult to stand near it:

Phillip: We had this huge bonfire on camp and even if you were ten metres you were boiling because we had so much wood on there. So, the only way to get close and put wood on there was to cover your face in water and then run and chuck stuff onto it.

Experience with bonfires at home had also provided children with an understanding of the immense heat that emanates from a large fire:

Liz:	And sometimes like where we have bonfires sometimes there's this clear stuff and it's like really tough and stuff and like it hurts your eyes
Briony:	What do you think that is?
Liz:	[*Unsure*]
Briony:	Is it the stuff that makes everything look like it's wobbly?
Erin:	Yeah, it's the heat. It looks really weird

-9yrs, Warrandyte

Thus, even if they lacked the vocabulary to identify it as such, direct experience with bonfires had provided children with an understanding of the aversive impacts of radiant heat.

7.2.2   Uncontained fires

A small number of children had also had direct experiences with uncontained or uncontrolled fires and this also served to inform children's understanding of the flammability of different kinds of matter. For example, Matthew explained how a fire had burned through his in his back yard, due to a heavy fuel load comprised of long dry grass and other dead, dry, vegetation:

Mark:	At our old place we had paddocks there, a paddock there and a paddock there and it was like all kind of dead grass kind of stuff when we lived there. There was this big section here which was never mowed, and it's kind of really long and just like old dead kind of things that could catch alight, and then there was like all trees and everything, and like there was a fire which come through once before and like all of that was burning up.

-11yrs, Huonville

Direct experience with larger scale uncontrolled fires also served to inform children's knowledge of fire spread. For example, Sophie was one of the few children in the study to exhibit knowledge of ignition via embers or sparks. As the following extract illustrates this knowledge was derived from a recent experience in which a bushfire had jumped the irrigation channel and impacted directly on her property. Whilst Sophie hadn't directly observed the fire jumping the channel, hearing about it had provided her with crucial evidence that is possible:

Maxine:	Yep, we've had a humungous fire on our farm but we didn't really go to it. It pretty much burnt most of our property. It was humungous. We were burning off stubble burning and we checked but we didn't see it and there was something still smoking and it jumped the barrier and there was heaps of dry straw and stuff around it. So it just caught alight and spread.
Briony:	How out of control did it get?
Maxine:	Oh, very, very out of control. We needed Bothwell fire brigade, Midsummer, Kempton's. Yeah, and it actually jumped a few things.
Briony:	Like what?
Maxine:	Well we have a sort of current [irrigation channel] thing that goes into our dam. It jumped that which my dad and everybody else couldn't believe it! So, that's pretty much how it burnt all of our property.

-10yrs, Bothwell

Dave, also at Bothwell, described a similar experience in which an agricultural burn near his property had 'skipped' over a fence and threatened a nearby pine plantation:

> Dave: Or you could burn a paddock off and all the roots and that could catch on fire and then skip into the next paddock and it flares up. Cos where we live, they was burning off a crop just up the road and we went up there cos there was a big pine plantation and every so often you'd see it flare up after a while and the fire brigade had to pump lots and lots and lots of water on it to try and put it out. And they was lucky cos it skipped, yeah, it got over the fence and it was lucky they was there and they put it out cos it would of gone through the big pine plantation and burnt all that down.
>
> -11yrs, Bothwell

It is important to note that direct experience with uncontrolled fires was relatively uncommon amongst the children in this study: for the most part, their experience had been limited to relatively small contained fires, such as campfires and open fires for heating inside their homes.

7.3 The school

The socio-cultural context of the school was found to influence children's knowledge of bushfire hazards in fundamental ways, and it did so through three separate mechanisms: *fire safety education programs* delivered by the CFA and TasFire; *curriculum-based activities* delivered by teachers; and the practice of *bushfire mitigation and preparedness within the school*.

7.3.1 School-based fire safety education programs

It was explained in Chapter 2 that TasFire and the CFA both deliver fire safety programs in Tasmanian and Victorian schools. Whilst lessons on bushfire hazards have been written into these programs, the data would suggest that these lessons had either not been delivered or, had not been effective in enhancing children's understanding of bushfire hazards. Whilst some children attributed their knowledge of simple preparedness measures, such as clearing leaves out of gutters, to school-based fire safety programs, there was very little evidence that comprehensive bushfire safety programs had been delivered in any of the schools studied. As noted in Chapter 6, this was a source of frustration for some children, who believed that they were entitled to bushfire education and felt that their needs in the area were not being met.

It was clear in the data that house fire education had taken priority over bushfire education in the four schools visited. In the previous chapter, it was explained that children commonly mistook their school-based house fire education for bushfire education. In this way, children's house fire safety education played a crucial role in children's understanding of bushfire mitigation and preparedness, from establishing warning systems (e.g. installing domestic fire alarms) to making a plan (e.g. running to the letterbox when the domestic fire alarm sounds). Thus, whilst the school-based house fire

programs have been highly successful in encouraging children to plan and prepare for house fire, children had generalised their house fire knowledge beyond the realm to which it is applicable.

7.3.2 Curriculum-based bushfire education

The only evidence that children had participated in any curriculum-based bushfire education came from Macedon Primary School, where children in Grades 3 and 4 were participating in a project they referred to as 'The Game of Life'. This project involved interviewing a community member about an important life experience. Given that many local people had experienced the Ash Wednesday bushfire disaster, several children had decided to seek them out and interview them about their experience:

> Tia: I've gotta plan my questions but I know who I'm interviewing - Jess's mum because she's got this spooky story about what happened to her. So, I'm going to ask her the story because she told my mum.
> -9yrs, Macedon

> Tom: I'm going to interview Mrs Cornell. She was in Ash Wednesday.
> Briony: Is she a teacher here?
> Tom: Yep.
> Sila: I interviewed my teacher Mrs White. She was in it too.
> -10yrs, Macedon

The children had put a lot of thought into their questions and were keen to learn about the events of Ash Wednesday from the people who'd experienced it. Some of the questions they intended to ask their interviewees are presented below:

> Tia: Well one of my questions is "Can you tell me a story about someone else?" Even though she was in it, I'll ask her to tell a story about someone else's experience.
> Con: I'm gonna ask questions about like "What did the fire feel like?" and "What did the fire look like?
> Tia: Yeah and I did "What damage did it do?"
> -9yrs, Macedon

It was through this project that Sila had learned how a lack of preparedness had endangered so many people in Macedon on Ash Wednesday:

> Sila: Well, Mrs White says one of the bad things was that nobody was really prepared for the fires and because it was a really hot day, they were all wearing just summer clothes and some people were wearing thongs…and most of the teachers went to the EMA [Emergency Management Australia] car park and sat there. It was really scary, that's what Mrs White said to me, and it sounded like a train.
> -10yrs, Macedon

'The Game of Life' project had clearly piqued children's interest in Ash Wednesday, and as demonstrated by Sila's portrayal of her teacher's experience, it had also provided them with an insight

into the importance of early warning and preparedness. Importantly, hearing her teacher's story had not caused Sila any visible signs of fear or anxiety. Rather, she and her friend, Gemma, reported feeling safe in the knowledge that their teacher had survived Ash Wednesday and would be able to teach them what to do:

> Jade: If there was a fire, I'd always do what the teacher told me to because they know what's right because some of the teachers here have been through fires.
> Briony: Does it make you feel safer knowing that Mrs White has been in that situation before?
> Tia: Yep, because she knows what to do, so she can tell us.
>
> - 9/10yrs, Macedon

It is worth noting again, that the 'Game of Life' project provided the only evidence of curriculum-based bushfire education in this study, despite all schools being located in bushfire prone areas.

7.3.3   Bushfire mitigation and preparedness within schools

Another way schools influenced children's knowledge of bushfire risk was through their own mitigation and preparedness activities on the school grounds. This was most apparent in the Victorian schools where there seemed to be more of an emphasis on bushfire mitigation and preparedness. Both Macedon and Warrandyte primary schools had designated bushfire refuges that had been installed with metal window shutters and sprinkler systems. Ostensibly, this is where some of the children had gained their knowledge of these structural mitigation strategies. It will be recalled from Chapter 5, that many children described their school bushfire refuges as safe places for sheltering in place. In the data, there were clear indications that children's knowledge of the school's mitigation and preparedness strategies, as well as their confidence in the safety of the designated refuges, had been acquired in the context of regular emergency drills. Children typically recounted these drills as follows:

> Briony: What if there's a bushfire when you're at school?
> Bec: Some people come into our classroom because it's got little windows that come down and because some people go into a classroom that has like those windows.
> Kurt: And we've actually done it before so that it shows us.
> Briony: So you've practised it?
> Bec: Yeah
>
> 7yrs, Macedon

> Briony: What would you do if there was a bushfire and you were at school?
> Lina: There's like a thing that Sue [Principal] does, and it goes goes woo woo woo, and everyone has to line up behind their teachers and stop, and then everyone gets in the line and walks to that stone building, and there's like drink supply and all that, and there's rolls that Alex keeps so um, when they're there...so when everyone's there you have to go like look at your other roll and say yep he's there but if there's not then I think someone goes out and looks.
>
> -9yrs, Warrandyte

Ana:	We did a practice, and well the teachers, what they would do, they would like get everyone, and then everyone in the class will have a partner, and we would all have to walk up through the corridor to the library, and we do that every year at the start of the year.
Stuart:	Yeah, fire drills.
Ana:	We go down to the library, where they've got the sprinklers on the roof and the...
Stuart:	The fireguard on the windows.

-11yrs, Macedon

By participating in drills, children had gained a concrete understanding of the procedures for sheltering in place that were clearly reflected in the findings presented in Chapter 6. Of particular importance is that the tendency to confuse bushfire and house fire safety in discussions of emergency response was not evident in children's explanations of school bushfire plans. Children readily differentiated between these two fire contexts and the data would suggest that, to a large extent, this can be attributed to the regular performance of drills for both fire types:

| Lang: | Oh, well our school fire plan is we run the gravel up the stairs and all that and if it is in a building, like you know one of these wooden buildings, and the fire's on there we would just run out onto the gravel but if it was coming from the state park and there was all these trees and all that we would run into the stone building. |

-12yrs, Warrandyte

Children's capacity to differentiate between structural fire and bushfire in this context provides evidence that, under the right circumstances, they are capable of making this differentiation.

7.4   The family

The third contextual and modifying condition associated with children's knowledge of bushfire hazards was the family. Parents influenced children's knowledge in several different ways. Firstly, by undertaking mitigation and preparedness activities around the house, parents modelled these activities to their children. Secondly, by involving children in the formulation of emergency bushfire plans, parents had enhanced their children's knowledge of planning for a bushfire event. Importantly, however, children also enhanced their parent's knowledge of particular risks and the strategies for reducing them, thereby highlighting the reciprocal nature of the child-parent relationship. The analyses pertaining to each of these influences are presented below.

7.4.1   Children's observations of family mitigation and preparation

A key factor influencing children's knowledge of mitigating and preparing was the family's level of mitigation and preparedness. When children had observed the efforts that their parents were making to mitigate bushfire hazards and prepare for bushfire events around their properties, they drew on these observations in the interviews. Substantial evidence of this has already been presented throughout Chapters 5 and 6 and need not be elaborated on here. However, it is important to acknowledge the

importance of these activities on children's knowledge acquisition. It is also important to emphasise that children's roles in family mitigation and preparation often extended beyond passive observation. This is discussed in the following section.

7.4.2   Children's active involvement in family mitigation and preparation

A particularly important influence on children's knowledge was their level of involvement in family mitigation and preparedness. As noted above, some children's families had already engaged in mitigation activities and children had observed these activities. Importantly, however, children were not always passive observers: many of them had also played an active role, particularly in the realm of general fuel management:

> Lexi: We have a bush at the back of our block and my daddy lights fires to burn the sticks because our bush is very messy and we help him because it's fun for us to go get sticks.
> Briony: Do you collect the sticks for your dad to burn?
> Lexi: Yeah.
>
> -6yrs, Macedon

> Dave: I always get the whipper snipper out and cut all the grass. Well, there's our house and there's a fence and then there's the road and I always cut the grass down along the road.
>
> -11yrs, Bothwell

> Philip: Sometimes we'll get a broom and sweep all the stuff off the roof and clean up the gutters.
> Briony: Do you do that at home Philip?
> Philip: I have to do it all the time.
>
> -12yrs, Macedon

The experience of participating in these activities had given children a concrete understanding of general fuel management strategies and whilst children sometimes said that they partook in these activities because they 'have to', the way in which they conveyed their participation suggested that they viewed their contributions as both valuable and worthwhile.

In addition to carrying out mitigation activities on their properties, children had also been involved in the development of family bushfire plans. However, the data obtained from children and their parents indicated that levels of participation in this activity varied substantially across families. Some children reported that they whilst they knew that their family had a plan, their parents had not discussed the plan with them:

> Louis: We've got a rough idea about what we'd do but we've never actually sat down and discussed it.
>
> -11yrs, Macedon

Other children, by contrast, had been more involved in their family plan and had been delegated specific tasks to undertake in the event of a fire. This was particularly the case amongst families who

planned to stay and defend, where children had been tasked with bringing animals inside, filling up baths or buckets, or caring for younger siblings:

> Jade: I have to move my animals into the laundry. I've got 7 guinea pigs and we've got 5 chickens… I would…if I did all my jobs and my mum and dad told me to um I would get two woollen rugs or something and wrap them around ourselves [her and her 7-year-old brother] and I would get one of my favourite books and read it while I'm wrapped up with the woollen rug over my head
>
> - 9yrs, Macedon

> Debbie: My job is to get the animals and make sure that they're inside. Mum said to fill the bath tub and make sure that they have enough water. I've got a dog and two cats. And I'd probably take them into the bathroom and let them in there so that they wouldn't be able to run out.
>
> -11yrs, Macedon

Parents who had not yet involved their children in bushfire planning tended to cite age as the determining factor. Several parents believed that their children were still too young to engage in discussions on this issue and were waiting until their children had reached a certain age before having those discussions:

> Bob: I suppose we've probably tended to shield her a bit from it up to an extent. Maybe because she's just turning nine this year, so it's probably that up until now we've thought well she didn't really need to know about that to an extent…it's probably something that we need to think about like, what is a good age to sort of talk about it and so that might be you know maybe 11 or 12yrs.
>
> - Father of Jane (9yrs, Warrandyte)

One parent felt that because her child was only eight years old, she would usually be under the supervision of an adult who would be responsible for her safety and this negated the need for her child to be aware of bushfire plans, or of bushfire risk more generally:

> Karyn: Well, I don't really know what you're suggesting that she needs to know. I mean if she's here at school, she'll be told, go in there and we'll have to wait until it's passed. I think because she's eight, it's up to the adult to lead. I can't imagine that she would be without an adult in that situation, I guess. And I don't want her to feel that she needs to know.
>
> - Mother of Penny (7yrs, Warrandyte)

However, the view that children do not need to know about bushfire plans was contested by the children in this study. As will be recalled from Chapter 6, children placed a high level of importance on their bushfire education and wanted to be informed on how to respond to a bushfire threat. This point of difference between parent's and children's views on what children need to know about bushfire hazards is important because it challenges the notion that children are content to defer decisions about their safety to their parents. Rather, they feel a sense of responsibility for their own safety and want access to information.

For parents, a major factor moderating the extent to which they involved their children in bushfire plans was a concern about the potential for negative emotional reactions. Many parents were apprehensive about giving their children too much information because it might trigger bushfire-related fears or anxieties. Concerns of this nature had caused some parents to avoid discussing bushfire plans with their children altogether:

> Karyn: We haven't really talked about it and I guess it is partly because we don't really want to instil terror and fear in her.
>
> -Mother of Penny (8yrs, Warrandyte)

Other parents had tried to find a balance between providing enough information to enhance awareness and providing too much anxiety-inducing detail. This approach to communicating with children was clearly articulated by Sarah in Warrandyte:

> Sarah: I'm not one to lie to kids; I'm really not comfortable with that. I think he needs to know the truth. It's not okay to tell just him 'Oh, it's okay' because he does actually need to know what's going to happen. So, you know, 'If a fire comes, you need a fire plan'. So, you know, I think with kids, tell them what they need to know. So, you tell him what he needs to know but you don't tell him the other stuff. I think with the education, you probably don't want to give them too much information. I think it's important that they have information and that they know what's going to happen and what they can do but I probably wouldn't take it any further than that. With the information he needs, I wouldn't actually say "Something might happen to the dog or the cat if we can't get him in his box he might die" I wouldn't necessarily put that in because he doesn't cope with that.
>
> -Mother of Daniel, 8yrs, Warrandyte

Additional extracts illustrating the balancing act involved in providing information are presented in Table 7.1.

Table 7.1: The balancing act of information provision

Kate: She knows that I take the stuff to work and I kept forgetting to take it out of the car so it was in the boot for ages and I remember the first year when she was in prep and I would tell her but didn't go into great detail about it, I thought I don't want to scare her too much (Mother of Jade, 7yrs, Warrandyte).

Rachel: I think it's that fine balance between preparing and knowing what's going to happen and getting it to the point where they know the risk so well that rather than it being supportive it actually creates more fear. It's like going to the dentist and if you know what they're going to first it makes it a lot harder to sit there. To know just the basic information is better than knowing too much and I think maybe kids can overload (Mother of Stuart, 11yrs, Macedon).

Briony: Is that something that you find a challenge, how much to tell them and how to communicate with them about it?
Diane: Well yeah, I mean, it's a serious matter but we don't want to frighten them but we have to let them know that this is what we're doing and this is why we're doing it, you know, just trying to prepare them for anything that may occur and just not to be frightened (Mother of Analyse, 11yrs, Macedon).

Bob: You know it's a bit tricky, like, I don't want to traumatise her because you don't want to sort of frighten them but at the same time you're sort of living in the bush where there could be a bushfire so she should be aware. I mean, we see bushfires on the TV and things and well obviously we drive past the CFA and you know, the CFA is very visible in Warrandyte and we see them at the local markets and she's very aware of what the CFA do but I suppose bushfires can be quite frightening, so yeah, it's a bit tricky (Father of Erin, 9yrs, Warrandyte).

Anne: I think it's important to be honest about what could happen but without being too sort of scaremongering and you know making them feel like they need to worry about it because I don't think that they need to worry about it but they certainly sort of need to know (Mother of William, 8yrs, Macedon).

Briony: As a parent, have you found it challenging or not so challenging to involve him in the plans in the plans and the discussions?
Clara: Yes, because the issue of how anxious will he get if he fears the worst and how much information to be open about and it's not something that you want to live in fear of, but we tend to have always gone for being more sort of straightforward and upfront and open because he needs to know. I used to worry about him being frightened though (Mother of Jared, 12yrs, Warrandyte).

In delivering information to their children, parents also sought to provide reassurance by focussing on practical information relating to the steps that had been taken to ensure the safety of family members, pets, and treasured possessions:

Sarah: Something came up about a year ago about fires and I think it might have come up at school, things like 'What are we going to do if there's a fire?' and we had to explain that yes we did have a plan, and he was really worried about his teddies and his animals and about those things he does get really kind of anxious so, you know, it's about reassuring him. But it wasn't about saying things will be okay because he actually needed to know that if there's a fire we're not going to stay, we'll just go. You know, I just think that it's not worth fighting for material things so he knows that if there's the chance of a fire, we'll just go and we'll take all our cats and our dogs and our teddies.
                                                        -Mother of Eamon (8yrs, Warrandyte)

Kate: There's that fine line of not wanting to panic her but she's had those thoughts, you know, like they say 'What if the house burnt down?' and things like that and those sorts of questions and I said 'Well look, yeah, it is a possibility but it's been there for a long time and it's still there now but, you know, it is a possibility and that's why I take all our special things with us so we'd have them and we'd have ourselves and that's the main thing and we can buy more My Little Ponies, we can buy more clothes' you know? So, we've had those conversations without getting too maudlin.

-Mother of Jade (8yrs, Warrandyte)

Some parents also described how they could monitor their children for signs of anxiety and then regulate the provision of information accordingly:

Lori: I think I would know enough is enough when they're showing some signs of anxiety, I'd be looking for cues that they don't want to talk about it or that they say something about having nightmares, but fortunately I haven't observed any of that with the kids.

- Mother of Cam (7yrs, Macedon)

Jane: I think giving them more information would be a better thing and because they're kids it's all a bit of a fantasy anyway, they don't take stuff too seriously but if they do get worried we'll just have to manage it and play it by ear and check how they are feeling.

- Mother of Rod (8yrs, Macedon)

Some parents stressed the importance of not showing any sign of their own bushfire-related anxieties when communicating with their children:

Alisha: I think if you do it rationally and you're not showing that you're scared of it yourself, it's like anything with kids, if you show them fear then they'll know fear and if you don't show them fear then they won't know fear…It's like spiders and ants and things. If you've got a mother that's going to scream at a spider then the kids are going to scream at a spider. You know they naturally have a bit fear, but you don't show them you're terrified because you'll just panic them.

-Mother of Joe (9yrs, Warrandyte)

Parents also described a strategy whereby they encouraged their child to ask questions and let those questions guide the amount of information provided. This was intended to reduce the chance of overwhelming children with too much information:

Rachel: When there was a fire in Grampians and people were killed on the road, the boys asked questions about being on the road and seeing the smoke and fires...We discuss these things when there's been a fire. They ask the questions and we try and answer them rather than us dumping it on them we try and encourage them to ask for the information and then what they are asking about becomes more and more detailed and more and more sophisticated. You know it used be "Will I get burnt, Mummy?" And I'd say "You'll be fine honey, that's what Mummy's here for" And it's now become more sophisticated questions that they're asking. With this last fire in the Grampians, when the family died on the road trying to get back to their property, it was 'Why did their parents choose to do that? Why did a parent make that mistake?' and those sorts of questions. So, we let them ask rather than us dumping it on them and taking that risk of panicking them unnecessarily because you know, we're not moving from here for a while so they need to be comfortable living in this environment.

-Mother of Stuart (11yrs, Macedon)

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Lori: When the Community Fire Guard meetings were taking place they knew what that was about and Luca would stick around for the start of the meeting and I would always say to Luca afterwards 'Do you have any questions? Did you hear any of the conversations? Do you want to know what we talked about?' and sometimes they'll ask questions and sometimes they can't be bothered. We let them decide how much info [they get].

- Mother of Cam (7yrs, Macedon)

Whilst parents were concerned that providing children with information about bushfire plans would create fear or anxiety, there was clear evidence in the data that children's fear of bushfires was more a result of not having information about how to respond. Where children did express fears or anxieties, they attributed them to not knowing what to do and, for many children, acquiring knowledge of the family bushfire plan had helped to reduce these fears (see Chapter 4.4.4).

In several families, children had been afforded a high level of involvement in bushfire emergency plans and these children exhibited a more sophisticated understanding of planning and preparing for a bushfire emergency. In Macedon, the Jenks family had heavily involved their son Brian (9yrs) in every aspect of their plan to stay and defend the property. As might be recalled from Chapter 5.3.3.2, Brian exhibited a sophisticated understanding of bushfire hazards. He was familiar with the concepts of embers and radiant heat and was one of the few children to adopt an expert approach to confronting the fire: he planned to patrol the property for embers until the fire front arrived, shelter from the radiant heat inside the house as fire front passed over, and return outside to patrol for embers after the fire front had passed. This contrasted sharply with the approach adopted by his fellow focus groups members who planned to evacuate when the fire front arrived, which Brian had argued would expose them to potentially fatal radiant heat.

The circumstances under which Brian had developed his understanding were interesting, especially in light of parents' concerns about bushfire related anxiety. Brian's family had moved to Macedon from the suburbs of Melbourne when Brian was five years old. When Brian first became aware of the high bushfire risk in the area, he began to exhibit signs of anxiety, as his mother, Sally, explained:

Sally: When we talked about fires in the first year he would get really frightened, very, very frightened, you know he would have trouble sleeping because he was worried about there being a bushfire and he chose not to go and play.

Sally, who at that stage was planning to stay and defend with her husband, had managed Brian's anxiety by providing him with detailed information about bushfire hazards and involving him in the family's emergency plan: she explained to him the process of patrolling for embers and taking refuge inside the house as the fire passes over; she also allocated him specific tasks to undertake during a

bushfire emergency. She felt that involving Brian in this way had helped him to gain a sense of control over the bushfire risk which, in turn, had served to reduce his anxiety:

> Sally: I tried not overstate it or understate it but said that is a reality of life. And in the second year, once I got the information, I felt better able to reassure him that we knew what to do, that it would be okay, it may not be very pleasant but it is something that may happen and we need to prepare for it and I think that the more information he had and the more I could explain, you know like 'The fire fronts only this amount of time and while it's happening we're inside we're safe, the rest of the time you're patrolling, you're putting out embers, it's understandable, it's manageable, the fire doesn't just land on your house and blow it up', he got more relaxed. And also involving him in the plan, you know, getting him to have jobs and take on things, it really helped him.

As Sally became more interested in bushfire mitigation and preparedness, she obtained a role as Community Fire Guard Facilitator[1] and, as she acquired more information through this role, there were many household conversations about preparations and procedures for staying to defend. Brian had shown a keen interest in those conversations and had also read the brochures and other material that Sally had sourced for her own purposes:

> Sally: Brian was there when I had a lot of conversations as I went through the training, I spent a long time preparing and talking to Tim [husband] and Brian was more interested in those conversations and I know he read the CFA material but we also talked about it. Brian collects brochures about all sorts of things and he probably does read them all!

Sally also made the point that Brian had been given the choice of staying to defend or evacuating to a relative's home in Melbourne and she noted how being granted this decision had given Brian a sense of empowerment:

> Sally: Brian was given a choice if he wanted to stay and help us and he chose to stay. So, he definitely feels part of the solution and not part of the problem.

When Sally attended a public forum, where local women and their now adult children were asked to share their experiences of Ash Wednesday, she came to the conclusion that the children who had been actively involved in the events of the day had coped better with the experience:

> Sally: That was something I got from the women and children in the Ash Wednesday forum and through talking to them, is that involving your kids and talking to them is really important. The mum's really thought that the more they talked to their kids and the more

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[1] It is important note that whilst participating in community-based programs such as community-fireguard was a key source of bushfire information for parents, evidence of children's direct participation in these programs was extremely limited. Hence, community-based programs did not earn their way into the model of contextual and modifying conditions. However, the indirect influence of these programs on children through their parents is duly acknowledged and supports the value and importance of such programs.

they involved them in the events of the day and didn't just shut them in a room and not tell them anything, they believed their children coped better and that made sense to me. They let the kids look out the window, they talked to the kids about what was happening and they gave the kids jobs and really involved them and their kids felt better because of that.

For Sally, this vindicated her decision to involve Brian in the family's plan to stay and defend as much possible. When Sally and Brian were confronted with a potential bushfire threat, her decision to involve him in the planning process was further vindicated. Although the threat never eventuated, in planning for that eventuality, Sally saw evidence that involving Brian in the plans and preparations to stay and defend had helped him to cope with the situation:

> Sally: We did have a situation last summer where the fire trucks went past and it was sort of around six in the evening and we turned on the scanner and I got Brian to go outside and listen for the sirens and when it was all over and you know it was nothing, it wasn't a fire, our adrenalin was pumping and we were both quite heightened by it and he was almost disappointed that there wasn't a fire so there's an excitement around it now as well.
>
> Briony: Do you think the preparations you had made at that point had empowered him and made him feel like he could cope with it, like you could cope with it together?
>
> Sally: Yeah, definitely.

Brian's articulated knowledge of staying to defend suggested that his involvement in his family's planning and preparations had provided him with an opportunity to develop a sophisticated understanding of bushfire mitigation and preparedness. Importantly, learning about bushfire risk reduction and being involved in his family's plan to stay and defend had not increased Brian's bushfire-related anxiety: on the contrary, it had ameliorated it.

Phillip (12yrs, Macedon) was another child with a sophisticated understanding of staying to defend. Although his mother, Simone, had decided that the family would leave early, she had also developed a detailed contingency plan for staying to defend in the event that the family was unable to leave. It is important to note in this context that Simone was a single mother and, as such, she felt wholly responsible for ensuring that her family was fully prepared for any eventuality. Simone's plan to stay and defend was highly detailed and she had also designated tasks to the children, such as filling up buckets, bringing pets inside, shutting doors and windows, closing curtains, and patrolling the house for embers and spot fires as the fire front approached. Simone had written up this plan and explained every aspect of it to the children, including what they would do as they fire passed over the house:

> Briony: Have you talked to the kids right through to the point of when the fire is passing over and what they would be doing then?
>
> Simone: Yes, and we had some friends out on a farm and they had the fire go over them, so the kids know that it's like basically sitting under the viewing thing at Tullamarine airport. They know that the noise is really terrible. They know that we would be safe under the house and that the roof isn't going to fall on us.

In addition to explaining the plan verbally, Simone had also involved the children in comprehensive drills:

Briony: Have you practiced any of that plan as a drill?
Simone: Yeah and it takes ages. It uses heaps of water. We haven't done it this summer yet. Realistically, I'm going to practice every fortnight, every summer. So have we practiced? Yes, we practiced it. I don't think we got to the point last year of getting changed but the year before we did and it took ages!

In Simone's view, the children had coped well with this level of involvement in the family bushfire plan and she had not identified any manifestations of bushfire-related anxiety or fear:

Briony: What has it been like explaining all of those plans to the children?
Simone: I think fine. We've got it all typed out and everything. Yeah, it's all been fine.

In his interview, Phillip recited the plan outlined by Simone with a high degree of accuracy. He described how before the fire arrived, he and his mother would fill buckets, start the pump, wet down the house and yard, and patrol for spot fires until the fire front arrived, at which point they would take refuge in the brick part of the house. He also described how once the fire front had passed, they would return outside and continue to patrol for spot fires. In addition, he was aware that this was a contingency plan that would only be implemented in a situation where it was too late too leave.

In Macedon, Jade (9yrs) and her brother Shaun (7yrs) had also been involved in their family's plan to stay and defend the property. Their mother, Lucy, explained how her decision to involve the children had been based on the view that children are more likely to experience post-traumatic stress if they are sent away in a fire emergency:

Lucy: I read somewhere that there's been studies that have found that it's the kids who have been sent away while the fires have taken place that have suffered the most post-traumatic stress. I think it's better for the kids to know what's happened rather than being taken away. And you know, even though we still have the tooth fairy or Father Christmas, they still experience things like chickens dying and having pigs dying and, you know, that's all part of living in the country.

