Vulnerability to Bushfire Risk at Melbourne’s Urban Fringe: The Failure of Regulatory Land Use Planning

MICHAEL BUXTON, RACHEL HAYNES, DAVID MERCER* and ANDREW BUTT*
RMIT University, School of Global Studies, Social Science & Planning, Swanston St., Melbourne.
*Latrobe University, Bendigo.
*Corresponding author. Email: dave.mercer@rmit.edu.au

Received 13 August 2009; Revised 10 June 2010; Accepted 8 June 2010

Abstract
The 7 February 2009 bushfires in the peri-urban region to the north of metropolitan Melbourne heralded what many have called an entirely new epoch in terms of weather-related disasters in Australia. A total of 173 people and 2000 properties were destroyed and, as with the 1939 fires in Victoria, a Royal Commission was subsequently instituted to inquire into the causes and responses to the fire. The Royal Commission has heard much evidence about alleged failings of fire response, communication and administration. It also considered land use planning issues and the associated regulatory framework. Using the Shire of Murrindindi as a case study, this paper argues that the location of population growth, and associated regulatory failure, are contributory, yet under-researched, factors associated with life and property losses. The adoption of more robust planning tools which incorporate climate change considerations, we argue, is essential to anticipate and minimise the impacts of disastrous natural events such as bushfires. In the latter part of the paper, attention is drawn to a recent Victorian Civil and Administrative Tribunal decision which is groundbreaking in its use of the precautionary principle to prevent dwelling construction in an ‘inappropriate’ location as well as to some major inconsistencies between planning for flood and bushfire threats.

KEY WORDS  bushfire; land use planning; Melbourne; precautionary principle; climate change

Introduction
Two important events occurred in the 1990s which helped raise awareness about natural disasters and risk. The first was the designation by the United Nations General Assembly of the 1990s as the International Decade for Natural Disaster Reduction. The second was the publication in 1992 of the English-language edition of Ulrich Beck’s Risk Society. Subsequently the book was translated into 20 other languages and the concept of risk has become the focus of ongoing debate in social science and public policy forums around the world. The debate has often been deeply polarised, and while there is no consensus as to the utility of the ‘risk society’ thesis (Mythen, 2007), there is no doubt that, for geographers, the popularity of Beck’s work rekindled an interest in natural hazards research, a tradition that stretches back to White’s (1945) pioneering work on human adjustment to floods. Over the last decade, in particular, debates around risk have also involved an increased interest on the part of both academics and policymakers in the related concepts of vulnerability, resilience and crisis (Ibarraran et al., 2009; Yates and Bergin, 2009). More recently, writers such as
Pyne (2009) and Champ and Brooks (2010) have argued for a renewed research emphasis on the human geography of fire.

The increased probability of non-linear change, in place of gradual predictable change, has important implications for future policy responses. Folke et al. (2002, 438) draw on Complex Systems Theory to propose a dynamic view of nature and society in which the ‘complex non-linear relations between entities under continuous change and facing discontinuities and uncertainty from ... synergistic stresses and shocks’ are emphasised. Complex non-linear relations can lead to sudden, irreversible and fundamental change, create new levels of uncertainty, increase the vulnerability and decrease the resilience of many affected species, including human populations. Folke et al. (2002), Walker and Salt (2006), and Fischer et al. (2009) point to the importance of resilience in determining critical ecosystem thresholds. Alberti and Marzluff (2004) also argued that resilience should be understood in terms of a socio-ecological system and that dynamic interactions between socio-economic and biophysical processes operate over multiple scales. The possibility of rapid, non-linear change, once critical thresholds are exceeded, requires anticipatory planning for alternative futures and rigorous alternative policies to achieve such ends. Anticipatory planning is the antithesis of business-as-usual practices typically characterised by reactive, market-oriented policies enabling incremental, ad-hoc development in a predictive trend line.