In the course of preparing Jade and Shaun to stay and defend, Lucy had told them what to expect from the experience:

Lucy: They know that it will be noisy and dark and scary and we've talked to them about how whilst there'll be flying embers it won't be too intense because we keep the grass short so it will just travel along the grass and I think they're feeling okay about that and I think they do get that there will be the embers and that's why we're running around with mops and I mean I've told them that when the fire is actually coming, we'll be sitting in the hallway together and we'll be a bit worried but we'll be okay. And Jade said 'Well, what happens if the house catches on fire?" And I said "Well by that time the fire will have passed and it will be okay we'll be out of the house by then. But we can't actually go anywhere darling' but yeah, we'll be fine. We'll just cope.

Although Lucy viewed the children as being too young to participate in actual firefighting activities, she had allocated Jade a number of other tasks so that she would feel like she was making a tangible contribution. Tasks allocated to Jade included filling the bath, bringing animals inside, preparing refreshments for her parents, and taking care of her younger brother. Jade recounted each of these tasks in her focus group interview and also described how she would sit in the hallway with her brother while her mother and father used hoses and mops to extinguish spot fires around the perimeter of the house. However, as might be recalled from Chapter 6, Jade's interpretations of *why* she had to fill the bath and sit in the hallway reflected a more naive understanding. It is worth presenting these again in full:

> Briony: Okay so if that bushfire did come and you had to do your emergency plan, what do you think would happen to your house?
>
> Jade: Our house might burn down and it might not because we've got that huge long hose and but we haven't got any sprinklers but the bath might stop it if it comes that way.
>
> -9yrs, Macedon
>
> Jade: My mum and dad told us to go in the hall near the front door and back door.
>
> Briony: Why do you think they told you to go in the hall?
>
> Jade: Well we've got tiles all along the hall and they're really, really cold and also they would take probably a while to burn.
>
> -9yrs, Macedon

It is not clear whether Lucy had explained to Jade the rationale underlying each of her jobs: however, Jade did report that *'we haven't really talked about it all that often'*. What is clear is that Jade had constructed her own understanding based on the common misconception that fire travels via a direct chain of ignition that can be halted by a body of water or a non-flammable surface, such as a tiled floor.

Larry (12yrs) in Warrandyte was another child who, whilst being heavily involved in his family's plan to stay and defend, had constructed his own understanding of the plan based on his own preconceived ideas about bushfire response.   Larry's family had moved to Warrandyte when he was five years old and, as his mother, Clara explained, he had always been involved in the fire plan:

> Clara: Oh he's always been a part of the fire plan and he was five when we came here and he was part of everything that we did like when the fellow [CFA volunteer] came out and we watched a video and all of that sort of stuff. So he's always been aware of the fire risk and of our fire plan and he's always been a part of it. We had things we would ask him to do like inside the house and more recently we've thought he'd be more able to do more things and we've talked about that, you know.

At one point in the interview, when Clara was considering whether Larry had ever exhibited any bushfire-related fear, Larry entered the room and the following exchange too place:

Clara:	I think there was a time when you were anxious about if there could be a fire, if there could be fires. Do you think Jared? I can't remember the detail but I just remember there were times when you might have been.
Larry:	At home do you mean?
Clara:	Yeah.
Larry:	I can't remember being overly scared because we've got the pool and I knew I could just jump in it, like even when I was really little.
Clara:	And did any of us tell you not to do that?
Larry:	Um, I never voiced it so…
Clara:	Because you know why you wouldn't do that?
Larry:	Something could fall over and you'd get trapped underneath I suppose.
Clara:	No, the water would heat up and you could get boiled! I would have felt sure that you knew not to jump in the water. I'm sure we've mentioned that.

Several weeks later, in his focus group interview, Larry was able to express his new, more sophisticated understanding of the family's plan to stay and defend:

Larry:	I know there are like the periods when you can't go outside because it's too hot and you have stay in a cool room away from the windows and I think my family seems to be pretty aware, we've a got a pool and a hose and a plan so probably we'll be fine.
Briony:	Why do you have to stay inside?
Larry:	Well, I'm supposed to do that because it's less dangerous and we've got brick walls so it isn't that bad. We've only got one room where there's heaps of windows. I'd sort of secure an opening so that I could get out if I needed to but then if it's safer inside, I'll stay inside.
Briony:	Why's it safer inside?
Larry:	We'll if it's around and it hasn't actually gone into the house, we're running around the house looking for spot fires that could get into the roof, yeah Dad's in the roof looking for spot fires.

- 12yrs, Warrandyte

He was also able to advise his fellow focus group members against seeking refuge in the pool when the fire arrived:

Ford:	I'll evacuate to my neighbours pool.
Larry:	But what would you do in the pool?
Ralph:	You'd hide.
Larry:	In the pool?
Ford:	Yeah like this [holding his breath].
Larry:	Well I just learnt this but if you stay in the pool, then the pool could boil and you'll get steam fried, Ford!

-11/12yrs, Warrandyte

For Larry, having the opportunity to articulate tacit misconceptions had enabled him and his mother to engage in a dialogue that had helped him to develop a more sophisticated of staying to defend that he was then able to pass onto his friends.

In this study, it was not uncommon for children who planned to stay and defend with their families to express misconceptions similar to Larry's. These misconceptions seemed to derive from a lack of

communication about the later stages of staying to defend. Many children expressed a sophisticated understanding of what to *before a threatens* and *as a fire approaches* because their parents had allocated them specific tasks, such as bringing animals inside or filling up buckets. However, it would seem that in many cases, family discussions about staying to defend had been terminated at this point, leaving children to construct their own understanding of what to do *when a fire arrives*. Invariably, these constructed understandings involved a last minute evacuation. For example, Con (9yrs, Macedon) demonstrated a highly sophisticated understanding of what to do before a fire threatens and as a fire approaches: but, if a fire was to reach the property, he would evacuate. In the absence of any information to contrary, he had determined that this would be the most appropriate course of action:

Briony:	Can you remember what your dad said you would do if the fire came up really close?
Con:	Ummmm, no, not exactly
Briony:	Can you remember what your mum said about that?
Con:	No. She doesn't really say anything but organises it.
Briony:	Did your dad say you would evacuate if the fire came up really close?
Con:	Yep. I mean, at least I think he did because I don't know what else we could do because I think you would just have evacuate.

-9yrs, Macedon

Lang also exhibited a sophisticated understanding of what to do before a fire threatens and as a fire approaches. However, like Con, he believed that if a fire reached the property he would have to evacuate. Again, it would seem that the family discussion about staying to defend had not included information about what to do when the fire arrived, leaving Lang to construct his own understanding:

Briony:	Is the rest of your family familiar with your plan to evacuate when the fire arrives?
Lang:	Um, well this is mainly what I believe what would happen. Well, some of this is my dad's plan but some of this is just what I believe. I know that we take the fire hoses down here and wet this area and we do take the cars and all that away from the house and take all the flammable stuff away but I'm not 100% exactly sure on what to do when it's there, like really close.

-12yrs, Macedon

An alternative explanation for children's misconceptions about what to do when a fire arrives is that parents had discussed these later stages of the plan with their children but their misconceptions about evacuating were deeply entrenched and resistant to change. Yet another possibility is that the children had not actively attended to these discussions. However, this seems unlikely in the case of Con, who presented as being extremely interested in his family's plan to stay and defend and felt a strong sense of responsibility for its implementation: *'I have to know all that stuff because my dad goes away a bit for his work and when he does, I'm the man of the house'*. However, it could apply to other children such as Lang who freely admitted that *'when dad starts talking about bushfires, I sometimes don't really listen'*.

Children's involvement in their family bushfire plans had also heavily influenced their knowledge of evacuation. Children exhibiting more sophisticated approaches to *identifying triggers* (i.e. leaving in advance of an imminent threat) and *choosing a destination* (i.e. leaving the area) had been fully briefed on their family's plan to evacuate. For example, Cam's (7yrs, Macedon) mother Julia, had *'always'* involved him in *'every part of the plan'* and they had written out the plan together. In his interview, Cam described how upon receiving an advanced warning, he and his family would pack up their pets and evacuate to his grandmother's house in Melbourne. Similarly, Stuart's mother explained how *'coming from the suburbs we were really aware [of the risk] from the beginning, from the very day we moved in and we've tried to make that part of the kid's understanding as well'*. She explained how her children *'know that I'll take them and we'll go somewhere safe. You know, we'll make that decision earlier and we'll go somewhere safe'*. In his interview, Stuart reported that upon receiving an early warning, his father would prepare to stay and defend whilst he, his mother and his brother would go to a suburban shopping centre and wait for the threat to pass.

In families where children had not been fully involved in evacuation plans, a less sophisticated understanding of both *identifying triggers* and *choosing a destination* was evident. For example, Ana's mother described how she was *'not really comfortable our plan because I don't think the kids are aware of what's needed and what would be required'*. This assessment was accurate in that Ana's plan to evacuate involved waiting until the fire reached the driveway and then evacuating to a part of the property *'away from the fire'*. In another example, Jade at Warrandyte was familiar with her family's plan to evacuate early and, as might be recalled from Chapter 6, she attempted to convince her friends, albeit unsuccessfully, that running to the letterbox was a bad idea. However, in the absence of any information about where the family would evacuate to, she surmised that they would go to the fire station or the local supermarket:

> Briony: Where would you go?
> Jade: We were talking about it mum and me but I don't exactly know. I might go to the firebrigade place or maybe IGA [local supermarket].
>
> -8yrs, Warrandyte

What the foregoing discussion of children's involvement in family bushfire plans demonstrates is that in the absence of any other information, or in the absence of dialogue that facilitates more sophisticated understandings, children construct their own understandings of how to respond to a fire event based on their pre-existing assumptions about bushfire hazards. However, when children have the opportunity to participate in the planning process and to engage in genuine dialogue through which their flawed assumptions are revealed and corrected, children's knowledge of how to respond is substantially enhanced.

7.4.3 Children's influence on parents

A particularly important finding to emerge in the analysis of family context was that the children had played an integral role in disseminating information about risk within their homes. As discussed previously, house fire education in Victorian and Tasmanian schools places a strong emphasis on the preparation of house fire plans, and children are commonly encouraged to prepare these plans at home with their families. Interviews with parents revealed that children are very effective in raising the issue of house fire plans in their homes, as illustrated in the following extracts:

> Dean: They discuss fire safety at school and they come and they ask question about it and makes us go 'Oh well actually, we do need to do something about that. And I think it's definitely raised itself that way. You know he'll say like 'What's our plan?' and it's like well…
>
> Melanie: Certainly, what they learn at school, they come home and they talk about it and bring it to the kitchen table and gets us thinking about 'What are we going to do, have we thought about it?' So after they've gone to bed we'll go, "Okay, well that's a really good point, what are we going to do'. It just plants that seed.
>
> <div align="right">-Mother and Father of Hugo (6yrs, Warrandyte)</div>

> Melissa: The children came home with an assignment where we had to work out a house [fire] plan. They took it really seriously so we sat down with them and worked out exactly what we would do, what our exit points would be and where we would meet outside. I couldn't believe we hadn't already done it: something so easy that could save our lives.
>
> <div align="right">-Mother of Fiona (9yrs, Huonville) and Colin (11yrs, Huonville)</div>

What is most apparent in these extracts is the extent to which the parents genuinely valued and appreciated their child's contributions to family house fire safety. Parents generally perceived safety messages from their children as highly influential. As Peter explained, children are in a unique position to communicate safety messages to parents, because a parent's desire for their child to feel safe and secure compels them to listen and act:

> Briony: With the house fire plan, do you think that the message was coming from your children was an important factor?
>
> Peter: Definitely, there's a certain level of emotional manipulation there.
>
> Briony: Can you explain that a bit more?
>
> Peter: Well, you want your kids to feel safe, if they come to you and ask you to something that will make them feel safe and possibly save all our lives, then you want to listen to them and do what you can to help them.
>
> Melissa: I think it's just a natural response.
>
> <div align="right">- Mother and Father of Fiona (9yrs, Huonville) and Colin (11yrs, Huonville)</div>

Melanie explained that whilst it may not always be possible to take action immediately, if the message came from her child, action would be taken:

> Melanie: You know, if your child comes home and says 'At school today they told us we had to come home and learn a fire plan', you're not gonna turn around and say 'Well, that's rubbish, we're not gonna do that'. You might be busy and say, 'Yeah okay, maybe another day' but you will do it.
>
> <div align="right">- Mother of Hugo (6yrs, Warrandyte)</div>

Although evidence of children's influence came predominantly from the realm of house fire safety, parents suggested that given the opportunity, their children would exert an equally powerful influence in the realm of bushfire safety:

> Melissa: Whenever the kids have anything like that we get involved and discuss it and do it with them. Both Jess and Kaelin took the house fire plan so seriously. I'm sure they would insist we did a bushfire one if they got it as an assignment at school or something.
> Peter: If they came home wanting to do a bushfire plan we would do it.
> Melissa: Absolutely, Jess gets really into things like that: she would demand our attention. I'm sure once we'd done it I'd think the Briane as with the house fire plan, you know, how could we not have already done it?
> — Mother and Father of Fiona (9yrs, Huonville) and Colin (11yrs, Huonville)

Parents strongly supported the idea of bushfire education in schools especially if it involved a practical homework component that involved the rest of the family because it would have the potential to trigger a discussion from which everyone could benefit:

> Briony: As a parent how do you see viability of kids coming home from school initiating discussions about risk and preparing for bushfires?
> Bob: I think it's a terrific idea. Just in terms of getting kids thinking about it and obviously getting families involved as well. If it's like a school homework project and if it was like an property assessment type thing yeah I think it would be a terrific idea and I guess if that triggered a bit a family discussion too…I think we could no doubt get something out of that as well. The more talking you do about it the better.
> — Father of Jane (9yrs, Warrandyte)

Parents also suggested that bushfire education in schools would be a powerful way in which fire agencies could engage members of the community who are more difficult to reach. For example, Karyn in Warrandyte believed that building community bushfire education programs around children would be a lot more successful than those that focus on adults alone. She willingly admitted that she would not ordinarily be interested in attending a CFA community meeting, but if it was held at the school and involved her child, she would go:

> Karyn: It could even be something here at school, where the parents are encouraged to come and work with their child and have somebody facilitate it so that you've got everybody involved. And I mean not everybody can attend those things and not everybody would want to but we would certainly, particularly if it was with her. If it was just left to us to go along to the CFA, then no, but if it's with her then we'll be there. It's strange isn't it! I think if you brought the kids and the parents together but through the kids I think that you'd get a much better response than just saying "Go along and see your local CFA".
> — Mother of Penny (9yrs, Warrandyte)

At Macedon, Kat pointed out that many parents worked fulltime in the city, and therefore lacked the regular community engagement through which she had been able to gain important local knowledge

about the bushfire risk. She suggested that educating the children at school could be one way of reaching these less connected members of the community:

Briony: So how do you learn about the risk up here?
Lori: It was just kind of chit chat at the supermarket and meeting prep mum's who have lived in the area for a while and I'm quite inquisitive so I would start to ask people and teachers, you know, like 'Where do you live?' and 'Can you tell me about the fires?'
Briony: So do you think having children at the school linked you in?
Lori: Absolutely. I think if it had been three years down the track and I had been working and commuting to the city, I probably wouldn't be any further along in terms of what I know....Up here, more often than not, it's such a changing demographic, with one or both parents working in the city and they're not in the community full time so they're not accessing the information that I've been fortunate to access so yeah, perhaps the children are the way to get through to them and you know whereas mum would never look at the CFA website, but I'm sure if the kids are educated about all of that, you know, like 'This is what we do if the fire approaches' or encouraging the parents you know, 'Do you have a fire plan?'

- Parent of Cam (7yrs, Macedon)

It is also important to note that simply having children in the household had encouraged some parents to mitigate and prepare. One family, who had invested significant time and money into bushfire mitigation and preparedness on their property, had done so in order to ensure the safety of the children:

Briony: So you've spent a lot of money and a lot of time on this?
Alisha: Yeah
Alan: Every year
Briony: What's motivated you to do that?
Alan: Looking out for our kids

-Parents of Joe (9yrs, Warrandyte)

Other parents explained how it was only upon having children that they perceived the need for a plan:

Dean: Well, we never had a plan before we had children.
Melanie: No, but we didn't live here before we had children.
Dean: Yeah, we lived here for three years in a granny flat.
Melanie: Yeah, but then we worked all day and it wasn't really the kind of thing I thought about.

-Parents of Hugo (6yrs, Warrandyte).

Thus, children also exerted what can be viewed as a more passive influence on parents' attitudes and behaviours.

There was also evidence that children had exerted an influence on the bushfire awareness of siblings. As described earlier, several children in Macedon had been given the opportunity to interview Ash Wednesday survivors about their experiences. Some of these children had shared what they had learned with younger family members. Sila and Madeleine, for example, had both shared what they'd

learned about Ash Wednesday with their younger brothers who then talked about this in their own interview:

> Rob: There's been a big bushfire here called Ash Wednesday.
> Briony: Really? Tell me about Ash Wednesday.
> Rob: The grade 3/4's are doing about Ash Wednesday. Mrs Keane was in it.
> Luke: Yeah and my sister [Madeleine] interviewed Mrs Clarke and she said when the bushfire came she was watching a TV show and she was really scared.
> Rob: Sila, she's my biggest sister and well she was drawing pictures of...well Mrs Keane did a story thingy and she had to draw pictures of them.
> Briony: Of a bushfire?
> Rob: Yeah, Ash Wednesday.
>
> - 7yrs, Macedon

What the above discussion highlights is that children provide a powerful means through which to build awareness and promote preparedness within their families. Children clearly have a capacity for initiating discussions about house fire safety and parents are highly responsive to their children's requests to develop emergency plans. The data also suggests that the agency of children in this realm would readily extend to the realm of bushfire safety. Furthermore, there is evidence that children talk about their school-based bushfire activities with their siblings, suggesting that bushfire education in schools would also promote bushfire-related discussions amongst children at home.

7.5   The research process

The research process itself was an important contextual influence on children's knowledge of bushfire hazards. The data suggest that by participating in the focus group interviews, by articulating and reflecting on their own knowledge and that of their peers, children actively constructed their concepts of the problems and processes associated with bushfire hazards. My role as researcher, and the ways in which I elicited the children's perspectives, also played an important role. As outlined previously (4.3.3), to avoid delimiting the scope and range of the children's responses, I attempted to frame my questions in the broadest terms possible. However, I also imposed a certain degree of structure on the interview process by using a scaffolding technique in which topic areas were explored in a particular order. It is inevitable that this influenced the knowledge, attitudes, and opinions that the children shared. In this way, the grounded theory presented in this thesis must be viewed as a social construction; it derives from an iterative process of action and interaction in which both I and the children were implicated. This is consistent with the philosophical assumptions (i.e. constructivism, social constructionism) and theoretical perspectives (i.e. symbolic interactionism and socio-cultural psychology) that underpin the research (3.2 and 3.3).

As discussed in Chapter 4.3.3, one of the interview techniques used to elicit children's perspectives was a bushfire planning scenario in which children used either Figure 4.1 or their own drawings as

tools with which to formulate a bushfire plan. For some children, participating in the scenario served to raise their awareness of the bushfire hazards in their area and their vulnerability to them. This is clearly articulated in the following extract in which Scout and Lang talk about how working through the bushfire planning scenario had altered their perspectives:

Lang: After doing this [the scenario exercise], I'm afraid about how the fire could come from any direction and we're trapped if it's down there, unless we run down here. Now I'm a lot more aware and concerned.
Briony: So what are you going to do about that concern?
Lang: If my dad talks about a fire I should care. You know, like I should listen.
Briony: When your dad does talk about it, are you interested?
Lang: After doing this, yes! Before I didn't really notice that it was that simple for a fire to come or that it's that risky. After drawing this I've noticed that our house is in a very large fire risk.
Scout: It's just an accident waiting to happen really, now that you think about it.
Briony: Had you really thought about the bushfire danger before you did this interview?
Lang: Nope. Well my dad was telling me and I'm just like 'Yep never gonna happen', and then I'll forget in a week.
Briony: So what part of this interview has made you think that it's a problem?
Scout: Writing this out [drawing his house with a fire approaching].
Lang: Yeah, drawing the fire.
Scout: And you know like it gets you thinking. I never really thought that we should have a plan because I didn't think it was gonna happen, but it could happen.

-11/12yrs, Warrandyte

It is important to reiterate that in this scenario the children were not given any information. My role as the researcher was limited to asking questions aimed at eliciting the children's knowledge and perspectives. However, as the extract above illustrates, the asking of questions is a powerful means by which to raise awareness and enable children to identify the gaps or misconceptions in their knowledge. As Lang admitted, he had tended to ignore his father's talk of bushfires in the past because he didn't see it as being relevant to him. However, by working through the bushfire scenario and constructing his own views on the risk, his perspective had been transformed.

There was also evidence that, for children planning to evacuate, working through the bushfire planning scenario served to influence their choice of destination. When asked what they would do if a fire reached the property, several children who had chosen destinations close to the house (e.g. letterbox, front gate, back yard) came to recognise the dangers associated with this choice. For example, at the beginning of the scenario, Scott had chosen a destination next to his house. However, when the fire arrived, he recanted:

Scott: Can you change where you're gonna go?
Briony: Yep.
Scott: I wanna go. I would go to the Murray River cos sometimes we go to Echuca.

-6yrs, Macedon

Similarly, Mark and Lana had both elected to evacuate to the letterbox. However, when confronted with a scenario whereby a fire was beginning to encroach on their property, they realised the dangers inherent in their choice:

Mark: In our house I think if it was in our house where we have to go down to the front of our house.
Lana: You go to the mailbox.
Mark: Yeah straight to the mailbox.
Briony: Okay then, so what about when [the fire's] coming on to your land?
Mark: I don't think I'd be there then. Well I wouldn't be sure because I don't think we've ever thought of that exactly, the being fire near our house.

-11yrs, Warrandyte

The scaffolded bushfire scenario also provided children with a concrete basis upon which to think about mitigating the hazard. For many children, it was only in the bushfire scenario that they began to identify strategies for creating safer locations or building safer houses. For example, when the fire was approaching, Larry suggested that we 'rewind' the scenario so that he could undertake fuel reduction burning:

Larry: Wait! Now, let's go back a couple of years and then you've gotta burn off and then you go back.

- 8yrs, Macedon

It would seem then, that encouraging the children to visualise a fire scenario, which began with an initial warning and concluded with the fire arriving at the house, provided a concrete basis upon which they could reflect more carefully upon the consequences of various mitigation and response strategies. Drawing their homes with a fire approaching in incremental steps provided a more concrete means by which they could think about the highly abstract phenomenon of a bushfire event.

Working through the bushfire planning scenario also provided opportunities for the children to increase each other's awareness of the bushfire risk and the need to have a plan. In Macedon, for example, Con expounded a detailed account of his family's plans and preparations and, for Amy, this served to highlight her own family's lack thereof. After hearing Con's account, she announced:

Amy: When I get home - because we always talk at the dinner table about
          something - I'm gonna get mum and dad to tell us what our fire plan is because we
          basically don't really have one and we don't really have that much protection around our
          house so...
Briony: Has hearing Connor talk about his plan….
Amy: Yeah, yeah. It's like Connor talking about his plan and all his water and stuff.
Briony: And that's making you feel like…
Amy: Like "Whoa! We don't really have a plan!"

- 8yrs, Macedon

Data elicited in the bushfire planning scenario also illustrated how children influence each other's perspectives on emergency plans. For example, in several focus group interviews, children with a

more sophisticated knowledge of staying to defend were found to influence the perspectives and choices of their less knowledgeable peers. It will be recalled that in planning to stay and defend, children articulated two distinct approaches to dealing with the fire when it arrived (Chapter 6.3.3.2): one of these involved seeking shelter inside the house as the fire front passed over and then returning outside to extinguish embers and spot fires once it had passed; the other, by contrast, involved a late evacuation. In the data, there were several instances in which children who were a planning a late evacuation altered their plans as a result of a dialogue with other children who planned to seek shelter inside. In Macedon, for example, Jess suggested that when the fire arrived, she would leave, whereas Brian suggested he would shelter from the radiant heat inside the house. Upon hearing this, Jess modified her plan:

Jess:	If it was outside I would stay inside. If there was nothing outside that would catch like very much and then catch onto the house. But then if there was the thing inside then I would go out and just like go away from it.
Briony:	Like if the house did catch?
Jess:	Yeah and then I would like probably have like a different door to get out and I would just like go away from it but if it was outside I would be inside.

-8yrs, Macedon

It is important to note that Jess considered Brian a reliable source of information, as demonstrated in the following extract:

Briony:	Okay, and did [Mum] give you those [CFA brochures] to you to read or did you just kind of pick them up and have a bit of a look?
Brian:	I just picked them up because I collect brochures.
Jess:	That's why you're so smart!

-9/10yrs, Macedon

Ostensibly, in having this view of Brian, Jess perceived his perspective as having a high degree of credibility. In another exchange, Brian successfully convinced his fellow focus group members that they would be safer in the house than the pool. By countering their arguments with his knowledge of fire behaviour, he succeeded in altering their perspectives:

Briony:	If you had a pool and the fire was coming up…
Jack:	Jump in it!
Briony:	Who would get in the pool?
Brian:	No.
Briony:	Brian, you said no. Why?
Brian:	Well, because like the embers are coming in and you can't like get out of the embers and the smoke.
Jack:	Hop under the water.
Brian:	Yeah but what if you go under the water you've gotta keep coming up.
Jack:	There wouldn't be any air so like if you could take an airtank with you.
Briony:	And stay under the water?
Brian:	Yeah but the embers would like [go under the water].
Briony:	So, what do you think would be safer, in the pool or in the house?

The issue of trust emerged again in an interview in Warrandyte where Jade tried to convince her friends that their plan to run to the letter box was dangerous, and that they should consider evacuating to a more distant destination. However, as the following extract illustrates, she was unsuccessful in her attempt because the advice to run the letterbox had come from members of the CFA, which her friends considered to be more credible source:

Olive: Yes, my mum and dad who are now not together anymore but they made a whole house plan, if the phone was gone that means one of us would've taken it but if we go we've gotta go and run out to the post box
Jade: But wouldn't you get in the car and then drive away?
Penny: No, you don't do that!
Olive: You've gotta get everyone together and then when everyone's together, well first you like run to the letterbox
Penny: We would be standing at the letterbox.
Olive: Yes, so we would we.
Jade: Why? Why wouldn't you be in your and driving away? That's what my mum and dad planned on because granny and grandad are going to be coming over in three weeks I think it is, so we need to be pretty ready.
Penny: I think standing by the letterbox because my uncle and auntie told me because they work for the CFA.

-7/8yrs, Warrandyte

The above discussion demonstrates the value of using focus groups to gather data in research with children. Such insights into how children influence each other's perspectives would not have been possible in individual interviews and would certainly not have been possible with the use of quantitative questionnaires. However, by enabling children to interact with each other on the topic of bushfire hazards, the peer group emerged as an important factor in the construction of children's knowledge.

7.6   Concluding remarks

This chapter has explicated how interactions with the physical and social world inform children's understanding of bushfire hazards. It has demonstrated how children's direct experience of fire provides a concrete foundation upon which they form their ideas about processes such as fire spread and radiant heat. It has documented the integral role that children's participation in family mitigation and preparedness activities plays in the development of their knowledge, and has shown how parents structure children's participation according to their child's age, interest levels, and other concerns, such as bush-related worry or fear. Of particular importance, this chapter has demonstrated that children are not passive recipients of risk information: rather, they actively disseminate information amongst other family members and are perceived by other family members as credible and worthwhile contributors to risk management within the household. Finally, by focussing on the

interview as a unit of analysis, this chapter has shown how both myself, as researcher, and the peer group influenced the construction of children's knowledge and perspectives during the course of the interview itself. By considering my role in the knowledge articulated by the children in the interviews, I am reflexively acknowledging my own contribution to the substantive theory that emerged from the analyses, which is consistent with the constructivist philosophy upon which the research is based. This substantive theory will now be presented in the following chapter.

CHAPTER 8: A SUBSTANTIVE THEORY OF SEEKING ADAPTATION

8.1   Introduction

The aim of this thesis is to develop a substantive theory that increases understanding of children's knowledge of bushfire hazards. The development of this theory comes at a critical time. Historically, children's bushfire education has not ranked as a priority in Australian emergency management policy or practice. However, the Black Saturday bushfire disaster and the subsequent Victorian Bushfires Royal Commission have resulted in an increased commitment to the delivery of bushfire education in Australian schools. This commitment, combined with the well documented need for hazards education to respect and accommodate the knowledge and experience of ordinary people, makes the development of this theory a crucial endeavour.

The thesis began by locating the study of children's knowledge of hazards and disasters within the broader hazards and disasters literature. Chapter 2 argued that the technocratic approach embodied by the hazards perspective has been largely unreceptive to the perspectives of children and this has served to marginalise them from the discourses of disaster research, policy, and practice. The vulnerability perspective was identified as offering a more appropriate frame through which to study children's knowledge: not only does it place a strong emphasis on understanding hazards and disasters from the perspectives of ordinary people; it also prioritises the safety and security of vulnerable and marginalised groups, such as children. As such, the vulnerability perspective has provided a strong theoretical foundation upon which to pursue an in-depth investigation of children's knowledge of bushfire hazards. In Chapter 3, the paradigm of inquiry guiding the research was outlined, whilst Chapter 4 described the qualitative methods that were employed to collect and analyse the data. Chapter 4 also detailed the procedures of theory development as stipulated by the canons of grounded theory methodology. Chapters 5 through 7 presented the problems, processes, and contexts that emerged from the grounded theory analysis. The primary aim of those three chapters was to develop a robust conceptual framework that privileges the perspectives of children and thereby resembles their perspectives as closely as possible. The aim of this chapter is to fulfil the fundamental requirement of grounded theory research and raise that conceptual framework to a more abstract, theoretical plane. It does this by proposing the substantive 'Seeking Adaptation'.

The substantive theory of Seeking Adaptation is a theoretical rendering of the phenomenon of bushfire hazards in south-eastern Australia, as studied from the perspectives of children that live there. It must be stated at the outset that this theory did not 'unfold' before my eyes, but was inevitably mediated by my own approach to the research process and my own interpretations of the data. This

perspective is consistent with the constructivist philosophy that underpins the research. As Charmaz (2000, p.522) explains:

> The grounded theorist's final analysis tells a story about people, social processes, and situations. The researcher composes the story. It does not simply unfold before the eyes of an objective viewer. The story reflects the viewer as well as the viewed.

This chapter begins by presenting a brief synopsis of the emergent theory. The theory is then explicated in detail, using the conceptual framework developed in Chapters 5 through 7 to guide the discussion and to show the theoretical links and relationships between the various problems, processes and contexts. Throughout the discussion, I draw on relevant literature from various disciplines including psychology, human geography, education, and hazard management to show how the current findings converge with, and diverge from, previous research. I also point to specific areas in which bushfire education for children would be particularly beneficial and suggest ways in which children's perspectives could be accommodated and transformed through the education process. The theory is then rendered in relation to two major theories in the child development literature; namely, Jean Piaget's Constructivist Theory of Adaptation (Piaget, 1952; 1955; 1960; 1970; 1977) and Barbara Rogoff's Theory of Guided Participation (Rogoff, 1990, 2003; Rogoff et al.,1993, 2002), both of which provide valuable theoretical frames through which to interpret the current findings. Conclusions about children's knowledge of bushfire hazards and the general implications for the development and delivery of children's bushfire education are drawn in Chapter 9.

8.2   A substantive Theory of Seeking Adaptation

The term 'adaptation' has its origins in the evolutionary theory of Charles Darwin (2003), who used it to describe the outcome of natural selection. The basic tenet of natural selection is that genetic variations in biological species are selected on the basis of their capacity to promote or inhibit survival in a particular environment: variations that allow a species to survive do so by allowing them to 'adapt' to specific environmental pressures and opportunities (Darwin, 2003; Dawkins, 1976). More recently, 'adaptation' has been appropriated by the disaster risk reduction and climate change adaptation research communities (Adger et al., 2003; Brooks, 2003; IPCC, 2007; Mercer, 2010; Thomalla et al., 2006; UN-IDSR, 2010). Both within and across these communities, there is a lack of a consensus concerning precisely what the term should be used to connote (c.f. Levina & Tirpak, 2006). Nonetheless, at a general level, adaptation in a disasters and climate change context can be taken to mean 'adjustment in a system's behaviour and characteristics that enhance its ability to cope with external stresses' (Brooks, 2003, p.8). Based on this general definition, adaptation was identified as a fitting descriptor for children's preferred ways of dealing with bushfire hazards. The substantive theory of Seeking Adaptation is encapsulated in Box 8.1.

Seeking Adaptation

For primary school-aged children in south-eastern Australia, being aware of the potential for bushfires in their local environment can cause worry and fear. This is because they perceive bushfires as having the potential to adversely impact upon things that they value, particularly life and property. In response to this worry and fear, children seek to develop strategies that will preserve and protect these valued things. To develop their strategies, they engage in active meaning making processes, both independently and in interaction with others, drawing on the knowledge they have acquired through their school, their family, and their own direct experiences with fire in the environment. When they perceive barriers to the implementation of their strategies, or strategies are judged ineffective, they seek to identify alternatives. If no alternatives can be found, a sense of helplessness emerges and their initial worries and fears prevail. However, when viable strategies can be identified, children gain a sense of empowerment which acts to ameliorate their fears of living in a bushfire prone environment.

Throughout this chapter, a detailed explication of Seeking Adaptation will be presented. The conceptual framework for this discussion has been developed in the preceding three chapters which delineated the following problem, process and contexts:

- *Perceiving Vulnerability* and its constituent sub-categories of *hazard impacts*, *the biophysical process of bushfire*, and *conditions of exposure* (Chapter 5).
- *Building Resilience* and its sub-processes of *mitigating the hazard* and *preparing for a bushfire event* (Chapter 6).
- The contexts and modifying conditions of *the school, the family, direct experience with fire,* and *the research process* itself (Chapter 7).

Through the use of this framework, which is depicted schematically in Figure 8.1, links and connections between the elements that comprise the theory of Seeking Adaptation can be made explicit, thereby fulfilling the fundamental goals of grounded theory research (Glaser & Strauss, 1967; Charmaz, 2006).
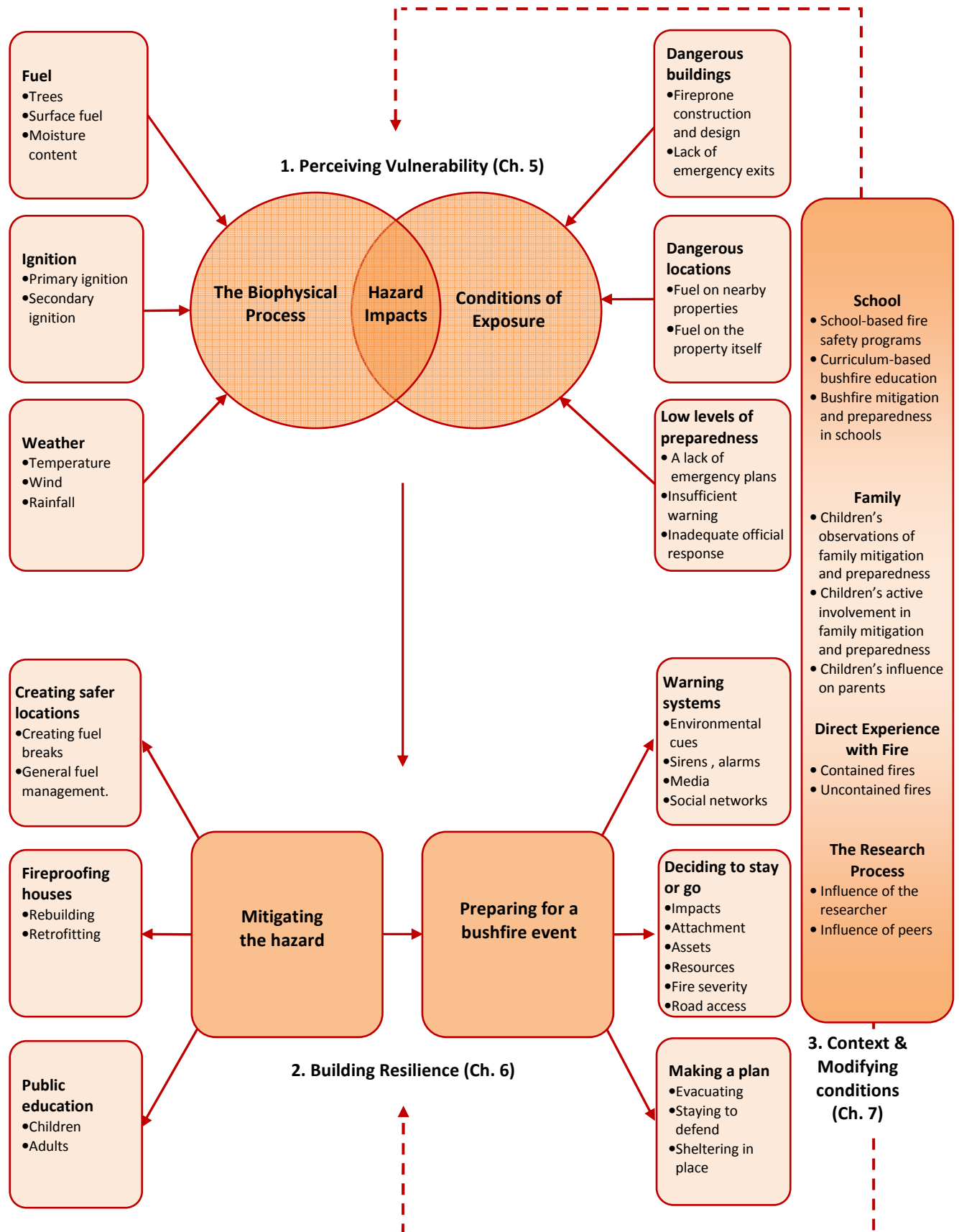
257

Figure 8.1: A conceptual framework of Seeking Adaptation

8.2.1 Perceiving Vulnerability

Hazard impacts

For the children in this study, perceiving vulnerability involved being aware of the potential for a bushfire event in the area and believing that such an event would impact adversely on the things that they value. Children were worried about their houses burning down, blowing up, or getting crushed by falling trees. They were also deeply concerned about the potential for death or injury, the causes of which were primarily attributed to burns, smoke inhalation, getting crushed by falling trees or debris, and getting trapped in burning houses where exposure to flames, smoke, and falling debris would be inescapable.

Children's perceptions of their own vulnerability to hazard impacts were generally accompanied by a certain degree of fear that they expressed through words such as 'scared', 'afraid', and 'frightened'. In most cases, children's fears of hazard impacts could be considered 'normal fears' which are defined in the literature as normal reactions to real or imagined threats that constitute an integral and adaptive aspect of development (Gullone, 1999, 2000; Klein, 2007; King, Hamilton & Ollendick, 1988; Morris & Kratochwill, 1983). Normal and adaptive fears have been differentiated from clinical fears or phobias on the basis of several criteria, including whether or not the expressed fear is age- or stage-specific, persists over an extended period of time, and/or significantly interferes with everyday functioning (Miller, Barrett & Hampe, 1974). Whilst one parent reported how her child's awareness of local bushfire hazards had interfered with his regular sleep patterns and usual play routines, there was little other evidence that children's bushfire-related fears approached a level indicative of clinical impairment or phobia. Rather, the data suggested that children's bushfire-related fears were situated at the 'normal' end of the fear spectrum, and given the high bushfire risk characterising the areas in which these children lived, these fears represented an adaptive reaction to a real potential for endangerment. It must be acknowledged, however, that although children's bushfire related-fears constitute a central element of the Theory of Seeking Adaptation, an in-depth analysis of these fears was well beyond the scope of this study. In the absence of any other detailed analyses of bushfire-related fears in childhood, developing a clearer picture of their dimensions, their correlates, and their impact on children's everyday functioning presents an opportunity for further research.

A key finding to emerge from the analysis was that children did not conceive bushfire hazards as impacting on people and property in an indiscriminate fashion. Rather, impacts were attributed to the interaction of bushfire as a biophysical process in nature and particular conditions of exposure that first, put people and property in harm's way, and then, impede their capacity to respond. This conceptualisation of hazards resembles Gilbert F. White's (1974, p.4) pioneering conceptualisation which was outlined in Chapter 2 and is worth repeating again in full:

A natural hazard is an interaction between people and nature governed by the coexistent state of adjustment in the human use system and the state of nature in the natural events system. Extreme events which exceed the normal capacity of the human system to reflect, absorb, or buffer them are inherent in hazard.

By viewing hazard impacts as the product of an interaction between the biophysical process of bushfire and the particular conditions in the human system that expose people to hazard impacts, children's conceptualisations were also aligned with those espoused by proponents of the vulnerability perspective, for whom disaster marks the interface between an extreme natural event and a vulnerable population (Bohle et al., 1993; Cutter, 1996; Hewitt, 1997; O'Keefe et al., 1976; Wisner et al., 2004). This is important because it serves to highlight that children's conceptualisations of bushfire hazards were not based upon calculations of probabilities or estimates of event likelihood (Johnston & Houghton, 1995; Ronan & Johnston, 2003; Finnis, et al., 2010; Finnis et al., 2004; Ronan et al., 2010; Ronan & Johnston, 2001; Ronan et al., 2006), but on their assessments of the extant conditions in the socio-ecological environment that serve to expose people to hazard impacts.

The Biophysical Process

Children's knowledge of bushfire as a biophysical process constituted an essential element of Seeking Adaptation: it formed the conceptual basis for identifying the conditions that expose people and property to hazard impacts, and it directly informed the development of strategies for building resilience. The children were able to identify many of the conditions and processes that facilitate and impede the biophysical process of bushfire: they correctly understood that it is highly contingent on fuel, ignition, and weather and they considered each of these factors when evaluating the potential for bushfire activity in their area. Of crucial importance to Seeking Adaptation, however, was that their knowledge was also characterised by numerous gaps and misconceptions which meant that conditions of exposure were often overlooked or underestimated. Consequently, children did not always perceive themselves as vulnerable and did not always experience the feelings of worry or fear that served as the impetus for identifying protective actions. The following pages will discuss children's knowledge of the biophysical process in light of the extant literature.

Fuel. Children were thoroughly familiar with the organic materials that would constitute fuel for a bushfire, including standing fuels, such as trees and shrubs, as well as surface fuels, such as grass, leaves, and timber litter, all of which were identified as highly combustible and highly conducive to bushfire activity. Children generally viewed bushfire likelihood as being determined, at least in part, by the available fuel in a particular location. Areas with dense tree coverage and deep layers of surface fuel were perceived as having a high likelihood of large bushfires. By contrast, areas with less dense tree coverage and fewer surface fuels were perceived as having a low likelihood of bushfire activity, and it was assumed that if a bushfire did occur in an area like this, it would be minor. In light of this general view, it was not surprising that native bushland areas, which are typically characterised

by dense tree coverage and heavy surface fuels, were considered the prime locations for "massive" bushfires, whereas bushfire activity in high-density urban environments was viewed as highly improbable. Importantly, the majority of children believed that the fuel loads in their area were substantial enough to support major bushfire activity, which was consistent with the assessments of the community safety directorates of the CFA and Tasmanian Fire Service which had identified each of the study areas as having a high likelihood of bushfire activity.

Children also identified the moisture content in fuel as a key determinant of its flammability and judged this as having important implications for the likelihood of fire ignition and rates of fire spread. Dry fuel was perceived as being highly susceptible to ignition which would facilitate a more rapid and more extensive rate of spread. Green fuel, on the other hand, was perceived as being either less susceptible, or entirely resistant to ignition, which would either slow fire spread or prevent it completely. Fuel moisture content, in combination with air temperature, relative humidity, and wind speed, constitutes a key variable in the McArthur Mk5 Forest Fire Danger Metre (FFDM), which is the key index used by Australian fire agencies to forecast the chances of a fire starting, its rate of spread, its intensity, and its difficulty of suppression (Cheney & Sullivan, 1997). On the FFDM, a decrease in fuel moisture generates a concomitant increase in each of these indices, an effect with which the children in this study were thoroughly familiar. Thus, children were able to accurately identify one of the key determinants of bushfire likelihood and severity as identified by the experts.

Ignition. Children identified ignition as the essential trigger for a bushfire event and a key determinant of fire spread. For brevity's sake these two processes were termed primary ignition and secondary ignition, respectively. With regards to primary ignition, children identified both natural and human causes. Natural causes included lightning strikes and, most interestingly, spontaneous ignition from the sun's rays. The number of children who cited spontaneous ignition from the sun's rays as a major cause of primary ignition suggests that children's understanding of bushfire ignition may be subject to what neo-Piagetian scholars refer to as naïve mental models or 'theories' of the world (Vosniado & Brewer, 1992, 1994; Wellman & Gelman, 1992). Research in the tradition of naïve theories seeks to show how children have strong intuitions about the natural world that lead them to construct particular theories to explain it. For example, Stella Vosniadou and colleagues (Samarapungavan, Vosniadou, Brewer, 1998). Vosniadou, 1994; Vosniadou & Brewer, 1992, 1994) have shown repeatedly, across a number of different cultures, that children say the earth is either a) flat with people on top, b) hollow with people inside, or c) dual with one flat earth on which we live, and another, spherical one up in the sky. These researchers claim that since it is unlikely that anyone has told children that the earth is flat, hollow or dual, children must have strong intuitions that lead them to understand the earth in this way. The frequency with which children identified the sun's rays as a cause of primary ignition suggests that more detailed examinations of children's theories about the earth as they relate to the specific mechanisms underlying extreme natural events may be a worthwhile endeavour for future child-

centred hazards research, particularly if these theories are resistant to change, as the proponents of research in this tradition have claimed (Vosniadou, 1994, 1998). However, as with much neo-Piagetian research, research on naïve theories has been criticised for disregarding the influence of socio-cultural context on children's constructions of reality (Siegal, Butterworth & Newcombe 2004). Hence, hazards research with children in this tradition would need to be sensitive to such influences.

In addition to natural causes, children also identified a number of human activities that can serve as mechanisms for primary ignition such as recreational or agricultural fires, and starting fires deliberately or 'for fun'. Of particular interest, was the pervasive perception that bushfires can start as a result of the sun shining though glass fragments that people have left on the ground. Whilst Cheney and Sullivan (1997, p.2) suggest that it is theoretically possible for glass bottles or fragments to facilitate bushfire ignition, they argue that under field conditions it is 'highly unlikely that a bottle or glass fragment will form a lens of the correct focal length and orientation to concentrate sunlight sufficiently to start a fire'. In his socio-historical analysis of bushfire in Australian popular culture, Schauble (2006, p.4) argues that the pervasive public perceptions to the contrary can be attributed to 'cultural artefacts', particularly depictions of bushfires in Australian literary fiction for children and young people (cf. Southall, 1965; Theile, 1966). He further argues that the common perception that discarded cigarette butts are a major cause of bushfire ignition, can be largely misconceived and can most likely be attributed to same literary sources. There was no direct evidence that the children in this study had read any of the literature to which Schauble (2006) refers in his analysis. Yet, glass fragments and cigarette butts were frequently identified as causes of primary ignition which would suggest these cultural artefacts also exist in the communities of the children in the study and this worthy of further investigation.

Of special significance to the theory of Seeking Adaptation was children's knowledge of secondary ignition and its role in fire spread. Whilst a small number of children articulated an understanding of how embers or sparks could ignite spot fires ahead of the main fire front, fire spread was primarily conceptualised as a concrete, linear process involving the flame from a burning fuel source igniting a nearby fuel source via direct flame contact. According to this conceptualisation, if the distance between two fuel sources exceeded the maximum flame length or there was some other non-flammable barrier preventing direct flame contact, the path of ignition would be broken, thereby halting the fire's progress. Understanding fire spread purely in terms of direct flame contact had major implications for Seeking Adaptation because it often led children to underestimate their potential exposure to hazard impacts. Indeed, the perception that if direct flame contact was impeded, hazard impacts would be prevented was pervasive. However, when children understood the concept of ignition via embers they were less likely to perceive a break in the chain of direct flame contact as preventing exposure to hazard impacts because an ember could traverse the break, ignite a new fire on the other side, and thereby perpetuate the threat. Clearly, concepts of ignition via sparks and ember

must be made a part of bushfire education for children, for it is upon these concepts that more sophisticated understandings of bushfire hazards rest.

It must be noted, that children who did understand the concept of ignition via sparks or embers tended to underestimate the sorts of distances that windborne embers can travel, with most children suggesting that they would only travel a few metres. As was clearly demonstrated on Black Saturday, however, when strong winds prevail and convection columns[1] are of sufficient magnitude, embers can start spot fires several kilometres away from the main fire front, exposing unsuspecting communities to hazard impacts (Teague et al., 2010). Thus, children not only need to learn the concept of ignition via embers and sparks, they also need to learn how far windborne embers can travel, lest they believe that it is only fires burning within a relatively short distance that have the potential to exert hazard impacts.

Another mechanism of fire spread of which children were largely unaware was ignition via radiant heat. Ignition via radiant heat involves the transfer of heat from burning objects via electromagnetic waves which travel at the speed of light away from the burning object and transfer their energy matter to the matter they impact upon (Cohen, 1995; Pyne et al., 1996). In general, the size of the burning object determines the amount of energy released and, if the energy released reaches a certain intensity or 'flux', it will ignite the receiving matter (Cohen, 1995; Pyne et al., 1996). Empirical studies have repeatedly found that radiant heat from a bushfire can ignite combustible fuel sources from distances of over 30 metres or more, depending on the size of the fuel source and size and intensity of the fire (Cohen, 2000). However, children did not exhibit any knowledge of ignition by radiant heat, not even at very short distances. The only time radiant heat was mentioned by the children in this study was in the context of hazard impacts on people, with a small number of children articulating at least a rudimentary knowledge of its potentially fatal effects on the human body.

Weather. As noted earlier, the key tool used for assessing fire danger in Australia is the FFDM, which provides an index the chances of a fire starting, its rate of spread, its intensity, and its difficulty of suppression (Cheney & Sullivan, 1997). It will also be recalled that particular atmospheric conditions, primarily temperature, relative humidity, and wind speed, comprise the key variables for calculating this index. With the exception of humidity, children recognised each of these atmospheric conditions as playing an integral role in the frequency, severity, and extent of bushfire activity. Perhaps more importantly, however, they also exhibited a sound knowledge of the particular roles that each of these atmospheric conditions would play.

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[1] A convection column is the rising column of smoke, ash, burning embers and other particle matter generated by a fire (AFAC, 2011).

Firstly, children were well aware that the high temperatures of the summer months drain the moisture from available fuels making them highly susceptible to ignition. They also knew that an uncharacteristically warm prelude to summer would further exacerbate this process, making the bushfire season a particularly active one. The summer heat was also associated with an increased frequency of lightning strikes which would increase the chances of a fire starting. Importantly, however, some children did not believe that the summer temperatures in their area were of the level required for serious bushfire activity, which they associated with the northern regions of Australia. Thus, whilst children made a clear connection between high temperatures and bushfires, there was a subjective element to their interpretations of the environment in which they live, which, in some cases, led to an underestimation of bushfire likelihood in the area. For the most part, however, children perceived the temperatures in their own local area as highly conducive to bushfire activity.

Secondly, children were well aware of the role of rainfall in the moisture content of fuel. Low rainfall was associated with dryer fuels and vice versa for high rainfall. Thus, low rainfall was strongly associated with a high likelihood of bushfire activity. Children recognised the impact of short-term rainfall patterns on the biophysical process: put simply, recent rain would dampen down fuels and impede the ignition process. Children also recognised the impact of long-term rainfall patterns and showed an understanding of how the climatic conditions at the time were increasing the likelihood of bushfires in their area. At the time of data collection, south-eastern Australia was in the grip of an extended drought. Most of Victoria and parts of Tasmania had experienced below average rainfall for over a decade (BoM, 2011). These drought conditions were a primary determinant of the intensity and severity of the Black Saturday bushfires that immediately proceeded the final phase of data collection for this research (McCaw et al., 2009; Tolhurst, 2009). Being under the age of twelve, these children had been living with drought their whole lives. Children in Macedon and Warrandyte had grown up in an era of water restrictions and had learned to conserve water as much as possible. Children in Bothwell, meanwhile, had observed firsthand the devastating impacts of drought on primary production. With their acute awareness of the drought conditions and their knowledge of the relationship between rainfall and fuel moisture, the children were anticipating severe bushfire activity during the 2008/2009 bushfire season. The scientific consensus that the Black Saturday bushfires were the most severe since European settlement is testament to the accuracy of the children's predictions (Teague et al., 2010).

Finally, wind was also identified as an important factor in the biophysical process. According to the literature, wind speed is the most important factor in determining fire behaviour in dry fuels (Pyne et al., 1996). Wind influences fire behaviour in several different ways: it blows the convection column ahead of the fire which increases the wind speed in the flame zone, thereby providing additional momentum to fire spread; it tilts the flames forward and provides more effective radiation and pre-heating of unburnt fuels; it increases the chances of direct flame contact with fuels ahead of the fire;

and lastly, it blows burning embers ahead of the fire to create spot fires (Rauscher & Hubbard, 2011). The influence of wind on the biophysical process was widely recognised by the children in this study, who readily identified its role in the latter two processes listed above. Firstly, they frequently described a process whereby wind would blow flames sideways, extending their length and increasing the chance of direct flame contact with nearby fuels. Secondly, children with an understanding of embers described a process whereby wind would blow embers and sparks onto new fuel sources, creating the potential for new fires to ignite. Whilst data relating to children's knowledge of the other listed effects of wind was not forthcoming, their knowledge of these processes should be probed more thoroughly in future research to further ascertain the breadth of their knowledge in this realm.

One particularly important issue relating to wind that was not articulated by the children, but has significant implications for bushfire behaviour in south-eastern Australia, relates to the typical summer wind pattern. As will be recalled from Chapter 1, a major factor influencing the severity and extent of bushfires in this part of the world relates to the characteristic late afternoon south-westerly wind change, which abruptly turns the flank of a long, narrow, cigar shaped fire into a fire front several kilometres wide (BOM, 2009; Tolhurst, 2009). Importantly, research has found that this characteristic wind pattern is not well understood by the general community (Lazarus & Elley, 1984) and the Victorian Royal Commission also noted a lack of awareness in the community concerning this pattern (Teague et al., 2010). Given the frequency with which this wind pattern manifests during the south-eastern Australian summer, and the extreme effect that it exerts on the rate and extent of fire spread, it is important for bushfire education to extend children's existing knowledge of wind to incorporate an awareness and understanding of this important atmospheric phenomenon. Because they already understand that wind direction determines the direction of a fire, learning about the south-westerly wind change would be a simple extension of their existing knowledge.

This discussion has shown that whilst children have knowledge of the biophysical process that is both vital and accurate, their knowledge is also characterised by fundamental misconceptions and critical gaps. Arguably, the most important of these relate to the misconception that fire spread, or 'secondary ignition', depends entirely upon a process of ignition via direct flame contact. The sophistication of children's knowledge about fire spread was of crucial importance to Seeking Adaptation because it caused many children to underestimate their potential exposure to hazard impacts. This, is turn, meant that children were not worried about, or afraid of, losing things of value which negated the need to engage in building resilience. Thus, learning about processes of fire spread must be made a core component of any bushfire education program. This argument is taken further in the following section on conditions of exposure.

Conditions of exposure

As already noted, children did not conceive bushfire hazards as impacting on people and property in an indiscriminate fashion. Rather, impacts were conceived as deriving from an interaction between the biophysical process of bushfire and particular *conditions exposure*. To identify these conditions, children drew heavily on their knowledge of the biophysical process and it was only when children believed that the conditions on and around their property would facilitate the biophysical process and expose them to hazard impacts that that they experienced the worry and fear that provided the impetus for engaging in the core process of building resilience. When children lived on a low-risk property, or their misconceived knowledge of fire behaviour lead them to perceive their high-risk property as low-risk, they did not feel afraid or concerned and therefore perceived no reason to engage in mitigating or preparing. Thus, conditions of exposure constituted a fundamental element of Seeking Adaptation.

The three major conditions that children believed would expose people or property to hazard *impacts* were *dangerous locations, dangerous houses* and *low levels of preparedness.* In the vulnerability literature, these conditions have been similarly identified as key characteristics of a vulnerable population (Cutter, 1996; Hewitt, 1997; Wisner et al., 2004; Maskrey; 1989). More importantly, however, the vulnerability literature places a premium on the social, economic, and political forces that create, or place people in, these dangerous situations and children also demonstrated a capacity for understanding how these structural factors conspire to make people vulnerable. In particular, these structural factors were viewed as rendering some resilience strategies untenable (e.g. not having sufficient economic resources to make structural adjustments to the home). This is an important finding because it complements the extant literature which has been unable to demonstrate a direct link between hazards knowledge and hazard adjustments (Sims & Baumann, 1983; Solberg et al., 2010), but has identified structural factors as key intervening variables in people's mitigation and preparedness behaviours (Solberg et al., 2010). In the current research, children's hazards knowledge and perceptions were an important precondition for wanting to mitigate and prepare for hazard events. Yet, children often felt that their capacity to undertake action was heavily constrained by social and economic forces. This exerted a profound influence on Seeking Adaptation which is highlighted throughout the discussion that follows.

Dangerous locations. Dangerous locations were primarily characterised by heavy fuel loads both on and around the property. Living in close proximity to native bushland, plantation forests or other sizeable tracts of dense vegetation was the defining characteristic of dangerous locations. Living in close proximity to densely vegetated or poorly maintained residential or commercial properties was another. However, not all children living in close proximity to bushland or other heavy fuel loads perceived the location of their property as dangerous: children whose knowledge of fire spread was limited to ignition via direct flame contact tended to overestimate the level of protection that would be provided by gaps or barriers, such as rivers, roads, walls and fences. These children did not believe

that a fire would be able to spread across these gaps or barriers and, consequently, did not believe that their property could be exposed to hazard impacts. Hence, they did not perceive their vulnerability and did not experience the bushfire related fear that provided the impetus to engage in the core process of building resilience. By contrast, children who *did* have an understanding of ignition via embers or sparks, did not believe that rivers, roads, walls and fences would completely prevent fire spread and were, therefore, more likely to perceive their own vulnerability, experience some level of fear or concern, and engage in identifying protective actions.

Although children generally perceived close proximity to bushland or other heavy fuel loads as increasing their exposure to bushfire hazards, it was fuel on the property itself to which hazard impacts were largely attributed. Furthermore, because most children understood fire spread solely in terms of direct flame contact, it was vegetation and other fuel sources positioned within flame distance of the house that were seen as the chief cause of house ignition and all of its associated impacts. Most children depicted house ignition as a process in which a fire would travel towards the house, from one fuel source to next, along a chain of direct flame contact until it reached fuel sources in close enough proximity to the house for flames to ignite the exterior walls, at which point the fire would consume the house from the outside in. Thus, there were cases in which children were living just metres from major tracts of bushland, but they did not believe their property would be exposed because flames 'would not reach that far'.

Contrary to children's general understanding of house ignition, however, extensive empirical research has repeatedly shown that the predominant cause of house ignition is not direct flame contact during the passage of the fire front, but spark and ember attack in the periods before the fire front arrives and after it has passed (Leicester, 1987; Ramsay & Dawkins, 1993; Ramsay & McArthur , 1987; Ramsay, McArthur & Dowling, 1994, Leonard, 2003; Blanchi & Leonard 2008). As Blanchi and Leonard (2008) explain, although direct flame contact can play a part in the ignition and destruction of buildings, this mechanism is generally only significant during the few minutes it takes for the fire front to pass. Yet, a building may be exposed to showers of burning debris for some time before the fire front arrives, as the fire front passes through, and for several hours afterwards. This extended period of ember attack explains why burning debris is a major cause of house ignition: if left to smoulder, these embers can start small spot fires in crevices, cracks, or cavities which then grow in size until they take hold of larger fuels and the house becomes consumed, usually from the inside out (Blanchi & Leonard, 2008). Furthermore, whilst research has found that trees in close proximity to the house increase the risk of house ignition, this has largely been attributed to the deposition of material on and immediately around the house as opposed to the mechanism assumed by the children in this study (i.e. the burning tree falling on the house) (Leonard, 2003; Ramsay et al., 1994).

Another form of house ignition of which children were largely unaware was ignition via radiant heat. Although less common than ignition via ember attack, house ignition via radiant heat is nonetheless possible and research has found that the radiant heat emitted from burning vegetation can ignite a wooden structure from over 15 metres away (Cohen, 1995). Ignition via radiant heat is particularly problematic in high density residential neighbourhoods, where houses are located within close distances of one another because radiant heat can trigger house to house ignition at a distance of only eight metres (Cohen, 1995). However, as noted earlier, the phenomenon of radiant heat was not widely understood by the children in this study and there was no evidence that children had any knowledge of house ignition, or the ignition of other fuels, via radiant heat.

It is important to emphasise that children conceived death and injury in a very similar way to house ignition: primarily in terms of the body coming into contact with some visible, concrete element of the hazard such as flames, debris, or smoke. They were much less aware of the less visible, less tangible dangers, such as radiant heat. Yet, radiant heat can kill a person very quickly without the flames ever touching them. The extreme radiant heat emitted from a bushfire, which can reach in excess of 300 degrees Celsius (Butler & Cohen, 1998), causes a rapid increase in core body temperature which then overwhelms the body's natural cooling system, which in turn, leads to heat exhaustion and heart failure (McLennan, Omodei, Elliot & Holgate, 2009; McLennan, Omodei, Elliot & Holgate, 2011). In empirical investigations, radiant heat has been repeatedly identified as the major cause of bushfire fatalities in Australia (Haynes et al., 2008b; Handmer, O'Neill, & Killalea, 2010). In a large scale retrospective study that examined bushfire fatalities from the years 1909 to 2009, Haynes and colleagues (2008b) attributed the majority of the documented 552 deaths to radiant heat exposure. In another study of the Black Saturday fatalities, radiant heat was again identified as a prominent cause of death (Handmer, O'Neill, & Killalea, 2010; Teague et al., 2010).

Children's general lack of knowledge about radiant heat has also been identified in the broader adult population. In a large scale qualitative study of Black Saturday survivors, McLennan and colleagues (McLennan et al., 2009, McLennan et al., 2011) concluded that the public at large is generally unaware of the dangers of radiant heat, and this places them in extreme peril when faced with a bushfire emergency. Thus, educating children about radiant heat and how to protect themselves against it should be made a key priority of bushfire education. That this would be both possible and worthwhile is supported by the finding that several children were aware of its dangers, and whilst they may not have articulated a detailed understanding of its underlying physical processes and dimensions, they were aware of the need to protect the body against it. Perhaps more importantly, they were also aware of how this could be achieved; namely, by seeking shelter inside a building during the passage of a fire front.

It must be emphasised that although children perceived dangerous locations as exposing people and property to hazard impacts, they also recognised the benefits of living in natural bush environments and valued the trees for their ecological and aesthetic properties. This perspective is consistent with Burton et al.'s (1978) conceptualisation of natural processes interacting with social systems to create hazards *and* resources and, when it came to general fuel management, sacrificing these resources was an issue for some children. A reluctance to alter the natural environment for the purposes of bushfire management has also been identified as a key barrier to creating defendable space in numerous adult-based studies of bushfire mitigation and preparedness (Brenkhert-Smith, 2006; Eriksen, 2010).

Dangerous houses. Whilst children based their assessments of the potential for a house to ignite on its proximity to fuel, this was not the only condition upon which house ignition was seen to rest. The house itself was considered an extremely important factor and some houses were perceived as being more susceptible to damage and destruction than others. In assessing the potential impacts of bushfire on a house, children focused heavily on building construction and design. They evaluated the strength and flammability of every structural component, including the walls, doors, decks, windows, rooves and eaves. With the positive identification of a single flammable element, the house was identified 'fire prone' and, if it was located in a dangerous location, it was identified as being highly susceptible to ignition and destruction. Whilst there was some variation in the building materials that children perceived as being most susceptible to ignition, wood was invariably perceived as being highly susceptible by all of the children. Hence, wooden houses, or houses with at least one wooden structural component (e.g. wooden window frames, wooden eaves, or a wooden door) were considered highly exposed to ignition and the related hazard impacts.

It is interesting to consider this finding in light of research involving both post-incident house loss surveys and controlled laboratory experiments (McArthur & Lutton, 2004; Leonard & Blanchi, 2005; Ramsay, 1995; Ramsay & McArthur, 1987). These surveys and experiments have consistently identified several elements of construction and design that act as key determinants of house ignition and destruction. For instance, in an analysis of post-bushfire house loss surveys conducted in the aftermath of Ash Wednesday in 1983, the Sydney bushfire in 1994, and the Canberra bushfires in 2003, Blanchi, Leonard, and Leicester (2007) ranked the most prominent points of house ignition. At the top of the list were timber decks, timber eaves, timber stairs, and timber window frames. Weatherboard walls, meanwhile, were identified as the least prominent. For the children in this study, however, weatherboard walls took precedence as the primary point of potential house ignition. Although children did acknowledge structural features such as timber eaves, decks and window frames as potential ignition points, the actual ignition of these features was conceived primarily in terms of direct flame contact with nearby fuel sources. Yet, as Blanchi et al. (2007) explain, it is not direct flame contact to which these features are susceptible, but ember attack. This is because they provide horizontal surfaces, crevices, or corners where embers and debris can accumulate and start

small fires that, if left to burn, can reach a size and intensity of sufficient magnitude to start igniting other parts of the house (Blanchi et al., 2007). Thus, whilst children identified a combination of construction materials and direct flame contact as the key determinants of house ignition, research has found that it is the design of buildings, particularly the number of surfaces upon which embers can accumulate, that is most important (Blanchi & Leonard, 2008).

The significance of this for the theory of Seeking Adaptation relates to the tendency for children living in weatherboard houses to think that mitigating the hazard would require completely rebuilding the house in brick, a strategy that would undoubtedly exceed the resources available to most Australian households. According to the proposed theory, this would lead to the feelings of disempowerment that emerge when children are presented with barriers which prevent them from finding satisfactory strategies for protecting the things that they value. Theoretically, however, if children's knowledge of house ignition was more sophisticated, they might be less likely to view the ignition of a wooden house as inevitable and be more likely to seek alternative strategies for protecting their homes from bushfire hazards.

The research on house ignition and destruction also demonstrates that whilst wooden houses may be more prone to these processes than brick houses, the latter are by no means fully resistant because any crack or crevice can serve as an entry point for embers or sparks and the resultant spot fires that consume a house from the inside out (Blanchi & Leonard, 2008). However, by focusing so heavily on the flammability of construction materials, children living in brick houses tended to overestimate the extent to which their house would resist hazard impacts, which in turn, negated the worry and fear that prompted engagement in building resilience. Put simply, some children living in brick houses did not think that they would need to do anything because their house was brick.

Windows were another design feature that children perceived as having substantial implications for house survival. Empirical research has also identified windows as particularly prone to breakage during a bushfire event (Ramsay & Rudolph, 2003; CSIRO, 2008). However, whilst children generally attributed window breakage to direct flame contact from nearby fuel sources, research has identified radiant heat as the major cause. Furthermore, whereas children generally identified broken windows as problematic because they would provide an opening through which flames could enter the house, research has consistently found that ember attack is the prominent mechanism for internal ignition via broken windows (Blanchi et al., 2007; Ramsay & Rudolph, 2003). Thus, whilst children correctly identified windows as a condition of exposure, their knowledge of the underlying mechanisms by which windows would expose a house to ignition was limited to that of ignition via direct flame contact. Children also perceived gaps and openings, such as open doors, windows, and holes in exterior walls, as problematic because they would provide a passage for ignition via direct flame contact. Yet, empirical research has identified the accumulation of embers as the prominent

mechanism for ignition in this context also (Blanchi et al., 2007; CSIRO, 2008; Ramsay & Rudolph, 2003).

Thus, children's knowledge of house ignition consisted of several misconceptions that were derived primarily from the underlying misconception that fire can only spread via direct flame contact. It is important to note that although there is no solid empirical research on how house ignition or fire spread is conceived by the public at large, the general view amongst emergency managers and scholars in the field is that that the physical process of house ignition is not well understood by adults and that the myth of 'exploding houses' is pervasive in the community (Teague et al., 2010; Ramsay & Rudolph, 2003). Thus, teaching children about the predominant mechanisms of house ignition should be made a priority of bushfire education: firstly, it would open up opportunities for children to identify mitigation strategies beyond rebuilding; secondly, it would help children to understand the more covert mechanisms of house ignition and subvert the notion that 'brick houses don't burn'; and thirdly, it would go some way towards addressing the myth of exploding houses that is thought to be widely held in the broader community.

Another characteristic of dangerous buildings that had particular import for the theory of Seeking Adaptation was related to of the existence of emergency exits through which occupants could escape if a building did catch alight. Getting trapped in burning buildings was identified as a major cause, if not the primary cause of bushfire deaths, and this had significant implications for how children planned their emergency response. Children were often reluctant to shelter inside a building because they believed that there was a high likelihood of getting trapped, the consequences of which would be fatal: yet, they had few reservations about undertaking a last minute evacuation. However, last minute evacuations have emerged as a major issue in post-fire inquiries and empirical research (Lazarus & Elley, 1984; Ellis et al., 2004; Handmer & Tibbits, 2005; Haynes et al., 2008b; Rhodes, 2008; Teague et al., 2010; Tibbits & Whittaker, 2007). According to research on Australian bushfire deaths, the vast majority of bushfire deaths occur not in buildings but out in the open, often as people attempt to flee their homes, either in cars or on foot, which exposes them to the perils of thick smoke and unmitigated radiant heat (Haynes et al., 2008b). In this study, the view that evacuating at the last minute would be safer than sheltering in a house exerted a profound influence on the development of plans for responding safely to bushfire emergencies. This issue will be picked up again in the later discussion of preparing for a bushfire event.

Low levels of preparedness. For the children in this study, a low level of preparedness was associated with increased exposure to hazard impacts because it would undermine the capacity to respond to a bushfire event. The absence of an emergency bushfire plan, insufficient warning, and inadequate support from the fire brigade were all identified as exposing people and property to hazard impacts. Arguably, however, it was the absence of an emergency plan that caused the greatest amount of

bushfire-related worry and fear amongst the children. Typically, if a child believed that their property could be exposed to hazard impacts but they lacked a definitive bushfire plan, they worried about how they would protect themselves in a bushfire event. This was usually dealt with by either making a plan themselves or by encouraging their family to make one, which had the effect of ameliorating worries and fears. However, a major issue relating to children's emergency plans was the marked tendency for children to mistake their house fire escape plans for bushfire plans. This often led children to overestimate their preparedness which circumvented of the need for Seeking Adaptation: they did not perceive any need to engage in the resilience building strategy of making a plan because they believed that they already had one. That children had developed these plans as part of their school-based house fire education demonstrates one of the key elements of the proposed theory: specifically, when developing strategies for protecting the things that they value children engage in active meaning-making processes, drawing on the knowledge they have acquired through various contexts, which, in this particular case, was the school. There was a distinct tendency for children who had received school-based house fire education to mistakenly believe that the information was applicable bushfires, and this had an important influence on how children understood and sought to adapt to bushfire hazards. This will be highlighted again throughout the remainder of this chapter.

Whilst the absence of an emergency bushfire plan seemed to cause children the most amount of worry, insufficient warning of an impending bushfire threat was also a key concern. Insufficient warning was seen to undermine attempts at protecting property because there would not be time to undertake adequate preparations. It was also seen to undermine attempts at protecting life because there would not be enough time to find a safe refuge or escape. Indeed, an absence of clear, reliable advanced warnings was identified by the Royal Commission as a key factor in the extensive house loss and high death toll in the Black Saturday bushfire disaster (Teague *et. al*., 2010). Research conducted in the aftermath of Black Saturday found that many people did not realise there was a fire until it was already impacting upon their area: in some extreme cases, people did not receive any advanced warning at all, and the fire had reached their property before they became aware of the threat (Teague et al., 2010; Whittaker et al., 2009). Whilst interviews for this study were conducted in the months preceding the Black Saturday disaster, the children were aware of how insufficient warning can expose people and property to bushfire hazard impacts. Hence, establishing warning systems was viewed as a key component of building resilience.

The final aspect of preparedness to which children attributed hazard impacts was related to the response capacity of official emergency management agencies, particularly the fire service. The level of professional firefighting support supplied to households in the event of a bushfire was considered a key determinant of exposure to a bushfire event, and the failure of the fire brigade to provide support was viewed as a primary cause of house damage and destruction. Importantly, however, children perceived fire agencies as having the capability to suppress any fire and to save any house which

represents a distinct overestimation of fire agency capabilities and resources. Amongst fire agencies and researchers in the field, there is a general consensus that unrealistic expectations of fire agency support are pervasive in the community, with many residents in high-risk areas expecting that the fire service will be there to protect their property if it comes under threat (Handmer & Haynes, 2008; Prior & Paton, 2008; Teague et al., 2010; Whittaker, 2009). For this reason, fire agencies direct considerable resources towards dispelling the myth that a fire truck will be dispensed to every house during a bushfire emergency (CFA, 2011; TasFire, 2011). It is possible that children's expectations of firefighting support is derived from their involvement in house fire safety education, which assures them that the fire brigade will be there to help in an emergency. This has important implications for Seeking Adaptation because placing responsibility for the protection of life and property in the hands of fire agencies, and believing that the fire agencies have the capability to fulfil that responsibility, negates the perceptions of vulnerability that precipitate building resilience: put another way, when children think that the fire service will always be there to save them and their home, then they perceive little need to do anything else to protect the things that they value.

Taken together, these discussions of children's knowledge of how the biophysical process and conditions of exposure interact to expose people and property to hazard impacts have shown how being aware of the potential for a bushfire in the area does not always translate into perceptions of vulnerability. Although children understand that bushfires have the potential to impact adversely upon the things that people value, often enough, the gaps and misconceptions in their knowledge of the biophysical process mean that they do not always perceive themselves as being personally exposed. Hence, not all children experience the feelings of worry and fear that serve as the impetus for identifying protective strategies. However, when children do perceive themselves as personally vulnerable and believe that a bushfire in the area could impact upon the things that they value, they seek to manage the resultant worry and fear by identifying strategies for protecting these valued things and view the process of building resilience as both necessary and worthwhile.

8.2.2   Building resilience

When children perceived their own vulnerability to hazard impacts - when they recognised that a bushfire in the area could impact adversely on the things that they value - they perceived a concomitant need to take action. Importantly, the way that children conceptualised vulnerability to hazard impacts provided considerable opportunities for reducing it. Whilst hazard impacts were related to natural conditions and processes over which humans have no control (i.e. hot, dry and windy weather, lightning strikes, and the extreme flammability of the Australian bush), they were also related to conditions and processes that are within the realm of human agency (i.e. building fire prone houses in dangerous locations and then failing to prepare for a bushfire event). This characterisation of vulnerability had special import for Seeking Adaptation: because hazard impacts were conceived as resulting from conditions that are within the realm of human agency, it was also considered within the

realm of human agency to alter these conditions in a way that would minimise adverse impacts on valued things. In taking this view, children did not view people as passive victims of bushfire disasters, but as active agents who can do something to protect themselves, their families, their homes, and their communities.

The process of building resilience involved taking steps to reduce exposure to bushfire hazards through mitigation measures such as *creating safer locations, fireproofing houses* and increasing people's knowledge and awareness of bushfire hazards through *public education.* It also involved increasing capacities to respond to a bushfire event by *establishing warning systems*, *deciding to stay or go,* and *making emergency plans.* In this sense, children's approaches to building resilience reflected the definition that was offered in Chapter 2, where it was conceived as:

> [A] product of the degree of planned preparation undertaken in the light of potential hazard, and of spontaneous or premeditated adjustments made in response to felt hazard, including relief and rescue (Pelling, 2003, p.48).

Of additional importance to the theory of Seeking Adaptation was that when children identified various physical, social and economic barriers to implementing protective strategies, alternative strategies were sought, but if no viable, achievable strategy could be identified, children's bushfire worries and fears and concerns persisted and a sense of helplessness emerged.

Over the following pages the process of building resilience will be related to the theory of Seeking Adaptation. Special emphasis will be given to how children's knowledge of the biophysical process and conditions of exposure informed the identification of protective strategies, and how, in some cases, this led to mitigation strategies and preparedness plans that would have the unintended effect of increasing their exposure to bushfire hazards. Emphasis is also placed on how children's knowledge of resilience strategies was informed by their previous experiences and interactions in various environmental and social contexts. However, a detailed discussion of these contextual factors is reserved for the subsequent discussion of contextual and modifying conditions.

Mitigating the hazard
Creating safer locations. One of the major strategies for creating safer locations involved establishing fire breaks. It has already been emphasised that when children did not have an understanding of ignition via embers or sparks, they perceived a pre-existing non-flammable barrier, such as a river or a road, as providing an impenetrable barrier to fire spread, and this served to create a false sense of security. Believing that a short break in fuel or a non-flammable barrier would effectively prevent fire spread also meant that children believed they could protect their properties through the single action of erecting a fire break or fence around their home, thereby rendering the need for further attempts at Seeking Adaptation unnecessary. However, given that the majority of houses are ignited by embers,

and that embers can travel up to several kilometres (Teague et al., 2010; RFS, 2010), children's thinking on this issue represents a misconception about the level of protection afforded by fire breaks.

The possible outcomes of overestimating the effectiveness of structural mitigation were most recently observed in the tsunami disaster that devastated the north-east coast of Japan in February 2011. Believing that their 15m sea walls would protect them from any tsunami threat, many communities failed to prepare in other ways, and, when the sea walls were overcome by 30m waves, residents were left completely exposed to the hazard (Cyranoski, 2011). This invokes the pioneering work of Gilbert F. White, who, almost 60 years ago, concluded that the construction of structural levees to protect floodplain settlements in the United States had in fact increased the flood hazard by creating a false sense of security that negated the need to engage in other ways of reducing the hazard (White, 1945). Children's faith in the effectiveness of fire breaks represents a similar phenomenon. However, when children had an understanding of the limitations of fire breaks, the identification of this strategy did not completely annul their bushfire-related worries and fears, and they continued along the path of Seeking Adaptation.

An additional strategy for creating safer locations involved undertaking general fuel management around the property. This was typically aimed at limiting the spread of fire around the property and reducing the risk of house ignition via direct flame contact. One approach to general fuel management involved reducing or removing fuel by cutting down trees and pulling out plants; raking up leaf and timber litter and removing it roof guttering; mowing grass; and moving wood piles and other flammable items away from the house. Several children also articulated an understanding of how prescribed burning would reduce the available fuel for a bushfire. The extent to which children believed that they would need to clear the vegetation on their properties was influenced by their understanding of fire spread and house ignition. When children understood fire spread and house ignition solely in terms of direct flame contact, it was only vegetation within flame distance of the house or trees within falling distance of the house that were marked for clearing. Thus, whereas the fire agencies encourage a clearance of 30 metres to reduce the chance of ignition via radiant heat, reduce the deposition of embers from nearby trees, and create a defendable space for active defence (e.g. CFA, 2011; TasFire, 2011), children's reasons for clearing were based around preventing house ignition via direct flame contact.

Importantly, children also identified several major barriers to undertaking general fuel management activities. The first of these was related to the removal of trees or plants and can be interpreted as a moral or ethical barrier that derived from children's conservation values: they were reluctant to cut down trees because this would not only destroy native habitat for various species of animals but would deplete natural resources that are essential for human survival (i.e. oxygen). The second of these could be interpreted as an aesthetic barrier that derived from children's appreciation for the

'look' of trees and plants around their homes. This finding is consistent with previous research on fire knowledge and attitudes amongst amenity-led migrants in south-east New South Wales (Eriksen, 2010), which identified conservation values and an attachment to the natural environment as a major barrier that prevented residents from creating the 30 metres of cleared space around the home that is recommended by fire agencies. Residents in Eriksen's (2010) study explained that they had chosen to live where they had because they *wanted* to be amongst the trees and chopping them down would defeat the whole purpose of living in the bush. Taken together, these findings support contemporary definitions of hazard in that they emphasise how features of the natural environment can create hazards on the one hand, but resources on the other (Burton et al., 1978; Wisner et al., 2004). It also demonstrates that, like adults, children engage in a series of tradeoffs when determining the lengths they will go to mitigate the hazard, particularly when it comes to altering the natural environment.

Other barriers to general fuel management included physical barriers (e.g. not being able to gain access the roof to clean gutters), social barriers (e.g. neighbours either refusing to clean up their own properties or prohibiting the removal of tree branches that were encroaching on children's properties) and economic barriers (e.g. living in a rented house meant that decisions about clearing vegetation were seen to rest with the landlord). The identification of these kinds of barriers had important implications for Seeking Adaptation. When children did not believe that they had the power or capacity to reduce the fuel on or around their around their properties, they would first seek to identify an alternative, but if an alternative could not be identified, the sense of helplessness characterising failed attempts at Seeking Adaptation would emerge. For example, if removing trees was deemed impossible due to any one of the structural conditions outlined above, children suggested that they could reduce the level of flammability by keeping them green over the summer months. However, if access to water resources for watering had been restricted by the drought, and no other strategy for fuel management could be identified, fear and worry would prevail until such an effective, achievable strategy could be identified. The integral role of social and economic barriers in children's approaches to building resilience not only further undermines the validity of the standard tripartite model of hazard perception, knowledge of adjustments, and adjustment adoption which has dominated hazards research with children (Johnston & Houghton, 1995; Ronan & Johnston, 2003; Finnis, et al., 2010; Finnis et al., 2004; Ronan et al., 2010; Ronan & Johnston, 2001; Ronan et al., 2006), but lends support to the basic assumptions of Hewitt (1983; 1997) and other proponents of the vulnerability perspective (Wisner et al., 2004): that is, people may perceive the risks and understand what they need to do to reduce them, but they may lack the power, capacity, or freedom of choice to act on what they know.

Fireproofing houses. As has been noted several times already, children perceived wooden houses as being highly exposed to hazard impacts. This was because the degree of exposure for any given house was primarily determined by the flammability of the materials from which it was built. Confident in their knowledge that wood is highly flammable, children associated wooden houses with inevitable

ignition and destruction. Thus, in this context, building resilience took on a literal meaning because it would require knocking down the house and rebuilding it with non-flammable materials such as brick, metal, stone, or whatever other material was perceived as 'fireproof'. Whilst rebuilding houses was a commonly identified strategy for building resilience, very few children perceived this as being within their family's economic means, which again highlights the crucial role of economic constraints in Seeking Adaptation and links children's perspectives on disaster risk reduction to the assumptions inherent in the vulnerability perspective (Hewitt, 1997; Wisner et al., 2004). When children perceived the destruction of their wooden house as inevitable, and viewed a complete rebuild as being beyond their families' economic means, they 'gave up' on the house and focussed their attention on strategies that would ensure their own personal protection, as well as the protection of pets and other treasured possessions. This demonstrates once again that when faced with barriers to the implementation of their strategies, children sought to identify alternatives. Although children who essentially 'gave up' on their houses were still worried about the prospect of house loss, knowing that they would be safe and their treasured possessions would be protected, served to ameliorate their hazard-related fears.

It is important to reemphasise, however, that the perception that a wooden house would be doomed to destruction was somewhat misconceived, at least in regard to the empirical research on house ignition which suggests that whilst a wooden house may be more susceptible to ignition, destruction is not a foregone conclusion and there are other factors that determine the degree of hazard impacts, including the extent to which vegetation has been cleared from around the house and the amount of fine fuel that has accumulated on flat surfaces, crevices, cracks, eddy points (Blanchi & Leonard, 2008). Theoretically, if children were able to develop a better understanding of the mechanisms underlying house ignition, if they were aware of other more achievable alternatives to rebuilding that can effectively reduce the degree of hazard impacts, they would have at least some opportunity to overcome the sense of helplessness that they felt in regard to protecting their wooden homes.

Retrofitting was also identified as a key strategy for fireproofing and involved reinforcing or upgrading the existing building to make it more resistant to ignition. Common approaches to retrofitting included replacing wooden components of the building with metal or brick; replacing standard windows with safety glass or brick; installing metal window shutters that could be pulled down in the event of a fire; installing sprinkler systems on rooves and exterior walls; and sealing up holes and cracks to prevent embers of flames from entering the building. In the guidelines for residents that are distributed by the fire agencies, these approaches are identified as an effective way to mitigate hazards impacts on houses (CFA, 2011; TasFire, 2011). The Victorian Building Commission (2011) also recommends that residents in high bushfire risk areas undertake as many of these retrofitting measures as possible. Whilst children exhibited a high degree of confidence in measures such as window shutters and roof sprinklers, they perceived the cost of such measures as

prohibitive and, at $12,000 for copper plated sprinkler systems and $3,700 to fit a small window with bushfire shutters, the costs of these measures were also perceived as prohibitive by many of their parents. Moreover, children living in rental accommodation viewed measures such as installing window shutters and roof sprinklers as untenable and this raises important issues about the specific vulnerabilities that might apply to children in lower socio-economic areas where rates of rental accommodation are highest (Atkinson & Jacobs, 2008; Kostenko, Scutella & Wilkins, 2010). Once again, this points to how the socio-economic circumstances of everyday life can impede the process of building resilience and challenge children's attempts at Seeking Adaptation by putting many of the identified fireproofing strategies out of their family's financial reach.

Educating the public. Public education was seen as a critical component of building resilience. Children often described how low levels of awareness and preparedness were common in their communities and suggested that one way of addressing this problem was through education. Children also identified the need for their own bushfire education. However, as noted earlier, children readily confused their school-based house fire education programs for bushfire education. In doing so, they believed that they had received sufficient amounts of the later, and thereby dismissed the need for any more. Importantly, however, some children did make the distinction between bushfire education and house fire education. These children complained that their access to bushfire education had been restricted due to their status as children and believed that this process of marginalisation was increasing their exposure to bushfire hazards.

As was explained in Chapter 2.5.1, the vulnerability perspective on hazards and disasters posits that the social processes that determine exposure to hazards, such as access to education, are very rarely equitable and that people's exposure differs according to personal characteristics, such as age (Wisner et al., 2004). By attributing their restricted access to education to their diminished social status, the children in this study exhibited a profound understanding of how personal characteristics can influence exposure to hazards and disasters, which aligns their conceptualisations of disaster risk with those posited by the vulnerability perspective (Wisner et al., 2004; Hewitt, 1997). It is also important to emphasise how children sought to address these inequalities by voicing their concerns in democratic forums, such as Warrandyte Primary School's Junior School Council. This represents a clear manifestation of Seeking Adaptation: when children perceived their vulnerability to bushfire hazards, they identified a strategy by which they could build resilience (i.e. education); when they perceived a barrier to implementing their strategy (i.e. restricted access to education because of their age), they identified a viable strategy for overcoming it (i.e. voicing their concerns to the Junior School Council), and this fostered a sense empowerment. In this context, the existence of the Junior School Council was in itself a mechanism for building resilience and highlights the importance of having formal mechanisms within which children can have their voices heard. As will be recalled from Chapter 2, the importance of democratic processes to the success of community-based disaster

risk reduction has been emphasised in the adult-based hazards literature (Solberg et al., 2010): the current findings suggest these processes are also important in childhood.

Preparing for a bushfire event

Preparedness was a key component of Seeking Adaptation. Preparing for a bushfire event was a definitive response to the worry and fear that children experienced in response to perceived vulnerability because it was perceived as a key strategy for protecting and preserving things of value. *Deciding to stay or go* and *making a plan* were the centrepieces of preparing for a bushfire event: however, *establishing warning systems* was also an integral component.

Establishing warning systems. As a way of avoiding the hazard impacts that they associated with insufficient warning of a bushfire threat, children identified a variety of mechanisms that would signal an approaching bushfire and indicate the need for some kind of protective response. Thus, establishing warning systems constituted a prime example of Seeking Adaptation: perceiving vulnerability to hazard impacts due to a lack of warning triggered fear and worry, which prompted children to identify a strategy that would enable sufficient warning of a bushfire threat to be received. Importantly, what was considered 'sufficient' depended very much on the child's understanding of how much time they thought they would need to respond. For some children this was a few minutes: for others it was a few days. Regardless, upon establishing or identifying a reliable warning system, children felt more confident that they would be able to avoid hazard impacts and at least some of their hazard-related worries and fears were ameliorated. The possible warning systems that children suggested took a variety of forms, including environmental cues, sirens and alarms, the media, and social networks, and each is worthy of discussion in its own right.

Common environmental cues identified by the children included the smell of smoke, the sight of smoke or flames, the sounds of the fire crackling or of trees falling down, and a rise in ambient air temperature. Although children often overlooked the problems that might be associated with not receiving a warning until the fire could be heard or flames could be seen, some children described how they had special vantage points on their properties (e.g. a hill or large window) that would enable them to monitor the area for visual cues of bushfire activity off in the distance. This latter aspect is particularly important because inquiries into Australian bushfire disasters have repeatedly found that many people in high-risk areas respond to high fire danger days by staying indoors, with the curtains closed, the air conditioner on, and the television blaring, thereby blocking out the external environment and preventing the observation of environmental cues that accompany an impending bushfire threat (Lazarus & Elley, 1984; Teague et al., 2010; Whittaker et al., 2009). This kind of behaviour was first documented by Lazarus and Elley (1984) in their study of human responses to the Ash Wednesday fires:

From our research on the Ash Wednesday fires, we found people who were sitting at home with the curtains drawn, the air-conditioner on, watching TV, oblivious of the danger. Suddenly they go outside, see the fire, panic and run (Lazarus, cited in Fin, 1985).

It was documented again more recently in post-Black Saturday research conducted by Whittaker et al. (2009). This research found that despite the incessant high fire danger warnings that directly preceded the disaster, people in high risk areas still chose to shut themselves off to any environmental cues that would signal danger. As one resident in the heavily impacted township of Hazelwood explained:

And we actually got a DVD that we wanted...We just decided to have one of those really ridiculous days where, you know, lay back and watch a DVD. And so we'd pulled all the blinds...And then the house stays nice...you know, has a better chance of keeping a reasonable temperature. So we had pulled all the blinds, and we had the air conditioner on in there and we had this DVD blaring really loudly (Whittaker et al., 2009, p.24).

Children's awareness of the cues that would accompany a bushfire event and their understanding of the need to monitor their environment for these cues, suggests an important capacity for taking an active role in alerting others to potential bushfire threats. Children's capacities for disseminating warnings based on environmental cues were aptly demonstrated in the stories of Tilly Smith and Anto Suryanto (see Ch. 1.4). This study provides empirical support for the idea that children can attend to their environment and evaluate it for signs of danger in a bushfire context.

Amongst the various types of sirens and alarms identified by the children, domestic fire alarms were the most common. Although children acknowledged that domestic fire alarms would not sound until a fire was within close proximity of the house, they did not seem to identify this as a major issue. It was noted in the discussion of fire alarms in Chapter 6 and school-based fire education in Chapter 7 that children had acquired their knowledge of domestic fire alarms from the house fire education programs that are routinely delivered in Victorian and Tasmanian schools. Thus, in identifying potential warning systems for bushfire threats, children drew on the pre-existing knowledge that they had acquired through their school, once again highlighting how Seeking Adaptation involved drawing on existing knowledge acquired at school and in other settings.

Children in Warrandyte and Macedon also identified the sounding of the siren at the local CFA station as a potential warning mechanism for bushfire. However, they also raised issues about its reliability because more often than not, it's '*just a drill'*. Hence, for children to interpret the siren as being indicative of a bushfire threat, it needed to be accompanied by some other warning: specifically, environmental cues, such as smoke or flames. Additional evidence of the need to observe an environmental cue before taking a siren or alarm seriously was provided by several instances in which children failed to respond to the sounding of the school siren because it was not accompanied by any other signs of impending danger. Children's perspectives on the reliability of warnings correspond

closely with the adult-based warnings research, which has consistently shown that for a warning to be taken seriously, people must believe that the source of the warning is reliable, and that the threat could actually materialise (Lindell & Perry 1992; Mileti & Sorensen 1990; Mileti 1999). This adult-based research has found that when people receive a warning from an unreliable or untrustworthy source, they will take steps to verify that the threat is real, a process commonly referred to as 'confirming the threat' (Mileti & Sorensen 1990; Mileti 1999). Whilst no research on children's interpretations of, or responses to, warnings could be located in the extant literature, the perspectives articulated in this study suggest that children's interpretations of warnings are also characterised by such processes, which points to an important new area for warnings research.

In relation to media warnings, radio took precedence as the key source. Children were also able to correctly identify the official Australian emergency management broadcaster - the Australian Broadcasting Corporation - and cite its band frequency correctly. Both the Victorian and Tasmanian Governments have formal arrangements for the ABC to broadcast emergency warnings and information to the community during bushfire emergencies (ABC, 2009; OESC, 2010; Environment and Communications References Committee, 2011). An important finding was the degree to which children trusted the ABC to provide reliable accurate warnings, and there was little evidence that these warnings would require confirmation of the threat via an environmental cue as would the CFA siren or school fire alarms. In the wider literature, trust has been identified as a significant issue in the dissemination of warnings and there is substantial evidence that for people take the appropriate protective action they must trust the source of the message (Haynes et al., 2008). Children's trust in the ABC as a reliable source of bushfire warnings and information provides an important evidence that children, like adults, interpret warnings differently depending on the trustworthiness of the source. When educating children about the bushfire warning systems that exist within their communities, this should certainly be taken into account.

Children also identified the internet as a source of warnings and children as young as 6 years old were familiar with the CFA website and its 'current incidents' page. As the emergency management sector begins to embrace new media and communication technologies such as social networking sites and crowdsourcing (Goodchild & Glennon, 2010; Palen & Liu, 2010; Tucker, 2011; Zook Graham, Shelton & Gorman, 2010), it will be important to consider how children and young people will participate in this new media landscape. This study suggests that children are already engaging with emergency management information on the internet and, in the name of equity, their needs will need to be accommodated within this realm.

Children perceived social networks as a particularly important mechanism through which bushfire warnings could be received, with many children citing friends and neighbours as key sources of information about bushfire activity in their local area. Children were also able to articulate the

procedures involved in CFA Community Fireguard 'telephone trees', which disseminate warnings amongst a group of neighbouring households in a predetermined, organised way. One of the most distinctive features of establishing warning systems was children's enthusiasm for participating in the dissemination of warnings through their social networks. They commonly stated that their first response to a bushfire would be to warn family, friends and neighbours of the threat so that they too could respond appropriately. This concern for the welfare of others has clear links to a construct referred to in the literature as 'sense of community' (Sarason, 1974; Dalton, Elias, & Wandersman, 2001; McMillan & Chavis, 1986). Sense of community has been defined in various ways: however, most definitions identify interdependence, communication, and emotional connection as key components (Dalton, Elias, & Wandersman, 2001; Sarason, 1974). McMillan and Chavis (1986, p.9), for example, define sense community as 'a feeling that members have of belonging, a feeling that members matter to one another and to the group, and a shared faith that members' needs will be met through their commitment to be together'. Several adult-based studies have identified sense of community as a key predictor of household and community hazard mitigation and preparedness (Bishop, Paton, Syme & Nancarrow, 2000; Duval & Mulilis, 1999; Prior, 2010) and the construct also adequately describes children's approaches to bushfire warnings. The identification of sense of community as an important factor driving children's preparedness behaviours lends further support to the important role of this construct in resilience to natural hazards, and further study of the role of sense of community in children's attitudes and priorities in the realm of hazard mitigation and preparedness is clearly warranted.

Although the role of children in the dissemination of warnings is an understudied area, there is some preliminary empirical evidence which demonstrates children's capacities for enhancing warning processes. Ethnographic research involving the New Orleans Vietnamese community in the aftermath of Hurricane Katrina found that children and youth had played a vital role in disseminating warnings and information before, during and after the hurricane (Mitchell et al., 2008). Both before and during the hurricane, children and youth had translated warnings to non-English family members, as well as other members of the community. They had also assisted in the evacuation process by translating information about evacuations centres from formal English language sources, such as the Federal Emergency Management Agency (FEMA) and the American Red Cross. Then, in the Hurricane's aftermath, they had channelled important information about relief supplies, food distribution centres, and registration for FEMA assistance back to their community. The accelerated recovery of the Vietnamese community was largely attributed to the active roles taken by its younger members (Mitchell et al., 2008). However, as Mitchell et al. 2008 point out, more research is needed to determine what factors influence the trust that is placed in warnings and other emergency management information that comes from children and youth. Given the critical role of trust in the interpretation of warnings by the public at large (Lindell & Perry 1992; Mileti & Sorensen 1990; Mileti, 1999), undertaking such research would be a worthwhile endeavour.

It is important to note that children also expected that in the event of a bushfire threat, they would receive an official warning via an emergency management official, such as a firefighter or police officer. Recent research conducted in the aftermath of Black Saturday confirms that this expectation is pervasive in the wider community. In a survey of human responses to the Black Saturday fires (Whittaker et al., 2009), 72 per cent of respondents indicated that if there was a bushfire in their town or suburb, they expected to receive an official warning from authorities, such as the CFA, police, or other emergency services. For 63 per cent of respondents, however, this expectation had not been fulfilled and this was a source of disappointment and frustration in affected communities (Teague et al., 2010).

Deciding to stay or go.

It was explained in Chapter 2 that the centrepiece of bushfire community safety in Australia is the 'stay and defend or leave early' policy, colloquially known as 'stay or go'. Whilst the children in this study may not have been explicitly aware that this approach to bushfire safety is embedded in an official policy, they did seem to be aware that when deciding how to respond to a bushfire event, they had the option to stay or go. Several factors influenced children's decisions to stay or go and one of the major ones was related to predicted hazard impacts. When children believed that their house would inevitably burn down or that staying on the property would inevitably result in death or injury, they decided to go. The decision to stay was also linked directly to perceived hazard impacts. Some children believed that their property would not be severely impacted because it was in a safe location, the house had been adequately fireproofed, or because the property was sufficiently prepared with fire fighting equipment. Some children also recognised the dangers of late evacuations and their associated impacts and as such a lack of warning would also prompt a decision to stay.

Deciding to stay or go was a key element in Seeking Adaptation. It was in making this decision that many children considered what was most valuable to them and, by extension, what it was most important for them to protect. In this context, a distinct 'life versus property' dichotomy emerged. Several children viewed their properties as highly valuable. In some cases, this was because of an attachment to place (c.f. Hidalgo & Hernandez, 2001): in others, it was because the property was a source of livelihood or had significant financial value. For these children, Seeking Adaptation involved staying on the property to defend the house and other valued assets because they believed that their family would not be able to bear the losses should the house or other assets be destroyed. Other children, by contrast, did not view the property as having any significant financial or sentimental value and if the house did indeed burn down, they would be able to bear the losses and recover: for these children, protecting life was deemed a much greater priority than saving the house and Seeking Adaptation would involve evacuating go to a place that was safe from the bushfire threat until that threat had passed. Thus, children living in rented properties and children living on farms

upon which family livelihoods were based sought adaptation in very different ways. This demonstrates the importance of the meanings that children attribute to things and how they map out their actions according to these meanings. This of course, invokes a fundamental tenet of symbolic interactionism and highlights the importance of enabling children to communicate their meanings in their own words because it is these meanings that determine their preferences and behaviour (Blumer, 1969; see Ch. 3.3.1).

The importance of people's own personal circumstances and the meaning they attribute to their property has been identified as a major factor in decisions to stay or go amongst adults living in high bushfire risk areas. For example, in her study of rural land owners in New South Wales, Eriksen (2010) found that long term residents seemed more emotionally attached to staying and defending their properties than shorter term residents who were more likely to leave their properties because 'that's why we pay insurance, isn't it?' (Eriksen, 2010, p.820). In his in-depth study of the Wulgumerang community in the aftermath of the 2003 Alpine fires, Whittaker (Whittaker, 2010) found a distinct divide between farmers and holiday home owners in terms of their decisions to stay or go. He found that the latter were more likely to have left because the property was not their primary place of residence and they were adequately insured and, as such, they could afford to bear the losses if their properties were destroyed. Farmers, by contrast had a greater share of their total asset base threatened by the fires and tended to be underinsured due to economic hardships caused by an extended drought and the deregulation of the agricultural industry: hence, they were more likely to stay and defend. The current research supports the general finding that decisions to stay or go are deeply connected to both the emotional experience and financial circumstances of residents, and it extends this finding to children. Consequently, just as public education for adults must accommodate residents' own unique relationship to their property (Brenkhert-Smith, 2006; Eriksen, 2010; Prior, 2008), school-based bushfire education must accommodate the different ways in which children are connected to their properties and how their connectedness influences their preferences for staying or going.

At the time of data collection, the CFA did not have a clear position on whether or not children should be allowed to stay and defend properties with their parents and there were several families in this study who were planning on keeping their children behind in the event of bushfire threat. However, in the wake of Black Saturday, the CFA has made a definitive statement on the issue and the advice to parents is clear: "*Children should be part of leaving early plans, not staying to defend*" (CFA, 2011, p.21). This new position has important implications for Seeking Adaptation. When children perceived a need to protect their property because of its emotional or financial value, being given a role in the family's plan to stay and defend contributed to a strong sense of empowerment because it provided them with an opportunity to protect what was valuable to them. As one parent whose child was going to stay and defend stated, "*he definitely feels part of the solution and not part of the problem*" (Sally,

Macedon). It is not clear how these children will react to having their roles in staying to defend taken away from them and this constitutes an important question for future research. An equally important question concerns the extent to which parents will comply with the official recommendation of the CFA. This will need to be examined because it cannot be assumed that the individual circumstances of every family will be conducive to sending children away, particularly where families live on remote properties with limited access for evacuation.

Another important finding relating to stay or go was that although some children indicated that they would decide to stay or go in advance of a bushfire threat, others suggested that upon receiving a warning they would assess the severity of the fire and make their decision to stay or go on that basis. Generally speaking, small or slow moving fires would prompt a decision to stay, whereas large, fast moving fires would prompt a decision to go. Research has found that this approach to stay or go decision-making was evident in the areas affected by Black Saturday (Whittaker et al., 2009). It was also identified in Prior's (2008) study of Tasmanian resident's approaches to emergency planning, where it was referred to as 'hedging bets', a term that accurately describes the reasoning of some children in this study. Hedging bets has been identified as a major issue in bushfire community safety because it has the potential to place people in situations where they do not have the resources to effectively defend their properties which results in a decision to flee from the property at the last minute (Prior & Paton, 2008; Tibbits & Whittaker, 2007; Teague et al., 2010). Hedging bets represents a key issue to be dealt with in children's bushfire education. Children engage in this decision-making process because they are seeking to protect both life and property: yet, they need to understand that responding to a threat in this way is a major cause of death and injury in bushfire events (Haynes et al., 2010a).

An additional issue affecting children's decisions to stay or go was related to their expectations of firebrigade support and assistance. For some children, the decision to stay or go was contingent on the firebrigade dispatching a firetruck or other firefighting resources to the property and, if this support could not relied upon, children would switch their plans from staying to going. Numerous studies have found that adults also base their decisions to stay or go on their expectations of fire agency support, and despite the consistent message from fire agencies that residents should not expect fire agency support during a fire event, the misconception that there will be a fire truck at every house is commonly held by residents in high risk areas (Eriksen, 2010; Eriksen & Gill, 2010; Prior, 2008). This represents a significant issue because, as Whittaker's (2008) study of Wulgulmerang bushfire disaster clearly demonstrated, when resident's expectations of fire agency support are not fulfilled, community trust in those agencies is seriously undermined. This has important implications for emergency management because trust is a key predictor of both disaster preparedness (Solberg et al., 2010) and warning response (Haynes et al., 2008a), and a lack of trust can reduce the extent to which individuals and communities act in accordance with fire agency instructions and advice (Prior &

Paton, 2008). Thus, bushfire education must support children in developing more realistic expectations about the level of firefighting support they will receive in a bushfire event. In doing so, however, it will be important to assure children that the lack of support in a bushfire event is due to the strain these events place on fire agencies resources and that in the event of a house fire they can continue to rely on high levels of support.

Making a plan. The importance that children placed on emergency bushfire plans was highlighted in the earlier discussions relating to conditions of exposure. It was explained that children associated a lack of emergency planning with increased exposure to hazard impacts. Hence, when they identified a lack of planning in their own household, they perceived themselves as vulnerable to hazard impacts and experienced all of the associated worries and fears. However, by developing a plan, these fears were ameliorated and children felt more comfortable about living in a bushfire pone environment. It is important to recognise children's agency in the formulation of emergency bushfire plans. When children's families were for some reason unable to develop a definitive plan, children tried to encourage them to do so, but if their efforts were unsuccessful, they set about developing their own plan. This reflects the problem solving element of Seeking Adaptation, in which children seek to identify alternatives when there are barriers to the implementation of their protective strategies.

In many ways, developing a bushfire plan represented a microcosm of Seeking Adaptation: the disequilibrium created by perceptions of high exposure and the absence of a definitive emergency plan was a source of fear that prompted efforts to develop one; if one approach to planning was unsuccessful (e.g. the family could not decide on whether to stay or go), an alternative approach would be adopted (e.g. making a plan with a friend or another relative); and finally, the development of a satisfactory plan would serve to ameliorate the fears created by the initial problem. This finding complements and contextualises the previous research of Ronan and colleagues (e.g. Finnis et al., 2010; Finnis et al., 2004; Ronan et al., 2010) which has demonstrated a link between children's knowledge of appropriate emergency response actions and levels of hazard-related fear. Thus, the available evidence argues for emergency planning to be included as a key component of school-based bushfire education programs, particularly in light of the myriad misconceptions that characterised children's knowledge of emergency plans, the details of which are explored below.

Evacuating. Children's plans to evacuate comprised four separate phases: deciding what to take, identifying triggers, choosing a safe destination, and managing barriers. The first phase, deciding what to take, was an important manifestation of Seeking Adaptation. The decision to evacuate was underpinned by the belief that the house would not survive the passage of a bushfire. Thus, deciding what to take provided an important opportunity for children to identify the things that were of most value to them. This reduced children's fears of losing their treasured possessions because if everything else was destroyed by the fire, at least these valued things would be preserved. Children

were particularly worried about hazard impacts on their pets, and therefore, ensuring the safe evacuation of pets was an integral part of reducing bushfire-related fears. Importantly, children's desire to ensure the safety of their treasured possessions and pets would be of huge benefit to them in the aftermath of a disaster. Disasters often destroy the physical structures that children rely on for their daily activities including their school, their home, and their spaces for play. In the aftermath of disaster 'transitional objects'[2] (Winnicott, 1951) in the form of a few treasured things would provide children with a certain degree of continuity, which is increasingly being recognised as a buffer against the development of trauma symptomology (Cohen et al., 2009; Omar & Alon, 1994; Woolsey & Bracy, 2010). Thus, packing what the children in this study referred to as a 'fire box' should be made a key part of bushfire education programs: not only do they have the potential to reduce worries and fears during a period of quiescence, but would also have tangible benefits to children if they were affected by a disaster.

The second phase, choosing a safe destination, also represented an important manifestation of 'Seeking Adaptation'. Children who decided to evacuate did so largely because they were afraid of death or injury. Identifying a safe place served to reduce their fears of getting burnt, being overwhelmed by smoke, or getting trapped in a burning house. To identify these destinations, children drew on their existing knowledge of hazard impacts and their knowledge of processes from which those impacts derive. For example, children commonly believed that they would be safe in a swimming pool because the flames would not be able to reach them there. They also drew heavily on their house fire escape plans and suggested running to their 'safe meeting place' (e.g. the letter box or the farthest reaches of the backyard). However, through articulating or mapping out this plan, and then considering its efficacy in the context of a fire arriving at the house, the children could identify the potentially fatal flaws in the plan and sought to identify an alternate destination. This highlights the value of enabling children to articulate or map out their bushfire emergency plans. It also highlights the symbolic interactionist nature of Seeking Adaptation: that is, people act towards things on the basis of the symbolic meanings that the things have for them, and that these meanings are defined and redefined through interaction with the self and with other people (Blumer, 1969).

The third phase of planning to evacuate involved identifying the specific trigger that would prompt an evacuation. Importantly, this trigger was not always the receipt of warning and, with only one notable exception, it was never a high fire danger day. Whilst some children intended to leave upon receiving a warning of a fire in the area, others determined to 'wait and see' until they received a tangible sign that they were in danger (i.e. flames in close proximity to the property). This 'wait and see' approach

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[2] Donald Winnicott (1951) first coined the term 'transitional object' in reference to a particular developmental sequence in which the infant moves from a stage of complete dependence to a stage of relative independence through the use of transitional objects which help the child to deal with the anxiety that derives from separation from their mother. The use of transition objects continues through our lives as we imbue objects with meaning and memories that are associated with other ideas, places and people.

to evacuation has been consistently acknowledged as a common public response to bushfire (Prior, 2008; Whittaker et al., 2009; Teague et al., 2010) and a variety of other hazards (Sorenson, 2000). The 'wait and see' approach to identifying triggers was also identified by the 2009 Victorian Bushfires Royal Commission as a major problem that endangered many people and was the cause of many deaths on Black Saturday:

> [Warnings] were directed to a minority of people with well-thought-out fire plans and did not take account of the knowledge that many people 'wait and see' and leave the area only when they receive a clear indication 'trigger' that they are in danger (Teague et al., 2010, p.14).

For the children in this study, the 'wait and see' approach to identifying triggers was often underpinned by the assumption that the firebrigade might put the fire out before it came to pose a specific threat. This supports Donner's (2007) adult-based work on public response to emergency warnings which found that decisions concerning the actions that should be taken in response to a potential threat are highly subjective and are characterised by a variety of interpretations (i.e. if emergency management agencies or other public officials are attempting to handle the crisis, no additional action is necessary). That the children in this study demonstrated decision-making processes that so closely resemble those identified in an adult population is a noteworthy finding. Children's perspectives have been largely overlooked in research on both warnings and evacuations. However, this research has shown that children have clear views and perspectives which heavily influence their preferences for emergency response. These views and perspectives are clearly worthy of future research. They must also be accommodated in bushfire education: educators cannot assume that children will consider an official warning to be a trigger to leave and they will also need to challenge the assumptions that underpin children's decision-making, such as the notion that the fire brigade has the capacity to suppress every fire.

It is important to note that children who planned to leave well in advance of a direct threat tended to have already made evacuation plans with their families. Having discussed with their families precisely when they would go, these children did not hesitate in identifying an early warning as their trigger to leave, suggesting that children's decisions to leave early are underpinned by a process of social interaction within the family. For decades, social interaction has been identified as a key factor influencing adults' decisions about when to evacuate (Drabek, 1969; Sorenson, 2000; Turner & Killian 1987; Quarantelli, 1984). The current findings suggest that social interaction plays an equally important role in children's decision-making in this realm: through talking with their families they had been able to clearly define the situation and come to a consensus about leaving as soon as a warning was received, regardless of the proximity of the threat. Children making the decision to leave early also cited the unpredictability of fire as major reason for their choice: whereas children who planned to 'wait and see' expected the fire to approach the house in a linear predictable fashion, children who

planned to leave early noted that it was impossible to judge how quickly a fire would arrive or from which direction and so it was best '*not to take any chances*' (Solomon, 11yrs, Macedon).

The final phase of planning to evacuate involved the development of strategies for managing the barriers that could potentially impede an evacuation, particularly in circumstances where the fire had already reached the property. Managing barriers is a prime example of how children sought adaptation by actively solving problems and finding ways around the various obstacles that would impede the implementation of their preferred protective strategies. When asked how they would deal with thick smoke, for example, children suggested that they would '*get down low and go go go'*. In identifying this strategy, children were once again drawing on their knowledge of house fire safety that they had acquired in school-based house fire education. When asked what they would do if their chosen evacuation route was blocked by the fire, some children suggested that they would go in the other direction, revealing their misconceptions about the speed at which fire can travel. Others suggested that they would go around the fire or over it, being careful to avoid the flames, revealing a lack of knowledge about radiant heat and the low visibility that characterises bushfire events. This lack of knowledge was also revealed by the suggestion that someone could run or drive as quickly as possible through the fire. Children also identified alternate strategies for getting to their chosen destination if their car was damaged by the fire. These included running, walking, riding a bike, or getting someone else to pick them up, which revealed, once again, a lack of knowledge about the speed at which fire can travel, the low visibility that characterises a bushfire event, and the dangers of radiant heat.

Thus, children's understanding of the biophysical process led them to plan out strategies that would place them in serious danger if they were ever to be implemented in a real fire event. Because they understood death and injury largely in terms of direct flame contact, they did not understand the hazards to which they would be exposed in a last minute evacuation: from the children's perspectives, as long as the flames could be avoided, a safe evacuation was assured. The tendency for people to evacuate at the last minute has been identified as a major issue in Australian bushfire management (Tibbits et al., 2008). In the aftermath of bushfire disasters, the landscape is littered with the burnt out cars of those who have gotten caught in the fire during desperate last minute attempts to flee, and the roadsides are dotted with the remains of those have tried to flee on foot. Hence, educating children about the dangers of last minute evacuation should be made a key priority for school-based bushfire education. Addressing this issue may also address the phenomenon of 'hedging bets' as well as the 'wait and see' approach to identifying triggers. That children are able to understand the dangers of last minute evacuation was demonstrated by a small number of children (n=4), who, having participated in the development of rigorous family bushfire planning, had learned that barriers to evacuation are not best managed by running in the other direction or by dodging the flames, but by initiating a contingency plan to stay and defend or shelter in place.

Staying to defend. Children's plans to stay and defend were characterised by four separate temporal phases which corresponded to the various stages of a fire event. The first phase was *before a fire threatens* and involved ensuring a dedicated water supply and obtaining fire equipment. In its '*Fire Ready Kit'*, the CFA (2011) clearly states that to stay and defend residents must have a minimum of 10,000 litres of water in tanks, dams or swimming pools, which is dedicated entirely to firefighting. It also recommends that residents strategically place smaller amounts of water around their homes using 44 gallon drums, rubbish bins, wheelbarrows, troughs or garden ponds. Children articulated knowledge of these required preparations and some children also articulated an understanding of *why* these preparations are necessary: namely, because the availability of mains water would be severely compromised during a fire event. The CFA (2011) also states that to stay and defend, a fire fighting pump and hoses are a necessity, whilst additional firefighting resources and equipment such as buckets, mops, spray buckets or knapsacks, and sprinklers systems on the roof are highly recommended. Children identified these resources and equipment as integral to staying to defend and recognised the importance of obtaining and installing them before the fire arrived. Importantly, children's observations of, and participation in, their families' preparations to stay and defend played a key role in the development of their knowledge in this domain.

The second phase of planning to stay and defend involved identifying what to do *when a fire threatens.* Upon receiving a warning of a local fire threat, children determined that they would initiate their plans of defence, beginning with the preparation of firefighting resources (e.g. setting up hoses, pumps, and sprinklers; filling up buckets, baths, and sinks). An important finding to emerge in this context pertained to the heterogeneity in children's interpretations of how these resources would be used to protect their properties. For example, whilst some children understood that baths full of water would provide an easy way to refill buckets to throw on the fire, others suggested that baths full of water would act as a non-flammable barrier that would prevent a fire from burning through to the rest of the house. Again, this demonstrates the active meaning-making and interpretative processes that characterised the identification of protective strategies. In the absence of other explanations for filling the bath, children constructed their own explanations based on their assumptions about fire spread. This example serves to demonstrate the importance of gaining a deeper understanding of children's knowledge than can be obtained using quantitative survey methods. Children may be well aware of various protective strategies and they may be able to recite these on demand, but unless research seeks to understand the specific meanings that children attribute to these activities, it runs the risk of misinterpreting and misrepresenting the nature and extent of children's knowledge and understanding. This finding also highlights the futility of providing children with simple lists of dos and don'ts for bushfire preparedness because children would construct their own meanings based on their pre-existing knowledge, and if this knowledge was misconceived, there would be little education benefit.

In addition to preparing firefighting resources and equipment, children also suggested strategies for reducing fire spread around the house (e.g. removing any accumulated fuels and wetting down the yard) and preventing house ignition (e.g. wetting the house down, filling gutters, pulling down window shutters, and sealing gaps), all of which are identified by the CFA and TasFire as integral to the process of staying to defend. However, the meanings that children attributed to these protective strategies also varied. For some children, these strategies were aimed at preventing house ignition via direct flame contact, whereas for others they were aimed at preventing house ignition via embers sparks. Thus, although children suggested the same protective strategies, the meanings that they attributed to them varied substantially and were underpinned by very different assumptions about fire spread and house ignition. Once again, this highlights the problems inherent in taking children's knowledge of protective strategies as a measure of their hazard knowledge, and it demonstrates the importance of gaining a deeper insight into the assumptions that underpin and inform children's approaches to managing bushfire hazards.

A final strategy that children planned to implement when a fire a threatened involved packing valuables and pets into the car, 'just in case' the fire came too close or things became too dangerous and a last minute evacuation was required. This represents a fundamental misinterpretation of what it means to stay and defend. This issue has also been identified in adult-based research on interpretations of the stay or go policy. Drawing on a series of case studies conducted in south-eastern Australia, Tibbits et al. (2008) suggest that 'prepare, stay and defend' is frequently interpreted as 'stay and defend until I feel threatened'. These case studies found that many of those who planned to stay and defend were not fully committed to doing so, and were consciously or unconsciously retaining late evacuation as a last minute option, despite widespread recognition of its dangers. As Tibbits et al. (2008, p.68) explain:

> Some people consider having a contingency plan, such as ensuring that the keys are in the car and that the car is facing toward an escape route, as rational planning in case things go wrong or they feel too scared. Evidence that people plan to stay and defend, but are prepared to leave their property if they feel threatened, suggests a misinterpretation of the policy, which fire agencies must work hard to rectify.

The phenomenon of deciding to stay and defend but leaving at the last minute was pervasive in the data on how to respond *when a fire arrives.* For the children in this study, the standard plan for responding to a fire arriving at the property involved fighting the fire front itself with hoses, buckets and whatever other equipment was available. The general aim of this process was to stop the fire front from reaching the house and, if this could not be achieved, a last minute evacuation would be initiated. Children adopting this approach perceived the impacts of the fire front as catastrophic: they were certain that if the fire front reached the house, the house would burn down, regardless of the extent to which it had been 'fireproofed'. Consequently, seeking shelter inside the house as a fire passes over was considered 'suicidal'. This finding can be interpreted through the frame of a construct

known in the hazards literature as 'outcome expectancy' (Duval & Mulilis, 1999). This construct refers to the beliefs that people hold about the extent to which preparedness measures reduce hazard exposure and increase safety in the context of a hazard event (Duval & Mulilis, 1999; Lasker, 2004; Lindell & Perry, 2000; Mulilis & Duval, 1995). Clearly, children who planned to evacuate when the fire arrived had low outcome expectancies about the capacity of the house to withstand the impacts of the fire front. Of particular interest is that children's outcome expectancies differed according the context in which they were elicited. When children were asked about the capacity of a particular house to withstand hazard impacts in the context of general conversation, their outcome expectancy was much higher than when they were asked the same question about the same house in the context of a scenario that involved a fire passing over the property. Whereas a brick house with metal window shutters and roof sprinklers was deemed fireproof in the first context, it was deemed a firetrap in the second. There is very little research on how outcome expectancies change according the contexts in which they are elicited. However, the documented tendency for people to abandon their plans to stay and defend when a fire arrives suggests that this an important area of future research in both child and adult populations (Tibbits et al., 2008).

It is important to emphasise that whilst most children in this study had misinterpreted the concept of staying to defend, there was a small number of children who had grasped the concept in a way that was highly consistent with the approach advocated by the fire agencies (e.g. CFA, 2011; TasFire, 2011; AFAC, 2008). These children recognised that staying to defend meant extinguishing embers and spot fires around the house as the fire approaches, sheltering from radiant heat inside the house as the fire passes over, and returning outside to extinguish embers and spot fires after the fire has passed. What distinguished these children from their less knowledgeable peers was the extent to which parents and children had discussed the process of staying to defend in its entirety – from the early stages of preparing the property at the beginning of the bushfire season to extinguishing embers and spot fires around the house as the fire approaches to taking shelter in the house as the fire passes over. Another factor facilitating children's understanding of staying to defend was participating in drills that incorporated each stage of a fire emergency from beginning to end. The factors that facilitated this level of discussion and participation in family plans to stay to defend are discussed in more detail in the subsequent section on contextual and modifying conditions. What is important to emphasise here, however, is the extent to which children drew on the knowledge that they had acquired from their families when developing their plans to stay and defend, which illustrates the fundamental importance of social context in Seeking Adaptation.

Sheltering in place.

Buildings. Children identified a variety of buildings that would be able to provide a safe shelter, including houses, out buildings (e.g. sheds, garages), and commercial or public buildings (e.g. shops, schools). For a building to be considered as safe shelter, it had to be viewed as 'fireproof'. However,

the substantial variation in children's views on what kinds of buildings were fireproof meant that there was substantial variation in the kinds of buildings that were identified as safe shelters. The major issue emerging from children's articulated perspectives on sheltering in buildings was related to their expressed preferences for sheltering passively. For example, children suggested sheltering under beds or sofas or in rooves, all of which would make it to difficult to escape from the building if it did become consumed by the fire. In post-fire research, sheltering passively in this way has been identified as a major cause of death (Haynes et al., 2008; Handmer et al., 2010). In their analyses of Black Saturday fatalities, for example, Handmer et al. (2010) found that over two thirds (69%) of the fatalities were sheltering passively in their homes at the time they died. It is generally acknowledged that sheltering inside as a fire passes over requires selecting a place where there are multiple exits so that the building can be evacuated if necessary (Handmer et al., 2010; McLennan et al., 2011). It is also generally recommended that the occupants move around inside the home, defending it as best they can, using the resources that they have available to them (McLennan et al., 2011).

A major point of interest regarding children's selection of building for sheltering is how some children drew on historical evidence when deciding whether or not a building could withstand a bushfire event. Several children in Macedon and Warrandyte were aware of local buildings that had survived bushfires in the past, and this gave them confidence that these buildings would provide safe shelters. That children had learned about the history of these buildings raises interesting questions about 'disaster memory' and how important information about previous disasters is passed down through generations. Research on disaster memory represents a newly emerging field: however, disaster anthropologist, Susanna Hoffman (2011) and archaeologist Marcy Rockman (2011) have both argued that disaster memory is likely to be a key characteristic of resilient communities. The fundamental importance of disaster memory in community resilience is demonstrated by the tsunami response of the residents on the Indonesian island of Simelue (see Chapter 2), where the 1907 earthquake and tsunami has been immortalised in stories, songs and games that are passed down from generation to generation. The way that children in the current research drew on historical events to identify safe shelters provides evidence that information about past bushfire disasters is also being passed down through the generations in an Australian cultural context. The mechanisms underlying this process are worthy of further research.

Water. The children in this study almost invariably perceived dams, swimming pools, rivers, and creeks as offering safe shelter. Historically, such places have been known to provide shelter to residents who have been stranded on their properties during bushfire events, and the recent Black Saturday disaster offers up several examples whereby people's lives were saved by taking shelter in these places (Teague et al., 2010). However, such places are widely considered to be 'places of last resort': yet, for the most part, the children in this study identified sheltering in these places as their first preference for emergency response. These children expected that being submerged in water

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would completely protect them hazard impacts because the flames would not be able to enter. Again, this highlights the pervasive misconception that hazard impacts on people are primarily caused by flames, and that by preventing direct flame contact with their bodies, people can successfully avoid death or injury. Whilst dams, rivers, creeks and swimming pools may provide protection from radiant heat, if they are located a sufficient distance away from the fire front, they are less likely to provide protection from ember attack or smoke, and hence, they do not represent a safe alternative to evacuating or staying to defend.

Children also commonly identified the bath as a safe shelter and this misconception also seems to be widespread in the community. In their analysis of Black Saturday fatalities, Handmer et al. (2010) found that 27% of the Black Saturday fatalities were found where the bathroom had once stood and that many of them were laying in a position indicative of having been laying in the bath. Handmer et al. (2010) also report how police statements commonly noted how residents had been advised to shelter in the bath or the bathroom by friends, family and officials. These researchers concluded that there was a consistent misconception that it was safe to passively shelter in baths and bathrooms. Clearly, this misconception must be addressed through education, both in schools and in the broader community.

Underground. The children in this study invariably perceived underground bunkers as safe places in which to shelter as a fire front passes over and several children explained how their family planned to shelter in the cellar in the event of fire emergency. However, it is important to note that there is debate concerning the safety of bunkers, and this debate has intensified post-Black Saturday. On Black Saturday, seven people died as a result of sheltering in bunkers or bunker-like structures (Teague et al., 2010). Some of these died as a result of toxic gases whilst sheltering in underground bunkers or cellars that were undamaged by fire (Handmer et al., 2010; Teague, et al., 2010).). Others appeared to have died whilst making their way from the main house to the bunker (Teague et al., 2010). This raises important questions about the safety of bunkers and children's expectations of them. In its interim report, the Victorian Bushfire Royal Commission expressed concern about the risks of misplaced reliance on bunkers and recommended that strict building standards be developed to ensure that bunkers would provide maximum protection for occupants (Teague et al., 2009). When introducing new standards in December 2010, the Victorian Building Commission (2010, p.1) declared:

> Private bushfire shelters [bunkers] may not be a safe option in all cases and are a last resort as part of a bushfire survival plan. The best way for people to ensure their safety during a bushfire is to leave their properties early…A private bushfire shelter (commonly referred to as a bushfire bunker) is an option of last resort where individuals can take refuge during a bushfire while the fire front passes.

Thus, like sheltering in rivers, swimming pools or creeks, sheltering in an underground bunker should only be considered when there are no other options.

Taken together, children's views on sheltering seem to reflect those held by parts of the broader adult community as evidenced by analyses of fatalities, particularly those that occurred in Black Saturday. Thus, educating children about the dangers associated with sheltering in place should be made a key priority of school-bushfire education. Education programs should help children to understand that sheltering in bunkers, creeks, dams, rivers, or bushfire bunkers only ever represents a last resort, and that sheltering passively in house or in a bath, is never a safe option.

The previous two sections have discussed children's knowledge of vulnerability and resilience and related it to the extant literature. One of the most interesting aspects of this discussion has been the extent to which children understandings and perspectives reflect those of the broader adult community. This provides a strong argument for commencing children's bushfire education when they are in school so that they don't carry those misconceptions into adulthood. The discussion will now move on to how children construct their knowledge of bushfire hazards. In doing so, it will identify a variety of promising approaches to enhancing their knowledge in this domain.

8.2.3   Contextual and modifying conditions

A consideration of context is a crucial component of any grounded theory and Seeking Adaptation is no exception. Four specific contexts were found to play a key role in children's knowledge of bushfire hazards and their approaches to dealing with them: direct experience with fire; the school; the family; and the focus group itself. In identifying protective strategies for Seeking Adaptation, children drew on knowledge that they had acquired in these various contexts. The role of each context is interpreted and related to the extant research in the discussions that follow.

Direct experience with fire

Children's direct experience with fire played an important role in their knowledge of bushfire as a biophysical process and their understanding of how it interacts with people and property to cause hazard impacts. Children's direct experience with fire took two main forms: experience with smaller scale contained fires and larger scale uncontained fires. Both forms offered children important opportunities to discover the flammability of different types of matter and the role of moisture content in flammability and children readily drew on these discoveries when thinking about bushfires and their impacts.

Whilst several children had observed large uncontained fires, most experience had been confined to the realm of small contained fires and this can go some way towards explaining the dominant modes of conceptual understanding that were manifest in the data. By having their direct experience limited

to small contained fires, children had not had an opportunity to see how fire behaves in the landscape. They had only observed ignition via a chain of direct flame contact, such as that which occurs when more wood is put on the camp fire. It is possible to speculate that such experience had created the perception that fire is static, relatively controllable, and avoidable in space. Such experience may also have created the perception that fires are easily extinguishable with a bucket or two of water. Importantly, however, larger bonfires had provided the opportunity to directly experience radiant heat and develop an understanding of how intense, uncomfortable, and potentially dangerous radiant heat can be.

Children who had experienced or observed an uncontained fire appeared to have a better understanding of how fire can spread via embers and sparks. Even if they had not observed this process directly, the evidence of a fire jumping a 'break', such as channel or a fence, had either been provided in the first-hand descriptions of others or by the children's own observations of the path along which the fire had travelled. These children seemed to have a greater appreciation of how fires can rapidly grow out of control and burn large areas before being successfully extinguished.

A useful framework within which to consider children's direct experiences with fire and its influences on the development of their knowledge is provided by James Gibson's (1951) Theory of Affordances. Gibson (1979, p.127) believed that the purpose of sensory perception is to perceive 'the affordances of the environment…what it offers the animal, what it provides or furnishes, either for good or ill'. Gibson proposed that whilst affordances in the environment are sometimes perceived without learning, most are perceived through children's direct experiences that children have when they encounter, traverse, and act on different environments:

> The simplest affordances, food, for example, or a predatory enemy, may well be detected without learning by the young of some animals, but in general learning is all important for this kind of perception. The child learns what things are manipulable and how they can be manipulated, what things are hurtful, what things are edible, what things can be put together with other things or put inside other things – and so on without limit….In short, the human observer learns to detect what have been called the values or meanings of things, perceiving their distinctive features, putting them into categories and subcategories, noticing their similarities and differences (Gibson, 1966, p.285).

By observing fire and actively engaging with it, by perceiving its distinctive features, children had developed knowledge of fire in the environment: by throwing different objects onto a fire they had discovered what is and isn't flammable, and had observed the process of ignition via direct flame contact; by standing too close a fire they had experienced the discomfort of radiant heat; by investigating the burnt path of a recent bushfire, they had discovered how a fire can travel over a fire break as a result of embers or sparks.

All of this indicates the importance of providing children with opportunities to actively observe and engage with fire in the environment. As indicated by the data, many of these opportunities already exist as a part of everyday life: children have bonfires on their properties or at school camp and have open fires in their homes. Providing children with these experiences and utilising them to enhance children's understandings of fire as a biophysical process should be made a core element of bushfire education. Of course, providing children with opportunities to directly observe ignition via embers or sparks poses more of a challenge, but even visiting a fire affected area after a fire could give children the opportunity to observe how fires can traverse roads, creeks and other fire breaks.

The school

There was very little evidence that bushfire education had been routinely delivered in any of the schools studied. However, most children had been participating in house fire education from their very first years of school. Almost all children interviewed reported that they had developed a house fire escape plan with their parents and they could readily recite the procedures for evacuating from a burning house. However, there was a distinct tendency for children to overgeneralise concepts of house fire safety to the bushfire context and this presents a major issue for the development and delivery of bushfire education in schools. It will be important for education programs to find ways of helping children differentiate between bushfire mitigation and preparedness on the one hand, and house fire mitigation and preparedness on the other. It is imperative that introducing the topic of bushfire emergency plans does not undermine the success of the house fire education, as this study has found that these programs have been highly effective in raising awareness of, and preparedness for house fire amongst both children and their parents.

The only evidence of curriculum based bushfire education came from Macedon Primary School. The teacher who had incorporated bushfire education into the curriculum was herself an Ash Wednesday survivor and had obviously championed the importance bushfire awareness and preparedness in her classroom. This demonstrates the integral role played by teachers and suggests that bushfire education programs must also incorporate professional development programs so that teachers can become advocates of bushfire risk reduction within their schools. Not all teachers working in high bushfire risk areas will be acquainted with issues associated with bushfire risk. In all schools studied, there were teachers who commuted from inner-city suburbs where bushfire hazards do not pose a major threat. It may be necessary, therefore, to provide teachers with professional development programs in which they can become familiar with the concept of bushfire risk reduction and the integral part that their students can play in the risk reduction process. Perhaps then, teachers would be better resourced and more inclined to identify everyday opportunities for embedding bushfire education into the existing curriculum, which would reduce the need to add yet more learning units to a syllabus that is already overloaded (cf. Hudson & Chandra, 2010).

One way in which schools did influence children's knowledge of mitigation and preparedness was through their own mitigation and preparedness activities. Children's observations of structural mitigation around the school (e.g. metal window shutters, sprinklers on the roof) and their participation in bushfire drills had provided them with a rich source of knowledge upon which they could draw when identifying protective strategies for Seeking Adaptation. A particularly, important finding was that although children did not always readily differentiate between their bushfire and house fire emergency plans, participating in drills for both bushfire and structural fire at school had enabled children to make this distinction: when schools had conducted regular drills for both house fire and bushfire, children were well aware of which emergency response would be appropriate for each type of emergency. Experiential learning, such as that which is achieved through drills, has been routinely identified as a critical component of school-based hazards education programs (Greene & Petal, 2010; Petal, 2007; Sharpe, 2009; Wisner, 2006). Yet, very little empirical research has evaluated its effectiveness in enhancing children's hazard knowledge. Whilst the current research identifies experiential learning, in the form of drills, as an effective way to enhance children's knowledge of emergency response, there remains a need to identify the processes and conditions that contribute to, or impede, its effectiveness. Of particular interest, is why children's ability to differentiate between structural fire and bushfire at school, did not readily generalise to the home. As Sharpe (2009) has argued, teachers often fail to explain to children *why* they need to undertake specific activities, which reduces the drill to a top-down process of rote learning. He suggests that when conducting drills, schools should capitalise of the opportunity to fully debrief students on why they are required undertake specific actions and explicitly relate these actions to hazard impacts (Sharpe, 2009).

The family

The family played a crucial role in the development of children's hazard knowledge. Children showed themselves to be keen observers of their parents' mitigation and preparedness activities and their observations provided them with a rich store of knowledge to draw on when identifying protecting strategies for Seeking Adaptation. Children had observed activities such as the installation of water tanks, pumps and hoses, and the clearing of fuels from around the property, and they readily drew on these observations when developing their own protective strategies. Children's active participation in their families' mitigation and preparedness activities was also a key influence on their knowledge development. When children had been given the opportunity to engage in dialogue, discussion and decision-making to do with emergency bushfire plans, they articulated more sophisticated understandings of both emergency response and bushfire hazards more generally. Children's participation in family mitigation and preparedness activities and its influence on the development of their knowledge is examined in detail through the lens of Rogoff's Theory of Guided Participation later in this chapter (see 7.4.2).

A major finding to emerge from the analysis was the strong influence that children exert on the attitudes and behaviours of their parents. Whilst authors have claimed that children exert an influence on the hazard-related knowledge, attitudes and behaviours of parents (e.g. *Finnis et al.,* 2004), empirical evidence of this has been lacking. Thus, the current research provides an important empirical substantiation of this frequently made claim. Whilst the evidence of children's influence related primarily to house fire hazards, parents readily acknowledged that their children would exert an equally powerful influence in the domain of bushfire hazards. There was also evidence that parents had taken steps to mitigate and prepare simply because there were children in the household. Thus, this research has identified two separate processes of child influence: active and passive. In a recent review of research pertaining to children's influence on the values of their parents, Knafo & Galansky (2008), also identified passive child influences (children causing change in parental values by their mere presence) and active child influences (children directly attempting to influence their parents' opinions or providing parents with relevant information). The identification of these two separate processes opens up a range of opportunities for increasing bushfire awareness, mitigation and preparedness amongst parents. Firstly, school-based bushfire education programs could capitalise on children's active influence by incorporating a homework component that involves parents and children working together to undertake mitigation activities and develop emergency plans. Secondly, community-based education programs could capitalise on children's passive influence by taking a 'whole of family' approach. Currently, programs such as CFA Community Fireguard exclude children; however, by including children and making that inclusion explicit it may be possible to increase adult participation in such programs. As one parent noted, if there was a community meeting aimed at adults alone, she probably would not attend: however, if it was aimed at the whole family, she would be more inclined to go along for the sake of her child.

The research process

The theory of Seeking Adaptation proposes that to identify strategies for building resilience, children engage in active meaning-making processes, both independently and in interaction with others, drawing on the knowledge they have acquired through their school, their family, and their own direct experiences with fire in the environment. It was the analyses of the research process itself that brought these active meaning-making processes to light and revealed two particularly important findings.

The first important finding to emerge from the analyses of the research process was that by engaging with concepts of hazard mitigation and preparedness through their own drawings and having an opportunity to articulate and reflect upon their own understandings in the context of scenarios, children were able to develop more sophisticated understandings of bushfire mitigation and preparedness. It is crucial to note that they were able to do this in the absence of any prescriptive information about how to manage bushfire hazards. Through the use of simple questions and scenarios, children were able to identify the flaws in their approaches to mitigation and preparedness

and come to new understandings. This demonstrates the value of employing constructivist pedagogies which privilege a 'discovery' model of learning whereby children learn through continuous and genuine engagement with the physical and social world, rather than through direct instruction. This argument is explored in detail in a subsequent discussion that relates the present findings to Piaget's Constructivist Theory of Adaptation (see 7.4.2).

The second important finding to emerge from the analyses of the research process was the extent to which children influenced each other's knowledge and perspectives. This finding points to the potential value of incorporating peer-tutoring into school-based education programs. Peer tutoring programs are a set of alternative teaching arrangements designed to supplement teacher-led instruction (Maheady, Mallette & Harper, 2006). In a peer-tutoring program, all students in the classroom form peer-tutoring dyads and participate in a learning activity simultaneously (Morgan, 2006). Typically, the dyads consist of a more skilled student who acts as the tutor and a less skilled student who acts as the tutee. Essentially, the tutor's job is to present the tutee with information, listen to the tutee's responses, and then provide corrective feedback (Morgan, 2006). Research has shown that peer tutoring has a positive impact on academic outcomes in areas such as reading (e.g. McMaster, Fuchs & Fuchs, 2006) and mathematics (e.g. Fuchs, Fuchs & Karns, 2001). Whilst peer-tutoring has not yet been applied to the realm of school-based hazards education, the findings from this research suggest that it provides a promising new approach worthy of further investigation.

However, there is an important caveat to be made in relation to the use of peer-tutoring for children's bushfire education. In this study, children's success in enhancing the knowledge and understanding of their peers seemed to depend a great deal on trust, and in order for a child to exert an influence on their peers, they needed to have credibility as a trusted source of information. As noted earlier, adult-based research has found that for people take appropriate protective action it is imperative that they trust the source of the information (Haynes et al., 2008a), and the analysis of peer interactions in this study suggests that trust may play an equally important role amongst children. This is something that should be taken into account in the development of any peer-tutoring research or practice in the hazards domain.

Taken together the two major findings to emerge to from the analyses of the research process itself provide further insight into how children develop their knowledge of bushfire hazards and suggest important new directions for research and practice in the field of children's bushfire education. Importantly, these findings suggest a move away from top-down information dissemination by locating children as active participants in, and contributors to, the learning process. Indeed, this is the major theme to emerge from the analyses and discussions of all four contextual and modifying conditions. This theme of active participation and direct engagement with the physical and social

world is taken further in the following section which compares the current findings to two major extant theories in children's knowledge development.

8.3   Comparisons to extant theories of children's knowledge development

No substantive theories relating to children's knowledge of natural hazards or disasters were located in the literature either before this study was conducted or during the processes of data collection, analysis or theory development. However, two prominent theories from the developmental psychology literature provide valuable theoretical frames through which to view children's knowledge of bushfire hazards and the substantive theory of Seeking Adaptation. These are Jean Piaget's Constructivist Theory of Adaptation (Piaget, 1952; 1955; 1967; 1970; 1977) and Barbara Rogoff's Theory of Guided Participation (Rogoff, 1990, 2003; Rogoff, Mistry, Göncü, Mosier, Chavajay & Brice-Heath, 1993; Rogoff, Turkanis & Bartlett, 2002). Beginning with Piaget's Theory of Adaptation, the fundamental tenets of these theories and their specific relevance to the findings of the current research will now be discussed.

8.3.1   Piaget's Constructivist Theory of Adaptation

At the beginning of his career in the early 1920's, Swiss developmental psychologist Jean Piaget (1886-1980) saw critical weaknesses in both nativist theories that explained knowledge development solely in terms of innate functions (e.g. Kant, 1787/1999) and empiricist theories that explained it solely in terms of the environment (e.g. Locke, 1690/1996; Hume, 1740/2010). Whilst he acknowledged that nature and the environment played crucial roles in the development of knowledge, he disagreed that either of them, taken alone, could sufficiently explain it (Flavell, 1963). In an attempt to address the inherent limitations of the prevailing nativist and empiricist theories, Piaget embarked on a lifelong research program which sought to 'explain knowledge, and in particular scientific knowledge, on the basis of its history, its sociogenesis, and especially the psychological origins of the notions and operations upon which it is based' (Beilin, 1992, p.196). Piaget referred to his pioneering approach as 'genetic epistemology' and, by all accounts, its contribution to modern psychology has been profound. As Block (1989, p.282) declares, 'biologically grounded, with extraordinary range, powerfully and elegantly reasoned, Piaget's genetic epistemology has transformed our views of knowledge development'.

Piaget's most significant contribution to modern psychology is the Theory of Constructivism, which conceives knowledge as deriving from a process in which the child reflects on and organises experiences to both create order in, and adapt to, the external environment (Flavell, 1963; Piaget, 1952; 1955; 1967; 1970; 1977). Whereas earlier theories of knowledge development had viewed children as passive subjects driven by instincts or impinged upon by external forces, Piaget viewed them as active thinkers, constantly trying to construct more advanced understandings of the world

(Flavell, 1963). In Piaget's theoretical expositions, this active process of knowledge construction is explained by his Theory of Adaptation.

It is important to distinguish the Theory of Adaptation from Piaget's other major theoretical contribution, the Theory of Organisation, or 'stage theory', which has tended to figure more prominently in both popular discussions of his work and international policy on child care, education and welfare (Boyden 2003; Woodhead, 1999). The Theory of Organisation proposes that knowledge development is constrained by domain-general organisational structures that undergo qualitative changes at specific ages throughout childhood and adolescence (Piaget, 2004). Whilst Piaget's empirical work provided compelling evidence for this proposition, it has since been subverted by a substantial body of research demonstrating that children's knowledge structures are neither age-specific nor domain-general but are heavily influenced by their engagement with the actions, work, play, technology, literature, art, and talk of their society (Cole, 1996a, 1996b; Donaldson, 1978; Rogoff, 2003; Wertsch, 1998).

Although the basic tenets of Piaget's Theory of Organisation have been largely discredited, his Theory of Adaptation continues to serve as the foundation stone for much theorising on knowledge development (e.g. Bransford, 2000; Duckworth, 1987; Grennon-Brooks & Brooks, 1999, Novak, 2002; Von Glaserfeld, 1987, 1989, 1991). For Piaget, the core element of the theory was the *scheme:* he proposed that through interacting with their physical and social environments, children organise information into schemes which constitute mental representations of reality (Piaget, 1970). According to Piaget (1970) these schemes can be either symbolic (e.g. images, concepts) or operational (e.g. strategies, plans, rules) and they form the basis of all behaviour. As Piaget asserted, 'No behaviour, even if it is new to the individual, constitutes an absolute beginning. It is always grafted onto previous schemes' (Piaget 1970, p.707). Piaget conceptualised this 'grafting' in terms of two central processes: assimilation and accommodation. He referred to these processes as 'functional invariants' and viewed them as the key drivers of all knowledge development (Piaget, 1952).

Assimilation was defined by Piaget (1970, p.706) as 'the integration of external elements into evolving or completed schemes'. That is, when the child encounters something new and it fits within an existing scheme, it is readily incorporated into that scheme. Piaget characterised assimilation as 'conservative' because it 'tends to subordinate the environment to the organism as it is' (Piaget 1954, p.352). He also proposed that it is essential to human existence because it 'assures the continuity of structures and the integration of new elements to these structures' (Piaget, 1970). Indeed, as Block (1989, p.282) has argued, 'without assimilation, there would be no sense of continuity, no apperceptive mass - the very fundamentals of meaning'. Accommodation, by contrast, was defined as 'any modification of an assimilatory scheme or structure by the elements it assimilates' (Piaget, 1970, p.708). That is, when the child encounters something new and it does not fit within any of their

existing schemes, they must create a new scheme to accommodate it. For Piaget, 'accommodation is the source of changes and bends the organism to the successive constraints of the environment' (Piaget 1955, p.352). This, he argued, is an essential requirement for the continued progression of knowledge development:

> If assimilation alone were involved in development, [the child] would not develop further…when assimilation outweighs accommodation (i.e., when the characteristics of the object are not taken into account...), thought evolves in an egocentric or even autistic direction' (Piaget, 1970, pp.707-708).

Piaget also noted, however, that if accommodation prevails over assimilation to the point where it 'faithfully reproduces the forms and movements of the objects or persons which are its models at that time, representation evolves…in the direction of imitation' (Piaget 1970, p.709). This 'imitation' to which Piaget refers is equivalent to what others have termed 'rote learning' and 'empty verbalisms' (e.g. Moll, 1990; Von Glasersfeld, 1989).

It is important to emphasise that Piaget viewed the relationship between the functions of assimilation and accommodation as dialectical and conceived successful adaptation, or intelligent thought and behaviour, as deriving from e*quilibrium* between two:

> There is no assimilation without accommodation…Accommodation does not exist without simultaneous assimilation either…Only the more or less stable equilibrium which may exist between them…characterises a complete act of intelligence…Assimilation is still subordinate to the properties of the objects, or, in other words, subordinate to the situation with the accommodations it entails; and accommodation itself is subordinate to the already existing structures to which the situation must be assimilated (Piaget, 1970, pp.708-709).

Piaget proposed that the neurology of the human brain has been wired by evolution so as to orient it toward this state of equilibrium and he argued that every human act is aimed toward attaining an equilibrated state:

> All behaviour tends toward assuring equilibrium between internal and external factors or, speaking more generally, between assimilation and accommodation (Piaget 1967, p.103).

To illustrate the process of adaptation, as conceptualised by Piaget, constructivist scholar Ernst Von Glasersfeld (1989) cites an example of how it commonly manifests in infancy. When an infant is given a rattle, she quickly learns that its makes a rewarding noise when shaken and this learning instils the infant with the ability to generate the noise at will. It is this that Piaget refers to this as the *construction of a scheme.* As with all schemes, the 'rattle scheme' consists of three parts:

i.   Recognition of a certain situation (e.g. the presence of a graspable item with a rounded shape at one end);

ii. Association of a specific activity with that kind of item (e.g. picking it up and shaking it); and

iii. Expectation of a certain result (e.g. the rattling noise).

As Von Glasersfeld (1989) proposes, it is very likely that the infant, when placed in her high-chair at the dining table, will pick up something that resembles a rattle, such as a spoon, and shake it. In this situation, the infant is assimilating the spoon to its 'rattle scheme'. Upon shaking the spoon, however, the infant is perturbed that it does not make the expected rattling sound. This creates a disequilibrium to which the infant might respond by attending to the item in her hand, which, in turn, may lead to the perception of some aspect that will enable her to make a distinction between spoons and rattles in the future. This would be an accommodation, albeit a modest one. However, in vigorously shaking the spoon to make it rattle, the spoon may hit the table and produce an unexpected but enchanting noise. This generates a disequilibrium that prompts a more significant accommodation which results in the construction of the notorious 'spoon banging scheme' which infants are so fond of. By contrast, if the object placed in front of the infant is in fact a rattle, when she picks it up and shakes it, it will make the noise that she expects, her state of equilibrium will be maintained and no new learning will occur.

It is important to note that whilst the above example is drawn from a child's interaction with the physical world, Piaget believed that disequilibrium is also created through social interaction (Piaget, 1995). Whilst Piaget has often been criticised for discounting the importance of social interaction in the process of knowledge development, labelling Piaget a theorist who posits asocial knowledge development is incorrect (Daniels, 2005). As Daniels (2005) has noted, the more recently translated *Sociological Studies* (Piaget, 1995), supports this contention:

> Human knowledge is essentially collective, and social life constitutes an essential factor in the creation and growth of knowledge, both pre-scientific and scientific.
>
> (Piaget, 1995, p.30)

It is also important to note that whilst the example of a child and her rattle is drawn from infancy, Piaget and the proponents of constructivism propose that adaptation underpins the acquisition of knowledge across the lifespan and constitutes the cardinal process by which human beings construct and reconstruct the concepts and actions that are required for thinking and acting intelligently in the world (Ausuble, 1963, 1977; Bransford, 2000; Bransford, Brown, & Cocking, 2004; Bruner, 1986; Duckworth, 1987; Grennon-Brooks & Brooks, 1999, Novak, 2002; Von Glaserfeld, 1984, 1987, 1989, 1991).

Piaget's Constructivist Theory of Adaptation offers a valuable lens through which to view children's engagement in, and experience of, Seeking Adaptation. Perceiving vulnerability - the process of becoming aware of the potential for a bushfire in their area, and recognising that such an event could impact adversely on the things that they value - was fundamentally shaped by the their mental representations, or schemes, of bushfire as biophysical process. These schemes, which had been developed through their direct experience with fire in the environment, as well as their interactions with others, were intrinsic to identifying the conditions that expose people to hazard impacts. For instance, some children's previous experiences and interactions had resulted in the construction of the following scheme:

i.   Recognition of fire spread as a process involving the ignition of one fuel by another fuel source via direct flame contact.
ii.   The associated notion that a non-flammable barrier will effectively halt a fire's progress.
iii.   The expectation that if a bushfire was to occur in the area or on the property, a non-flammable barrier would prevent hazard impacts.

Other children, by contrast, drawing on a different set of experiences and interactions, had constructed an additional scheme:

i.   Recognition of fire spread as a process involving windborne sparks and embers that can light spot fires ahead of the main fire front.
ii.   The associated notion that a fire can travel over a non-flammable barrier.
iii.   The expectation that if a bushfire was to occur in the area or on the property, a non-flammable barrier would not wholly prevent hazard impacts.

As noted earlier, Piaget (1970) asserted that no new thought or behaviour constitutes an absolute beginning, but is always grafted onto previous schemes through the processes of assimilation and accommodation. When thinking about the potential for bushfires to adversely impact on their properties, children grafted their thoughts onto their previous schemes of fire spread and the nature of these schemes determined the extent to which they perceived their own vulnerability. For example, when children did not have a scheme for ignition via embers and sparks, they overestimated the protection that would be provided by rivers, roads, or fences and did not believe that they would be impacted by bushfire hazards. Additionally, children's schemes of fire spread determined their approaches to mitigating and preparing for bushfire events. For example, children without a scheme for embers or sparks believed that constructing a brick wall or fence around the property would effectively mitigate the hazard.

Most importantly, however, children assimilated new information about mitigating and preparing into their previous schemes. For example, children readily assimilated instructions from parents, such as filling the bath, into their previous schemes about fire spread which lead to a fundamental misinterpretation of the purpose of this strategy (i.e. the bath would stop the fire from spreading any further into the house). Another pertinent example of assimilation was the application of house fire safety to the bushfire context. Most children came to interview with a rich variety of operational schemes relating to house fire safety, particularly house fire escape plans. When asked to develop bushfire emergency plans, children readily assimilated the task into their existing schemes for escaping a house fire and, as a result, the suggestion of running to the letterbox or the front gate was pervasive in the data. However, through the bushfire scenarios that constituted part of the interview process, children were faced with the unexpected prospect of a bushfire burning towards these destinations which generated perturbation and disequilibrium, not unlike the child who is disappointed to find that a spoon does not rattle in the way that she expects. Orienting themselves towards equilibrium, children accommodated the potential for a bushfire to burn towards the letterbox and constructed a new operational scheme for bushfire response, typically one that involved evacuating to a more distant destination.

This constructivist interpretation of the substantive theory of Seeking Adaptation has major implications for children's bushfire education. It proscribes 'telling' children how to mitigate or prepare for bushfire events because understanding is not a matter of passively receiving but of actively building up a conceptual network (Von Glasersfeld, 1989). The best teachers have always approached education in this way; yet, as argued in Chapter 2, many who are involved in hazards education continue to act as though it were reasonable to believe that the verbal reiteration of facts and principles will generate the desired understanding and action. This thesis has shown that children's knowledge of bushfire hazards must never be considered an objective representation of the world because it derives from a process in which the child actively reflects on and organises their experiences to create order in, and adapt to, the environment. Consequently, when developing curricula for school-based bushfire education, a sharp distinction must be drawn between 'training' and 'learning' (Von Glasersfield, 1989). Von Glasersfeld (1989) argues that the former is appropriate when the aim of education is the acquisition of skills or patterns of action. However, if the aim of education is to encourage understanding (i.e. the construction of viable conceptual networks), 'rote learning' or 'repeated practice' will not suffice because understanding cannot simply be transferred by means of words. As Von Glasersfeld (1989, p.136) explains:

> Verbally explaining a problem does not lead to understanding, unless the concepts the listener has associated with the linguistic components of the explanation are compatible with those the explainer has in mind. Hence, it is essential that the teacher have an adequate model of the conceptual network within which the student assimilates what he or she is being told. Without such a model as basis, teaching is likely to remain a hit-or-miss affair.

Based on the evidence presented in this thesis, and drawing further on the constructivist expositions of Von Glasersfeld (1989), it is proposed here that it will not be enough for educators to simply tell children what they need to do to mitigate and prepare for bushfire events because children will assimilate these instructions to their own existing schemes, which could lead to either misconceptions or empty verbalisms. Nor will it be useful to tell children that their proposed protective strategies are 'wrong': this is unlikely to create the kind of disequilibrium that leads to the formation of new concepts and will potentially undermine the child's experience of Seeking Adaptation and inhibit further efforts (Von Glasersfeld, 1989). Rather, educators will need to explore how children see the problem of bushfire hazards and why their proposed strategies seem useful to *them*. In doing so, the educator can build up an understanding of the child's conceptual network and then adapt instructional activity so that it creates the kinds of novel, unexpected situations that trigger the disequilibrations which catalyse the accommodations that are imperative for the growth of knowledge.

8.3.2   Rogoff's Theory of Guided Participation

The substantive Theory of Seeking Adaptation posits that in identifying their strategies for building resilience, children engage in active meaning-making processes, both independently and in interaction with others, drawing on the knowledge they have acquired through their school, their family, and their own direct experiences with fire in the environment. This aspect of Seeking Adaptation focuses attention on the distinctly social nature of dealing with bushfire hazards and links the proposed theory directly to socio-cultural perspectives on child development (e.g. Cole, 1996; Rogoff, 2003; Vygotsky, 1978).

A particularly useful socio-cultural frame through which to consider the social dimension of Seeking Adaptation is offered by Barbara Rogoff's Theory of Guided Participation *(Rogoff, 1990; Rogoff, 2003; Rogoff et al., 1993; Rogoff et al., 2002). Rogoff (1993) formulated the Theory of Guided Participation in an attempt to focus attention on the individual, interpersonal, and cultural processes and conditions in which child development is embedded. The central assumption underlying this theory is that

> …children's development occurs through active participation in cultural systems of practice in which children, together with their caregivers and other companions learn and extend the skills, values, and knowledge of their community (Rogoff et al., 1993, p.1).

In Rogoff's expositions of the theory (Rogoff, 1990; Rogoff, 2003; Rogoff et al., 1993; Rogoff et al., 2002), guidance refers not only to explicit instruction, but to the specific directions that are embedded in the cultural practices that have been passed down by antecedent generations. Participation, meanwhile, refers to the shared endeavours in which children, their caregivers and other companions

are engaged as they appropriate, extend, and transform the cultural practices they have inherited. These shared endeavours can involve face-to-face or side-by-side activities as well more distal arrangements in which companions may not be immediately present.

The Theory of Guided Participation is an extension of Soviet Psychologist Lev Vygotsky's (1962, 1978) socio-historical theory, which conceives child development as occurring through activity in the *zone of proximal development*. Vygotsky (1978, p.86) defined the zone of proximal development as

> …the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance, or in collaboration with more capable peers.

Vygotsky had not fully explicated his thinking on the zone of proximal development when his life was cut short by tuberculosis at the age of 37. However, his initial formulations of the construct have served as an important starting point for the development of a range of socio-cultural theories that seek to explain how cognition develops in socio-cultural context (Cole, 1996a, 1996b; Wertsch, 1998). In the Theory of Guided Participation, the zone of proximal development has been transfigured to incorporate the processes of *structuring* and *bridging*. Structuring refers to a process whereby children's involvement in diverse relationships and activities is arranged by caregivers, the community, and children themselves. For Rogoff et al. (1993), it includes the tacit, distal structuring that occurs as children choose whether or not to help with chores or eavesdrop on their parents, as parents extend or limit opportunities for their children to participate in chores or other household activities, or as communities construct institutions that include or exclude children. It also includes the explicit, proximal structuring that occurs in the context of shared activity as caregivers simplify concepts and tasks to fit with what the child can understand or accomplish, or as children articulate their ideas, seek involvement, ask for clarification, or request assistance.

Bridging, by contrast, refers to a process whereby children and their caregivers work together to construct a shared meaning in order to ensure the mutual comprehension that is essential for collaborative activity (Rogoff et al., 1993). Children and their caregivers will often have discrepant views of a situation but will seek a shared meaning through which to communicate their ideas. This requires a stretch on the part of both participants: the caregiver must stretch themselves downward to understand how the child defines the task or problem, whilst the child must stretch themselves upward in the direction of a more mature definition (Rogoff et al., 1993). As Rogoff et al. (1993) argue, constructing shared meaning is intrinsic to human communication. Indeed, some authors contend that it is innate, and that from the earliest interactions, infants and their caregivers are involved in the construction of shared meaning, otherwise referred to as 'intersubjectivity' (Brazelton, 1983; Fernald, 1984; Luria, 1987; Newson, 1977; Trevarthen, 1988).

According to Rogoff (2003), it is through these processes of structuring and bridging that children come to participate in the everyday activities and interactions that facilitate the development of knowledge that is valued by caregivers. Importantly, she assumes that knowledge that is valued by caregivers is contingent upon the goals of development in their households and communities (Rogoff et al., 1993). Moreover, she assumes cultural variation in the goals of development, rather than a universal endpoint to which all should aspire:

> In a community in which literacy is a primary means of communication and a requirement for economic success in adulthood, it may be important for preschoolers to learn to attend to the nuances of differences between small, two-dimensional shapes, but such a focus may not matter in other communities, where it may be more important for young children to learn to attend to the nuances of weather patterns or of social cues, to use words cleverly to joust, or to understand the relation between human and supernatural events (Rogoff et al., 1993, p.9).

Thus, Rogoff (2003) contends that to understand development, we must examine children's involvement in activity in terms of its function in achieving locally valued goals of development, conscientiously avoiding the arbitrary imposition of our own values on another group: interpreting the activity of people without regard for their goals renders observations meaningless.

Rogoff's Theory of Guided Participation provides a valuable frame through which to view the substantial variation in the sophistication of children's approaches to Seeking Adaptation. Drawing on the evidence presented in this thesis, the following discussion demonstrates how guided participation, with its constituent processes of structuring (both proximal and distal) and bridging, played an integral role in the development of children's understanding of bushfire hazards and how to mitigate and prevent them. It also highlights how the degree to which children had participated in shared activity aimed at mitigating bushfire hazards was underpinned by the family's bushfire management goals, which determined the valued goals of child development as it related to knowledge about bushfire hazards.

Structuring

Both children and their parents were active in structuring children's participation in discussions and activities relating to bushfire mitigation and preparedness. This structuring occurred at both the distal and proximal levels and played a crucial role in the development of children's knowledge. At the distal level, there was substantial variation in how parents structured children's participation in conversations and activities to do with bushfire mitigation and preparedness. In some families, parents had extended opportunities for their children to participate in all aspects of bushfire management: they had involved them in mitigation activities around the house and included them in family conversations about plans and procedures for responding to a bushfire threat. Some parents had also let their children make their own decisions about staying or going and, when they had decided in favour of the former, they were allocated specific tasks that would be essential to the success of the family's

emergency response effort (e.g. filling buckets or baths, soaking towels, bringing pets inside, extinguishing embers and spot fires, caring for younger brothers and sisters). Some children had also participated in drills or had been involved in responding to false alarms and this had provided them with direct experience of their role as active, contributing members of the family's bushfire management agenda. Importantly, by extending these opportunities to their children, parents were structuring their child's participation in accordance with their family's bushfire management goals: specifically, to successfully defend the home and keep the family safe whilst doing so.

In other families, the opportunities for children to participate in bushfire management were much more limited. There were various reasons for this, all of them consistent with the idea that parents structure their child's participation in accordance with the goals of development within the household. In some families, parents who planned to stay and defend believed that their children were too young to participate in this process and, therefore, had made arrangements for the child to be evacuated in advance of any direct threat. Ostensibly, in these families, extending opportunities for children to participate in conversations and activities about the procedures for staying to defend or how to survive a bushfire event was not a priority because the children would not be present during a fire event. Thus, parents had structured children's participation in bushfire management conversations and activities according to what they believed their children needed to know, that is, according to the goals of development within the family. This stands in contrast to levels of child participation in families where children were being relied upon to make an essential contribution to defending the property.

It is important to note that children themselves were also involved in the distal structuring of their participation in mitigation and preparedness activities. Among other things, children in this study had engaged in mitigation activities on their properties or observed their parents undertaking mitigation activities (e.g. mowing lawns, raking up leaf litter, cleaning gutters, installing water tanks), listened in on bushfire-related conversations between their parents, initiated their own discussions with parents, chosen to interview bushfire survivors for school projects, sought increased access to bushfire education at school, and chosen to stay and defend with their families. Volunteering for this research can also be viewed as a key example of children actively structuring their participation in bushfire-related discussions and activities. This serves to demonstrate that children are not merely passive recipients of information that is handed down by adults. Rather, they actively create their own opportunities for participating in discussions and activities that facilitate their knowledge development.

In addition to distal structuring, there was also evidence that children and parents had engaged in the proximal structuring which occurs as caregivers simplify concepts or tasks and as children articulate their ideas, seek involvement, ask for clarification, or request assistance. The parents interviewed for this study had often adapted their approaches or contributions to bushfire-related discussions and

activities to fit with they thought their children could understand, restructuring the problem of hazard impacts and the processes of mitigation and preparedness to be within the child's grasp. This was especially the case amongst parents who were concerned that providing information to their children would create the potential for hazard-related anxiety and fear. These parents engaged in a 'balancing act' of providing enough information to enhance the child's understanding but withholding information that would cause the child to be worried or fearful. Parents had monitored their children for signs of anxiety and structured their hazard-related discussions accordingly; they also made concerted efforts to avoid showing their own bushfire-related fears, and oriented discussions and activities toward reassuring children that the family, their pets and their treasured possessions would be safe if a bushfire was to impact upon their property. Parents had also provided opportunities for children to engage in proximal structuring by encouraging them to ask questions, seek clarification, and request more information.

In seeking to understand the substantial variation in children's approaches to Seeking Adaptation, a consideration of how both parents and children structure children's participation, at both the proximal and distal levels, is far more instructive than a consideration of the age-related cognitive competencies that constitute the primary focus of universalist stage-theories of development. However, this does not discount the importance age as an important variable in children's knowledge development because often the extent to which parents involved children in bushfire management was influenced by their beliefs about what was 'age-appropriate'. These beliefs varied from family to family: some parents believed that children as young as five were old enough to participate in defending the home, whereas others believed such involvement would not be appropriate until early adolescence. How parents form their beliefs about what constitutes age-appropriate participation for their children is an area for future research, but it is likely to be influence by a myriad of factors at the child, family, and community levels.

Bridging

As will be recalled, bridging refers to a process whereby children and adults seek a shared meaning through which to communicate their ideas about a task or problem. This requires that adults stretch themselves downward to understand how children define a task or problem. It also requires that children stretch themselves upward in the direction of a more mature definition. This study provides important evidence of the crucial role that bridging plays in the construction of more sophisticated perspectives on bushfire hazards. When adults and children had not established a shared understanding of the each other's perspectives, children's knowledge had not advanced beyond their initial misconceptions. For example, in his discussions with his family about staying to defend, 12-year-old Larry had never voiced his misconception about jumping on the pool, and his mother, Clara, had assumed that he understood the extreme dangers associated with such a response (see Chapter 7.4.2). As a result, they had not been successful in establishing a shared meaning, and Larry's

misconceptions had been sustained. However, through a dialogue that was sparked by the interview process, Larry had been given the opportunity to voice his misconceptions, he and Clara were able to establish a shared meaning, and Larry was able to build a more sophisticated understanding. This demonstrates the crucial importance of asking children how they understand particular aspects of bushfire risk and of stretching downward to understand how they define the problem. When adults and children fail to establish shared meaning and mutual comprehension, the sophistication of children's knowledge is constrained by their existing misconceptions. This argues for bushfire education that provides ample opportunities for children to engage in genuine dialogue that facilitates the process of establishing shared meaning with educators.

Whilst this research has revealed clear themes in children's misconceptions about bushfire hazards, it should not be viewed as a substitute for engaging in genuine dialogue with children as part of the education process. Put another way, this research does not save educators the trouble of stretching downward to understand the perspectives of the children whom they teach. The purpose of presenting children's misconceptions in the way that I have has been to demonstrate that children's views are often discrepant from the views of adults and that advancing children's knowledge requires that the idiosyncratic nature of their misconceptions is understood. Thus, the recommendation here is that educators seek to understand the unique and varied misconceptions of those whom they teach and refrain from making assumptions about children's knowledge. This precludes taking the misconceptions documented in this thesis and presenting them to classrooms of children as 'myths'. Such an approach would not facilitate the process of bridging and would only circumvent the kind of dialogue that promotes knowledge development.

8.4   Concluding remarks

This chapter has presented the substantive grounded theory that emerged from the in-depth analysis of children's knowledge of bushfire hazards. Titled Seeking Adaptation, the theory proposes that when children perceive bushfires as having the potential to adversely impact upon the things that they value, they experience feelings of worry and fear which prompt the identification of protective strategies that will protect those valued things. Thus, the theory conceives children as active agents who are unwilling to accept hazard impacts as unavoidable or inevitable. Importantly, children's engagement in Seeking Adaptation is strongly influenced by their knowledge of bushfire hazards and this knowledge is often incomplete or misconceived. Interestingly, many of the misconceptions held by the children in this study have also been identified in research with adult populations, and hence, addressing these misconceptions when children are still at school represents a promising long-term strategy for increasing levels of community knowledge and understanding. Importantly, however, educating children when they are still at school also has the potential to increase levels of community knowledge and understanding in the here and now because they exert a keen influence on the attitudes and behaviours of their parents. Crucially, capitalising on this influence will depend upon the extent to

which children's education programs facilitate the development of more sophisticated hazards knowledge. Piaget's Theory of Adaptation and Rogoff's Theory of Guided participation provide useful frameworks for achieving this aim. Central to both of these theories is the notion that extending and enhancing children's knowledge requires structuring and organising the introduction of new information in a way that accommodates and transforms the knowledge that they already have. This, in turn, requires that education programs provide children with ample opportunities to engage in genuine dialogue with educators about their existing knowledge and ideas.

CHAPTER 8: CONCLUSION

The final import of the conclusions as to knowledge resides

in the changed idea it enforces into action.

- John Dewey (1929, p.196).

This thesis began by identifying the significant opportunity that Black Saturday, and the subsequent recommendations of the 2009 Victorian Bushfires Royal Commission, represents for the development and delivery of children's bushfire education. Whilst bushfire education for children has been recommended by every Australian bushfire commission and inquiry since Black Friday in 1939, the magnitude and extent of the Black Saturday disaster has prompted governments and fire agencies to ensure that this time around, the recommendation for school-based bushfire education is implemented in full. An emergent literature on child-led disaster risk reduction suggests that doing so effectively will not only increase the resilience of children and their households, but will extend benefits to whole communities. However, if children's bushfire education is to facilitate the kind of learning and action that builds resilience, it must respect and accommodate children's knowledge and perspectives.

The educational imperative to accommodate the knowledge and perspectives of the learner has long been recognised by scholars and practitioners of developmental psychology, education, and community development and, more recently, by those working in the hazards and disasters field. Historically, however, children have been marginalised from hazards and disaster research, and as a result, little attention has been focussed on how they conceptualise bushfire hazards and disasters, or hazards and disasters more broadly. Clearly, research that increases understanding of children's knowledge in this domain is crucial. Hence, this thesis aims to develop an increased understanding of children's knowledge of a) the conditions and processes that cause bushfire hazards and disasters, b) the conditions and processes that mitigate or prevent bushfire hazards and disasters, and c) the role of environmental and socio-cultural context in the development of children's hazard knowledge.

To avoid some of the conceptual, theoretical, and methodological shortfalls of past hazards and disasters research, the extant literature was critically evaluated in order to identify a rigorous foundation upon which a study of children's knowledge could be based. The technocratic hazards perspective, which has dominated research for the last several decades, was dismissed for this purpose because its long running preoccupation with the empirically unsubstantiated tripartite model of hazard adjustment has precluded the development of any guiding theory that can adequately explain how children or adults conceive, experience, or adapt to environmental hazards and disasters. Moreover, the 'citadel of expertise' that characterises the hazards perspective has served to marginalise children from hazards and disasters research, policy and practice. The emergent paradigm of the vulnerability perspective was identified as providing a more robust foundation for this research because by embedding hazards and disasters in the processes and conditions that characterise everyday life, it

privileges the perspectives of ordinary people, particularly those who belong to vulnerable groups, such as children.

This thesis takes the symbolic interactionist stance that neither children nor adults are passive receptacles impinged upon by external forces, simply receiving and responding to stimuli: rather, they actively construct their own meanings for things through their communications with others and their communications with themselves. According to this perspective, it is these meanings that underpin knowledge and guide behaviour, *not* external stimuli. The thesis also views knowledge development through a socio-cultural frame in which learning is viewed as a cultural process with people developing as participants in the practices and circumstances of their communities. In doing so, it rejects the view that children pass through universal stages of development that constrain their capacities for particular intellectual tasks at particular ages. It also rejects the notion that the influence of socio-cultural context on children's knowledge development is unidirectional: rather, it takes the position that children are active agents for change in their homes, educating and influencing the awareness, knowledge, and behaviour of their parents and their siblings. As such, the thesis proposes that any study of children's knowledge must also attend to the role that children play in the knowledge development of others. Finally, the thesis aligns itself with a newly emergent paradigm in childhood research which challenges the dominance of the quantitative surveys and experimental methods that have delimited the extent to which children can articulate their own meanings in their own words.

By taking the positions outlined above and employing a constructivist grounded theory methodology, the thesis has fulfilled the first research aim of increasing understanding of children's knowledge of the conditions and processes that cause bushfire hazards and disasters. The research found that children were well aware of the adverse impacts that bushfire hazards can exert on people and property. They understood that bushfires can cause extensive loss of life and property and create intense suffering in affected communities. Importantly, however, children did not conceive bushfire hazards as impacting upon people and property indiscriminately. Rather, they were seen as the product of complex interactions between the biophysical process of bushfire and the pre-existing conditions, in both households and communities, which expose people to that process. By conceptualising hazards in this way, children's perspectives are aligned with the scholarly conceptualisations of the late Gilbert F. White, as well as the contemporary proponents of the vulnerability perspective.

Whilst children demonstrated substantial knowledge of bushfire as a biophysical process that involves fuel, ignition and specific weather conditions, the sophistication of their understanding was compromised by several major misconceptions, particularly in relation to fire spread, which was primarily conceived in terms of direct flame contact. Considering the extent to which children's knowledge of the biophysical process underpinned their understanding of the conditions that expose

people to bushfire hazards, it is crucial that education not only accommodates these misconceptions but actively dispels and replaces them with more sophisticated understandings that incorporate concepts such as ember attack and radiant heat flux. It is not being suggested that children's bushfire education should include a detailed course on the physics of fire behaviour: this would be neither appropriate nor particularly useful, as it would detract from time spent on other equally important components of the hazards education project. However, if children are to accurately identify the conditions that expose people to bushfires, they will need to understand the specific processes of ember attack and radiant heat flux and how these mechanisms impact upon both people and property. Children's capacities for understanding these mechanisms of fire behaviour and applying them appropriately was amply demonstrated by numerous children in this study. In light of this, and the fact that these mechanisms constitute the major causes of death, injury and property loss during bushfire events, seeking to enhance children's knowledge of them should be viewed as an achievable and worthwhile goal for bushfire education programs.

The research has also addressed the second aim of increasing understanding of children's knowledge of the conditions and processes that mitigate and prevent bushfire hazards and disasters. By conceptualising bushfire hazards and disasters as an interaction between the biophysical process of bushfire and conditions of exposure in human systems, children were able to identify myriad ways in which the human system could be altered to reduce hazard impacts. Children demonstrated an understanding of mitigating exposure to bushfire events through the general strategies of altering the environment that surrounds a home and by modifying the home itself. Importantly, the specific strategies identified by the children were directly informed by their knowledge of the biophysical process, conditions of exposure, and how these phenomena interact to create bushfire hazards. As such, the identification of effective and appropriate mitigation strategies was frequently undermined by their lack of knowledge about ember attack and radiant heat flux. Once again, this highlights the importance of educating children about these two critical elements of fire behaviour.

In addition to recognising the importance of mitigating the hazard, children also identified the need prepare for bushfire events: in particular, they perceived a fundamental need for reliable warning systems and bushfire emergency plans. A key issue emerging from analyses of children's knowledge in both of these areas relates to a tendency to apply their knowledge of house fire safety to the bushfire context. Thus, bushfire education programs must aim to help children to differentiate between these two types of fire emergencies. This will need to be done very carefully so as not to undermine the observed success of house fire programs in building children's knowledge of effective house fire response. Another key issue to emerge from analyses of children's knowledge of preparing for a bushfire event pertains to the tendency for children to delay evacuation until the last minute. Again, this tendency seems to stem from gaps and misconceptions in their knowledge of fire behaviour. When children had an understanding of the dangers associated with late evacuations (e.g.

smoke, low visibility, radiant heat) they were more aware of the need to leave early or stay and defend until the fire front had passed. When children lacked knowledge of the dangers associated with late evacuations, they were more likely to wait for the fire to reach the immediate vicinity of the property. This further emphasises the importance of equipping children with a more sophisticated understanding of the biophysical process and the particular mechanisms by which it impacts on people to cause death and injury.

A particularly important finding to emerge from the research was the extent to which children felt they would be able to implement the mitigation and preparedness strategies that they identified. Children identified a variety of physical, social, ethical, and economic barriers to mitigating and preparing, and this provides important evidence in support of the vulnerability perspective on hazards and disasters: namely, that whilst people may be aware of the hazard and have knowledge of the actions required to manage it, they do not always have the economic power or freedom of choice to take these actions. In this sense, the research represents an important contribution to the vulnerability literature which, to date, has not attended to how children understand the structural factors that impede adaptation to natural hazards. By identifying the barriers to mitigating and preparing, children also demonstrate the inadequacy of the tripartite model of hazard perception, knowledge of adjustments, and adjustment adoption that has dominated hazards research with children. By discounting or denying the importance of the freedom to choose, research based on the tripartite model has overlooked a major intervening variable in children's knowledge and experiences of adapting to natural hazards.

The third aim of the study was to develop an increased understanding of how the environmental and socio-cultural contexts in which children live their day to day lives both facilitate and constrain the scope and sophistication of their knowledge. The study identified the school, the family, direct experience with the fire, and the research process itself as integral to children's knowledge development in the bushfire hazards domain. Analyses of each context revealed several key processes that underlie children's knowledge development. The key theme uniting these various processes is that children develop their knowledge through *active engagement* with the physical world and *genuine participation* in the social world. Active engagement and genuine participation appear to be essential to the development of more sophisticated understandings, and it is strongly recommended that they be taken as the fundamental starting point for bushfire education programs.

Another key finding to emerge from analyses of the socio-cultural context pertained to the extent to which children influence the attitudes and behaviours of their parents. This finding represents a key foundation upon which to develop both school-based and community-based bushfire education programs that adopt a whole-of-family approach. Children's capacities to influence to their parents, both actively and passively, provides emergency managers with a new approach to engaging with the

adult community and the analyses presented in this thesis provides a strong evidence base for pursuing this approach in the future.

The overarching aim of the thesis was to raise child-centred hazards research to a theoretical level by developing a substantive grounded theory of children's knowledge of bushfire hazards. By proposing the theory of Seeking Adaptation, the thesis has achieved this aim, and this represents a major contribution to the global hazards literature. The theory of Seeking Adaptation dispels any notion that children are passive observers of hazards phenomena. Rather, when they are aware of the potential to be adversely affected by a hazard event, they are driven to identify strategies that will protect the things that they value. The ultimate task of bushfire education should be to assist children in their attempts at Seeking Adaptation. It should support them to better understand the biophysical nature of bushfires and how they interact with human systems to cause hazard impacts. It should also assist them to identify strategies for preventing or mitigating these impacts. It should also help them to develop the problem solving skills for dealing with barriers to the implantation of their protective strategies so that their attempts at Seeking Adaptation can provide a sense of self-efficacy and empowerment and ameliorate the worry and fear that accompanies the prospect of unmitigated hazard impacts.

Interpreting the findings of the research through the theoretical frames of Piaget's Constructivist Theory of Adaptation and Rogoff's Socio-cultural Theory of Guided Participation has provided additional insights into how children construct their knowledge of bushfire hazards. In doing so, the thesis provides educators and researchers with a firm theoretical basis upon which to develop education programs that capitalise on children's ways knowing. Piaget's theory emphasises the importance of creating novel situations that can challenge children's misconceptions and lead to the development of new more sophisticated understandings, whilst Rogoff's theory emphasises the importance of structuring and bridging children's participation in shared activities that lie within their zone of proximal development. Of fundamental importance to the development of education programs is the emphasis that both theories place on taking the time to engage with children and understand their perspectives *before* providing new information.

In addition to fulfilling the various aims of the research, the thesis also demonstrates the value of hermeneutical methodologies and in-depth qualitative methods that fully engage with the depth and breadth of children's knowledge of vulnerability, resilience and adaptation. At the same time it highlights the perils of imposing *a priori* models or theories through the use of hypothetico-deductive, quantitative surveys that delimit children's responses to those predetermined by the researcher. By seeking to understand bushfire hazards and disasters from the perspectives of the children, the research has highlighted the fundamental importance of allowing children to voice their perspectives, as well as the assumptions that underpin those perspectives. Often enough children had misconceived

the purpose of mitigation or preparedness strategies and it was only through a deeper exploration of their understanding of these strategies that these misconceptions were revealed. In these instances, a quantitative survey would have overestimated children's knowledge and added little to our understanding.

Whilst this thesis represents an important contribution to child-centred hazards research and bushfire education in Australia, there are several limitations that must be acknowledged. Firstly, parents participating in the research were predominantly women, and therefore, the perspectives of fathers are underrepresented in this research. Given the crucial role that gender plays in both bushfire management and hazard and disasters more generally, it will be important that future research addresses this limitation by examining the role that fathers play in the development of children's knowledge. It would also be interesting to further examine gender differences in children's participation in bushfire management.

Another limitation of the current study relates to the fact that teachers were not interviewed. In the design phase of the research it was determined that whilst teachers were an important element of the social context, the fact that children have a different teacher every year would make it difficult to identify direct relationships between children's knowledge and the views, perspectives and practices of particular teachers. However, future research should certainly investigate how teachers engage with the children on issues concerning bushfire risk. The implementation of the new bushfire education curriculum will provide ample opportunities to study the role of teachers in the development of children's knowledge in the classroom. Action-research methodologies would be ideal for this kind of project and could provide important evaluative information to promote the continued improvement of school-based bushfire education programs.

A final limitation of the study can also be viewed as its major strength. The conceptual framework developed in this research is extremely broad in scope and covers all aspects of hazard knowledge, from the biophysical process and the conditions of exposure that create hazard impacts, through to the myriad strategies that can be employed to reduce those impacts, through to the contextual and modifying conditions that influence children's knowledge in these areas. Any one of these components would be worthy of a detailed study in its own right and future research could seek to further refine the individual components of the framework and develop more nuanced understandings of children's knowledge. In this sense, the research represents a starting point for the design of new research projects that zero in on specific aspects of vulnerability and resilience as viewed from children's perspectives. Research could also further examine how children's knowledge in each area differs across ages, cultures, genders, and other variables that are known to influence how people construe and experience their worlds.

Having developed a theory that increases understanding of children's knowledge of bushfire hazards, research can now move towards an examination of the conditions and processes that influence how this knowledge translates into effective action. Action-research methodologies that maximise children's participation in the research process are the obvious choice for this project. Whilst quantitative surveys and tests may offer a more time efficient way to assess the degree to which children's knowledge has translated into action, these approaches are limited in the extent to which they can capture the complexity of the meanings that children attribute to particular actions, or the structural conditions and processes that facilitate or impede implementation. Importantly, the utilisation of action-research methodologies will also encourage researchers, educators, policy makers, and hazard managers to engage with children as legitimate stakeholders in hazard management projects. Whilst this thesis has drawn attention to the gaps and misconceptions in children's knowledge of bushfire hazards, it has also demonstrated that they have an intrinsic capacity for building their understanding and making genuine, valued contributions to the bushfire management process. As such, they represent a major resource for the development of safer, more resilient communities.

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Appendix 1.1: Impacts of environmental hazards and disasters on children

Wherever disasters occur, children are often among the worst affected (Peek, 2008; Penrose & Tataki, 2006; Seballos, et. al., 2011). The International Federation of the Red Cross and Red Crescent Societies (2001) estimate that each year between 1991 and 2000, 76.5 million children under the age of 15 were affected by natural disasters or armed conflict. Save the Children (2007) estimate that over the next decade, this figure is set to triple with predictions that up to 175 million children will be affected every year by the kinds of natural disasters brought about by climate change. Although children are frequently identified as highly vulnerable to the impacts of disasters (Cutter, 1995; Hewitt, 1997; Wisner, et al, 2004), research documenting the precise nature and degree of this vulnerability is lacking (Anderson, 2005; Peek, 2008; Seballos et al, 2011). Nevertheless, the available research indicates that children are less equipped to deal with the psychosocial and physical impacts of disasters (Bartlett, 2008; Cutter; 1995; Peek, 2008) than adults.

In terms of psychosocial impacts, research has shown that disaster exposure can interfere with and impair children's everyday functioning and cause considerable distress for them and their families (La Greca et al, 2002). In a meta-analysis of 160 post-disaster investigations, Norris and colleagues (2002) found that young people were more likely to suffer psychological impairment than adults, with 48 percent of school-age youth experiencing moderate impairment and 52 percent experiencing severe or very severe effects. The psychosocial impacts of disasters on children have also been found to exert a prolonged affect long after the event. For example, among child victims of the 1988 Armenian earthquake, epidemic proportions of Post-Traumatic Stress Disorder (PTSD)[1] remained at high levels 18 months after the disaster (Pynoos et al.,1993).

Several studies have also shown that the psychosocial impacts of disasters vary according to age. Reactions observed in early childhood (1-4yrs) have included clinginess, nightmares, aggression and separation anxiety (Norris et al, 2002), whilst reactions observed in primary school-aged children (5-12yrs) include symptoms of PTSD, social withdrawal, somatic complaints and increased hostility towards siblings (Mandalakis, et al, 1999; Vogel & Vernberg, 1993). Problems emerging in adolescence, meanwhile, include PTSD, aggressive or oppositional behaviour, sleep or eating disorders, increased risk taking behaviour, and increased drug and alcohol abuse (Gupta, 1999; Madalakas et al, 1999; Shannon et al, 1994).

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[1] PTSD is a debilitating condition characterised by symptoms of reliving the experience (e.g., recurrent or intrusive thoughts or dreams), avoidance or numbing of normal emotional responses (e.g. avoiding thoughts or feelings about the event; feeling detached) and hyperarousal (e.g. difficulty sleeping or concentrating) (American Psychiatric Association, 2000).

In regards to bushfire hazards and disasters, very little research in Australia or internationally has examined children's psycho-social reactions. However, the limited evidence available suggests that exposure to a bushfire disaster has a negative impact on behavioural functioning and emotional well-being (Clayer et al., 1983; McDermott et al. 2005; McFarlane, 1987; McFarlane, Policansky & Irwin, 1987; Valent, 1984; Yelland et al., 2010). Several studies of the Ash Wednesday disaster in 1983, reported that children experienced substantial stress in the aftermath of the fire. In what can be described as an observational study, Valent (1984) reported that one to two months after the fire children were upset by the loss of houses, pets, toys, schools, playing areas, and structure. They exhibited symptoms like sleeplessness, nightmares, enuresis, walking and talking in sleep, clinging and school phobia. Some children also exhibited behavioural problems, such as regression, overactivity, or aggression. Similar reactions were documented by Clayer et al. (1983). These authors excluded children from their study but cited parent reports of children's negative reactions including enuresis, clinginess, behavioural problems, sleep problems, as well as agitation when exposed to fire-related stimuli such as smoke or hot, dry winds. In a controlled, longitudinal study, McFarlane and colleagues (McFarlane, 1987; McFarlane, Policansky & Irwin, 1987) found that two months after the disaster, behavioural and emotional problems among children who had experienced the event directly was actually less prevalent than those among a control group. However, eight months after the disaster, problems among the children who had experienced the event had risen significantly and continued to persist at high levels at 26 months.

In a more recent study examining children's reactions to the 2003 Canberra bushfires, McDermott et al. (2005) found that six months after the event 12.1 percent of children and adolescents reported symptoms consistent with moderate PTSD and 9 per cent reported symptoms consistent with severe to very severe PTSD. Also, children who reported feeling specific threats to their safety also experienced higher levels of PTSD. For example, children who thought that they might die, who were within 50m of the flames, who saw flames, or who were home alone reported higher levels of PTSD symptomology and emotional problems. PTSD symptomology and emotional problems were also positively correlated with children's subjective reports of how frightening the bushfires had been. It was also found that primary school-aged children reported higher levels of PTSD and more emotional problems than their high school counterparts.

Following the 2005 Lake Eyre fires in which 8 people died (4 of them children) Yelland et al. (2010) found that 27 per cent of children and youth reported moderate to severe levels of PTSD and that younger children reported higher levels than older children. Percieved personal life threat and ongoing loss and disruption were also related to greater PTSD symptomology.

Whilst research on children's experiences of disasters has tended to focus more on psychosocial impacts, it is widely acknowledged that children are highly susceptible to the physical impacts of disasters and are much less likely to survive one than adults (Peek, 2008). Disproportionate numbers of children among the victims of several recent disasters have served to reinforce this view. Of the estimated 1,836 fatalities in

Hurricane Katrina, 500 were children and youth under the age of 15 ((National Centre for Missing and Exploited Children, 2006) and although the exact number of children who died in the 2004 Boxing Day tsunami will never be known, Penrose and Tataki (2006) suggest that any estimate under 100,000 would be cautious. In the 2008 Sichuan earthquake, thousands of children were crushed to death when their schools collapsed. The Chinese Government reported that 5,335 children were killed, but human rights group Amnesty International (REF) have suggested that this figure is a fabrication and that the true figure is likely to be much higher.

Although controlled epidemiological studies of physical impacts on children are scarce, the few that have been conducted reflect a general trend of increased mortality, with children accounting for between 50-55 percent of disaster deaths. In a study of the 1991 cyclone in Bangladesh, Ikeda (1995) found that despite constituting only one third of the population, children under 10 years accounted for at least half of the 138,000 deaths. Parasuraman (1995) found that approximately 55 percent of the 3,490 individuals who died in the 1993 Latur-Osmanabad earthquake in India were children under the age 14. In a cross sectional survey of Sri Lankans displaced by the Boxing Day Tsunami, Nishikiori et al. (2006) found that children under 9 years of age accounted for 54.5 percent of fatalities. Thus, although limited in quantity and scope, the available epidemiological data suggests that children are highly vulnerable to the physical impacts of hazards.

Appendix 4.1: Letter of invitation to school principals
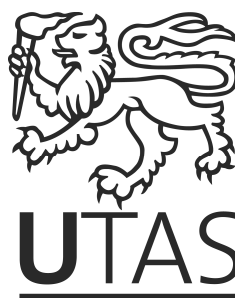
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The Socio-Cognitive Construction of Bushfire Risk: A Developmental Perspective
Chief Investigator: Professor Douglas Paton   PhD Candidate: Briony Towers

Dear   _____,

Your school is being invited to participate in a research project being conducted by Professor Douglas Paton and Ms Briony Towers. The research is being undertaken by Briony to fulfil the requirements for a PhD degree in psychology at the University of Tasmania. The project is sponsored by the Bushfire Co-operative Research Council, a Commonwealth Government scientific research body that is focused on bushfire mitigation and management. We are inviting your school to participate as it is located in an area which the [CFA] [Tasmanian Fire Service] identifies as being susceptible to bushfire activity.

Following the Canberra bushfires in 2003, the Australian Government commissioned a National Inquiry on Bushfire Mitigation and Management. This inquiry identified a serious need to further educate communities about bushfire risk and mitigation and, by extension, increase levels of bushfire preparedness in at-risk areas. Schools were identified as a major resource for achieving this objective. However, in order to effectively utilise this resource we need to understand how children perceive issues associated bushfire risk and mitigation. Two issues are significant in this context. Firstly, throughout childhood and adolescence children's conceptual understanding of causality and prevention undergoes systematic, qualitative changes. Research in the field of health psychology has found that when risk communication about health and illness accommodates these changes children are able to develop more complex, more sophisticated concepts of illness management and prevention. The second issue arises from research highlighting the importance of social context in conceptual development. Research on road safety education, for example, has found that when the mode of information delivery is consistent with prevailing elements of the social context (i.e. peers, family, or school) children are better able to develop an understanding of road safety that, in turn, influences their behaviour.

Our research aims to
- Identify the age-related changes in children's understanding of bushfire risk and mitigation.
- Identify the role of social context in children's understanding of bushfire risk and mitigation.
- Extend the analysis of age-related changes and social context into adulthood by studying parents and the family context collectively.

The findings of the research will be used by the Tasmanian Fire Service, the Victorian Country Fire Authority, the Bureau of Meteorology, and the Melbourne Metropolitan Fire Brigade in the development of their bushfire education programs. This research has the full support and endorsement of the

aforementioned agencies, all of whom recognise the need to develop evidence-based programs that draw on theory and research from educational and developmental psychology.

We are seeking your approval to invite the children at your school to participate in either a focus group interview that will run for approximately one hour. We would like to interview approximately 20 to 25 children aged between 5 and 11 years. The interviews will involve a discussion about bushfire characteristics, bushfire consequences, and bushfire mitigation strategies. The interviews will also involve children being questioned as to the origins of their knowledge in each of these conceptual domains, that is, they will be asked with whom they interacted to acquire their knowledge.

At participating schools, children will be recruited for the interviews via short classroom presentations (about 5 minutes) to be delivered by Ms Briony Towers. In these presentations students will be informed about the nature and purpose of the research and those students who are interested in participating will be invited to take home a recruitment package to share with their parents. This package will contain an information sheet, consent forms and demographics questionnaires. The information sheet will also invite parents to volunteer for an interview and additional consent forms and demographics sheets will be included for them. We have included recruitment packages for both the individual interviews and focus group interviews for your perusal.

We are very flexible in terms of dates and times for the interviews and would like to schedule interviews in consultation with you and your staff to ensure that they take place at the most convenient, least disruptive times. Please be aware that in order to conduct as many interviews as possible during our short visit to your region, some interviews will need to be conducted during class time. Of course you, your staff, your students and their parents will be given the opportunity to request specific interview times and we will do our very best to accommodate these in the schedule.

The interviews will be videotaped and written consent will be sought from students and their parents for this to occur. Please be assured that all video footage will be stored in a password protected computer file, will be viewed only by the researchers, will not be used for any purpose beyond the initial transcribing of the interview, and will be destroyed upon completion of the project. Participation in the research is entirely voluntary and anonymity and confidentiality of all participants is assured.

This research has obtained ethical approval from the University of Tasmania Human Research Ethics Committee and approval to invite your school to participate in the research has been obtained from the Tasmanian Education Department.

If you would like your students to participate in this research or if you have any questions or concerns about any aspect of the research please contact Ms Briony Towers at your earliest convenience (contact details over leaf). We look forward to hearing from you soon.

Yours sincerely,

_____   _____

Professor Douglas Paton   Ms Briony Towers
Chief Investigator   PhD Candidate

Appendix 4.2: Letter of invitation to children and parents
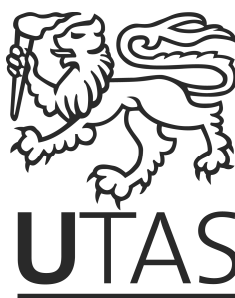
Briony Towers
School of Psychology
Private Bag 1342, Launceston
Tasmania, Australia, 7250
Telephone (03) 6324 3426
Mobile
Email: bctowers@utas.edu.au

____/____/____

The Socio-Cognitive Construction of Bushfire Risk: A Developmental Perspective
Chief Investigator: Professor Douglas Paton   PhD Candidate: Briony Towers

Primary School Child Focus Group Information Sheet

Dear Parent,

You and your child are being invited to participate in a study, being conducted by Professor Douglas Paton and Ms Briony Towers, investigating how people perceive bushfire risk in their local area. The study is being undertaken by Briony Towers to fulfil the requirements for a PhD degree in psychology at the University of Tasmania. The project is sponsored by the Bushfire Co-operative Research Council, a Commonwealth Government scientific research body that is focused on bushfire mitigation and management.

The children and parents at your child's school are being invited to participate in the study because the school is located in a geographic region in which bushfires could occur. By participating in the project you and your child will be assisting the investigators to develop a theory explaining how people of different ages perceive bushfire risk. It is hoped that this theory will assist the Tasmanian Fire Service, the Victorian Country Fire Authority, the Melbourne Metropolitan Fire Brigade, and the Bureau of Meteorology to develop more effective community information programs aimed at increasing levels of preparedness in areas that are susceptible to bushfires. By participating in the study you and your child will also have an opportunity to learn more about recent work on managing bushfires in Australia.

Your child is being invited to volunteer for a focus group interview about bushfires. This interview will involve sitting and talking with a small group of same-aged children about the causes of bushfires, the consequences of bushfires, things people can do to prevent these consequences, and actions that can be undertaken to enhance family safety. The interview is not designed to test your child's knowledge but rather to enable us to understand how children think about and understand the issues associated with bushfires. The interview will be conducted at your child's school, in school hours, and can be expected to run for approximately one hour. The interview will be scheduled in consultation with the teachers at your child's school to ensure that it takes place at the most convenient and least disruptive time.

You are also being invited to volunteer for an interview about bushfires. This interview will involve discussing a range of issues associated with bushfires, can be expected to run for approximately one hour, and can be conducted either at your child's school, at your home or another location depending on your preference. We are inviting parents to volunteer because we are interested in examining the differences between the way adults and children perceive bushfire risk.

If your child would like to volunteer for the study and you consent to their participation, please complete the consent form titled 'Child Group Interviews'. If you have a preference for the time of your child's interview, or there is a time that is not appropriate, please indicate such times on the consent form. You are also being asked to provide some demographic information about your child and your family on a demographics sheet that is attached to the consent form. You are <u>not</u> being asked to provide any identifying information (i.e. name, contact details) on this demographics sheet. If you would also like to volunteer to be interviewed, you are being asked to complete one of the consent forms titled "Parent Individual Interviews' and the attached demographics sheet. Please provide a contact number or email address in the section provided on the consent form so that we can arrange an interview time and location that is convenient for you. We would like you to return the consent forms and demographics sheets to your child's classroom teacher in the envelope provided within 14 days. Upon collection, consent forms and demographics sheets will be separated to maintain anonymity.

In order to transcribe the interview data for analysis, the interviews will be videotaped. By providing consent to participate in the study you will also be providing permission for this to occur. To ensure confidentiality, all video footage will be stored in a password protected computer file to be accessed only by the investigators and footage will not be used for any purpose beyond the initial transcribing of the interview. All other data, including demographic information and interview transcripts will be stored in a locked filing cabinet in the School of Psychology, University of Tasmania, Newnham. All data, including video files, will be destroyed after five years. To protect your anonymity you and your child will be assigned code numbers so that neither of you will be identifiable on any data that is provided. In addition, the interviewer will emphasise to all of the other participants in the focus group interview the need to respect the privacy of information that is shared by others in the interview. All participants will have the opportunity to review their interview transcripts and will be given the opportunity to amend or withdraw any interview data without explanation or consequence.

Your child's school has agreed to participate in this study. However, your family's participation in this study is entirely voluntary and you and your child are free to withdraw from the study at any time without explanation or consequence. You are also entitled to withdraw any data provided by you, or your child, at any time. There is no payment for participation. Please note that the researchers have not accessed any information about your identity or contact details.

It is hoped that your child will find the interview experience a fun and enjoyable one. However, if your child displays any signs of distress in the interview, the interview will be terminated immediately and you and your child's teacher will be informed. It is possible that someone who has experienced loss or trauma as the result of a fire might find thinking and talking about bushfires distressing. Thus, we are discouraging people who have experienced loss or trauma as the result of a fire from participating in the study.

This project has received ethical approval from the Human Research Ethics Committee (Tasmania) Network. Approval for the project has also been granted by the Victorian Education Department and the Tasmanian Education Department. Upon completion of the project, a summary of the findings will be posted on the University of Tasmania, School of Psychology web page http:/www.scienq.utas.edu.au/psychol and a hard copy of the results summary can be obtained by contacting the investigators (contact details below). Please retain this information sheet for your own use.

Concerns and Complaints
If you have any questions about the research please do not hesitate to contact the investigators at any time. If you have any concerns of an ethical nature or have any complaints about the manner in which the

research is conducted please contact the Ethics Executive Officer of the Human Research Ethics Committee (Tasmania) Network (Ph. 03 62262763).

Contact persons

Professor Douglas Paton	Briony Towers
Ph: 03 63243193	Ph: 03 63243426
Email: Douglas.Paton@utas.edu	Mobile:
	Email: bctowers@utas.edu.au

_____   _____

Douglas Paton   Briony Towers

Chief Investigator   PhD Candidate

Appendix 4.3: Consent form for child focus group interview

Consent Form

The Socio-Cognitive Construction of Bushfire Risk: A Developmental Perspective

<u>Child Focus Group Interviews</u>

1. I have read and understood the 'Information Sheet' for this study.
2. The nature and possible effects of the study have been explained to me.
3. I understand that in the focus group interview my child will discuss bushfire issues with a small group of same-age peers.
4. I understand that the interview will be conducted at my child's school in school hours, and that it can be expected to run for one hour.
5. I understand that the interview will be videotaped and that by providing written consent for my child to participate I am also providing permission for this occur. I understand that the video footage of my child will not be used for any purpose beyond the initial transcribing of the interview and that the footage will be viewed by the investigators only.
6. I understand that I am being asked to complete a demographics sheet and that this sheet will be assigned a code number so that neither I nor my child will be identifiable on this sheet in any way.
7. I understand that my child's interview will be scheduled in consultation with their teacher to ensure that it takes place at the most convenient, least disruptive time. It will not be possible to interview my child at the following times:

   _____

   I would prefer my child to be interviewed at one of the following times:

   _____

8. I understand that a child who has experienced loss or trauma as the result of a fire might find the interview distressing and I do not believe that my child to be at risk in this respect. I understand that if my child demonstrates any signs of distress or anxiety in the interview, the interview will be terminated immediately and my child's teacher and I will be informed.
9. I understand that all video footage will be stored in a password protected file to be accessed only by the investigators and that all other research data will be securely stored on the University of Tasmania premises for a period of 5 years. The data will be destroyed at the end of 5 years.
10. Any questions that I have asked have been answered to my satisfaction
11. I agree that the research data gathered for the study may be published (provided that my child cannot be identified as a participant).
12. I understand that in all research data my child's identity will be kept confidential and that any information supplied to the researchers will be used only for the purposes of research. I understand that the interviewer will emphasise to all of the children involved in the interview the need to respect the privacy of information that is shared by other children in the interview.
13. I agree that my child may participate in this investigation and understand that they may withdraw at any time without explanation or effect, and that I or my child may request any data we have supplied to be withdrawn from the research.

   Name of child _____

   Name of parent _____

   Signature of parent _____Date _____

14. Statement by the investigator: I have explained this project and the implications of participation in it to this volunteer and I believe that the consent is informed and that he/she understands the implications of participation.

Name of investigator _____

Signature of investigator _____ Date _____

Appendix 4.4: Consent form for parent interview

Consent Form

The Socio-Cognitive Construction of Bushfire Risk: A Developmental Perspective

<u>Parent Individual Interviews</u>

1. I have read and understood the 'Information Sheet' for this study.
2. The nature and possible effects of the study have been explained to me.
3. I understand that in the interview I will be asked a series of questions about bushfires.
4. I understand that the interview will be conducted at my home or in another location depending on my preference, and can be expected to run for 30 minutes to an hour.
5. I understand that the interview will be video-recorded and that by providing written consent to be interviewed I am also providing permission for this occur. I understand that the video footage will not be use for any purpose beyond the initial transcribing of the interview and that the footage will be viewed by the investigators only.
6. I understand that I am being asked to complete a demographics sheet and that the sheet will be assigned a code number so that I will not be identifiable on this sheet in any way.
7. I understand that someone who has experienced loss or trauma as the result of a fire might find the interview distressing and I do not believe that I am at risk in this respect.
8. I understand that all video footage will be stored in a password protected file to be accessed only by the investigators and that all other research data will be securely stored on the University of Tasmania premises for a period of 5 years and after this time all data will be destroyed.
9. Any questions that I have asked have been answered to my satisfaction.
10. I agree that the research data gathered for the study may be published (provided that I cannot be identified as a participant).
11. I understand that in all research data my identity will be kept confidential and that any information I supply to the researchers will be used only for the purposes of research.
12. I agree to participate in this investigation and understand that I may withdraw at any time without explanation or effect, and if I so wish, may request any data I have supplied to be withdrawn from the research.

Name of parent _____

Signature of parent _____Date _____

Please provide a contact number or email address so that we may contact you to arrange an interview at a time that is convenient for you _____

Alternatively, you may contact Briony Towers at your convenience (contact details are provided on the information sheet).

13. Statement by the investigator: I have explained this project and the implications of participation in it to this volunteer and I believe that the consent is informed and that he/she understands the implications of participation.

Name of investigator _____

Signature of investigator _____Date _____

Appendix 4.5: Short demographic questionnaire

Demographic Information

Age ____yrs ___mths

Gender (please circle)   Male   Female

For how long has your family lived in your current residence? ____yrs

For how long has your family lived in the area? ____yrs

Has your family experienced a bushfire in your area? (please circle) Yes   No

Has your family ever experienced any direct personal losses as the result of a bushfire? (please circle) Yes   No

Appendix 4.6: Examples of children's drawings

Drawing by a six year-old child

Drawing by a six-year-old child

Drawing by a seven-year-old child

Drawing by an eight-year-old child

Drawing by an 11-year-old child

Appendix 4.7: Example of an analytic memo

Memo 7/10/08

<u>Conceptions of staying to defend</u>

In the last several interviews (xx *et al*, Macedon; xx *et al*, Macedon; xx *et al*, Warrandyte) it has become clear that children's conceptions of staying to defend vary substantially. Some children have a sophisticated understanding and realise that staying to defend means taking shelter in the house as the fire front passes over. Other children, however, evacuate when the fire arrives because they think that if the fire reaches the house then house will burn down. They seem to think that staying to defend means putting the fire out before it reaches the house. These different understandings seem to be related to the social context. Some families who plan to stay and defend haven't told their children what will happen when the fire arrives and so children fill in the blanks with this more naïve conception of last minute evacuation: they think that if they can't stop the fire from reaching the house the house will burn down. Other children's parents have talked their children through the whole process and given them an idea of the dangers associated with last minute evacuations. They also seem to understand that the primary activity involved in defending is putting out spot fires and embers before and after the fire as opposed to fighting the fire front. These are issues need to be explored further in future interviews. The scenario is a particularly useful way to study these conceptions. In upcoming interviews try to get a better handle on why the kids leave at the last minute. Does the house make a difference? Does having a brick house with shutters, sprinklers etc make children more likely to shelter inside or is the fire perceived as all powerful? Also, what stops parents from talking their children through the entire stay and defend process? Have they thought through the entire process themselves or are they intentionally keeping that information from them in order to avoid the scaring the children or making them anxious. Do children with more a sophisticated understanding exhibit any fear or anxiety or are they confident that staying in the house as the fire passes over is a safe option?

Appendix 4.8: Ethics approval letter

COPY

MEMORANDUM

Private Bag 01 Hobart
Tasmania 7001 Australia
Telephone (03) 6226 2764
Facsimile (03) 6226 7148
Marilyn.Knott@utas.edu.au
http://www.research.utas.edu.au//index.htm

UTAS
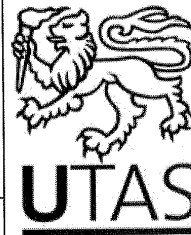
HUMAN RESEARCH ETHICS COMMITTEE (TASMANIA) NETWORK

FULL COMMITTEE APPLICATION APPROVAL

21 July 2006

Professor Douglas Paton
Psychology
Private Bag 1342
Launceston

Ethics reference: H8977
The socio-cognitive construction of bushfire risk: A developmental perspective.
Student researcher: Briony Towers (PhD)

Dear Professor Paton

The Tasmania Social Sciences HREC Ethics Committee approved the above project on 21 July 2006.

All committees operating under the Human Research Ethics Committee (Tasmania) Network are registered and required to comply with the *National Statement on the Ethical Conduct in Research involving Humans 1999* (NHMRC guidelines).

Therefore, the Chief Investigator's responsibility is to ensure that:

1) All researchers listed on the application comply with HREC approved application.

2) Modifications to the application do not proceed until approval is obtained in writing from the HREC.

3) The confidentiality and anonymity of all research subjects is maintained at all times, except as required by law.

4) Clause 2.37 of the *National Statement* states:
   An HREC shall, as a condition of approval of each protocol, require that researchers immediately report anything which might warrant review of ethical approval of the protocol, including:
   a) *Serious or unexpected adverse effects on participants;*
   b) *Proposed changes in the application; and*
   c) *Unforeseen events that might affect continued ethical acceptability of the project.*

   The report must be lodged within 24 hours of the event to the Ethics Executive Officer who will report to the Chairs.

5) All participants must be provided with the current Information Sheet and Consent form as approved by the Ethics Committee.

6) The Committee is notified if any investigators are added to, or cease involvement with, the project.

7) This study has approval for four years contingent upon annual review. An *Annual Report* is to be provided on the anniversary date of your approval. Your first report is due [12 months from 'Ethics Committee Approval' date]. You will be sent a courtesy reminder by email closer to this due date.
<u>Clause 2.35 of the National Statement states:</u>
As a minimum an HREC must require at regular periods, at least annually, reports from principal researchers on matters including:

a) *Progress to date or outcome in case of completed research;*

b) *Maintenance and security of records;*

c) *Compliance with the approved protocol, and*

d) *Compliance with any conditions of approval.*

8) A *Final Report* and a copy of the published material, either in full or abstract, must be provided at the end of project.

Yours sincerely

Ethics Executive Officer

Appendix 4.9: Approval to conduct research in Victorian schools

Department of Education & Training

Office of Learning and Teaching

SOS003375

Prof Douglas Paton and Ms Briony Towers
School of Psychology
University of Tasmania
Locked Bag 1342
NEWNHAM   TAS   7250

Dear Prof Paton and Ms Towers

Thank you for your application of 4 September 2006 in which you request permission to conduct a research study in government schools titled: *The socio-cognitive construction of bush-fire risk: A developmental perspectice.*

I am pleased to advise that on the basis of the information you have provided your research proposal is approved in principle subject to the conditions detailed below.

1. Should your institution's ethics committee require changes or you decide to make changes, these changes must be submitted to the Department of Education and Training for its consideration before you proceed.

2. You obtain approval for the research to be conducted in each school directly from the principal. Details of your research, copies of this letter of approval and the letter of approval from the relevant ethics committee are to be provided to the principal. The final decision as to whether or not your research can proceed in a school rests with the principal.

3. No student is to participate in this research study unless they are willing to do so and parental permission is received. Sufficient information must be provided to enable parents to make an informed decision and their consent must be obtained in writing.

4. As a matter of courtesy, you should advise the relevant Regional Director of the schools you intend to approach. An outline of your research and a copy of this letter should be provided to the Regional Director.

5.   Any extensions or variations to the research proposal, additional research involving use of the data collected, or publication of the data beyond that normally associated with academic studies will require a further research approval submission.

6.   At the conclusion of your study, a copy or summary of the research findings should be forwarded to the Research and Development Branch, Department of Education and Training, Level 2, 33 St Andrews Place, GPO Box 4367, Melbourne, 3001.

I wish you well with your research study. Should you have further enquiries on this matter, please contact Chris Warne, Project Officer, Research on (03) 9637 2272.

Yours sincerely

John McCarthy
Assistant General Manager
Research and Innovation Division

18 / 5 / 2006

enc

Appendix 4.10: Approval to conduct research in Tasmanian schools

Tasmania

DEPARTMENT *of* EDUCATION

File: 560191

4 September 2006

Dr Douglas Paton
School of Psychology
University of Tasmania
Locked Bag 1342
NEWNHAM TAS 7248

COPY FOR YOUR INFORMATION

Dear Douglas

RE: THE SOCIO-COGNITIVE CONSTRUCTION OF BUSHFIRE RISK: A DEVELOPMENTAL PERSPECTIVE

I have been advised by the Departmental Consultative Research Committee that the above research study adheres to the guidelines established and that there is no objection to the study proceeding.

Please note that you have been given permission to proceed at a general level, and not at individual school level. You must still seek approval from the principals of the selected schools before you can proceed in those schools.

A copy of your final report should be forwarded to the Director, Office for Educational Review, Department of Education, GPO Box 169, Hobart 7001 at your earliest convenience and within six months of the completion of the research phase in Department of Education schools.

Yours sincerely

David Hanlon
DEPUTY SECRETARY (SCHOOL EDUCATION)

Appendix 4.11: Detailed socio-demographic data for each research location

	Macedon	**Warrandyte**	**Bothwell**	**Huonville**
Person characteristics				
Total persons	1,439	5,205	376	1,934
Male	50.7%	49.6%	51.3%	48.8%
Female	49.3%	50.4%	48.7%	51.2%
Indigenous persons	0.5%	0.2%	3.5%	8.1%
Country of birth				
Australia	78.3%	77.5%	87.5%	85.4%
England	5.8%	5.2%	2.4%	4.3%
Other	3.2%	4.0%	3.8%	2.8%
Language spoken at home				
English only	91.7%	87.2%	96.0%	94.1%
Other	8.3%	12.8%	3.2%	1.8%
Religious affiliation				
No religion	27.7%	27.1%	9.3%	20.6%
Catholic	23.0%	22.5%	16.2%	17.5%
Anglican	20.1%	15.3%	51.3%	32.1%
Uniting Church	6.5%	5.5%	6.1%	6.6%
Other	2.8%	3.7%	6.1%	1.8%
Labour force				
Employed full-time	57.9%	56.4%	58.3%	55.0%
Employed part-time	33.7%	34.3%	29.8%	32.2%
Employed but away from work	4.3%	3.5%	2.0%	3.4%

Employed hours not stated	1.5%	2.3%	4.6%	4.8%
Unemployed	2.6%	3.4%	5.3%	4.8%
Occupation				
Professionals	24.5%	26.9%	4.2%	8.8%
Managers	16.6%	18.5%	16.1%	10.3%
Clerical and administrative workers	14.5%	15.8%	5.6%	10.6%
Technicians and trade workers	12.1%	11.6%	21.1%	18.3%
Community and personal service workers	11.4%	8.3%	7.7%	11.5%
Sales workers	9.2%	9.8%	8.4%	9.9%
Labourers	6.4%	5.3%	24.5%	19.0%
Machinery operators and drivers	4.2%	2.0%	11.9%	8.7%
Median income				
Median individual income ($/weekly)	515	584	301	358
Median household income ($/weekly)	1,196	1,642	599	696

(Source: ABS 2007a,b,c,d)