The present paper applies these ideas to the bushfires (‘wildfires’) which occurred on the northern fringes of Melbourne on 7 February 2009 (‘Black Saturday’). The authors urge a much stronger emphasis on land use planning as an effective mitigation tool (see also, Council of Australian Governments, 2005; and Kelly, 2010). The city’s extensive peri-urban region is neither fully urbanised nor completely rural, but comprises a ‘middle band’ of land with particular characteristics (Buxton et al., 2008). It consists of a ring of inner and outer peri-urban zones, as shown in Figure 1. The inner area consists of the Melbourne green belt including the Dandenong

Figure 1 Outer and inner peri-urban Melbourne areas (Source: Adapted from Vicmap, 2007).
Ranges, the Upper Yarra Valley, Mornington Peninsula and the Shire of Nillumbik. These regions are highly fire-prone and include a mix of urbanised areas forming part of the Melbourne metropolitan region, small and medium-sized towns, rural-residential developments, tourism complexes and larger rural lots. The outer peri-urban area includes the Shires of Surf Coast, Golden Plains, Moorabool, Macedon Ranges, Mitchell, Murrindindi, Baw Baw and Bass Coast. Surf Coast, the Dandenong Ranges, and the Macedon Ranges and surrounds have been affected by bushfires in the past, sometimes on many occasions. In addition, areas beyond the outer peri-urban zone, such as the Ballarat and Bendigo regions, may legitimately be regarded as part of Melbourne’s extended peri-urban zone.

Parts of the inner and outer peri-urban zones, and of the extended peri-urban area, were severely affected by the February 2009 bushfires. The main Kilmore-East / Murrindindi fire complex affected the municipalities of Mitchell, Murrindindi, Yarra Ranges, Nillumbik and Whittlesea, with the majority of the 173 lives lost being in Murrindindi and Nillumbik. This paper analyses the potential of land use and development policy to have reduced life and property losses from the events of 7 February 2009, and to reduce vulnerability in the future, focussing on the Shire Murrindindi as a case study. It does this by combining the information and geospatial datasets contained in an earlier publication on Melbourne’s peri-urban region (Buxton et al., 2008) with mapping of the fire-affected area. In essence, the paper seeks to make a contribution to the literature on policy learning (May, 1992; Brody, 2003). In terms of public policy, when combined, the issues under consideration in this paper together make up a ‘hypercomplex’ – or ‘wicked’ – problem (Lodge, 2009). This peri-urban region is a socio-ecological system under stress, recently affected by a major system ‘shock’, the February 2009 bushfires. It can only be understood by evaluating the reciprocal impacts between key factors potentially increasing regional vulnerability to non-linear impacts, in particular, the relationships between climate change, population increases, urban and regional development, natural resource uses, loss of biodiversity, water supply, human health, emergency management administration and procedures, and governance.

The Victorian government has paid little attention to the development of an anticipatory policy agenda to hazard risk, climate change and biodiversity preservation. However, the government established a Royal Commission to inquire into the causes of the loss of life and property in the 2009 fires. Much of the initial evidence focused on alleged failures of communication, as well as tardiness and a lack of coordination in the response. The Commission produced its first report in August 2009 (Teague et al., 2009). Subsequently, in February 2009, the commission examined whether the locations of people and dwellings on the urban periphery might increase the risk to persons and property from bushfire, in particular, whether dispersed rural and small town settlement patterns, and dwellings close to remnant native bushland were more vulnerable to the impacts of a greater number of more extreme fire events.

Weather-related disasters
Even though the most detailed and comprehensive databases relating to losses from natural disasters are confidential and held by the insurance industry, weather-related disasters such as severe storms, floods, droughts and bushfires are increasing globally. These now dominate the global disaster landscape, eclipsing annual losses from natural catastrophes such as earthquakes and volcanic eruptions. Drawing upon the Emergency Events Database (EM-DAT: www.emdat.be), Low (2008) has highlighted the dramatic, 13 per cent increase in weather-related disasters between 2006 and 2007. With a total of 874 worldwide, 2007 set the record for the highest number of such events since comprehensive monitoring began in 1974. The following year, 2008, was the third most expensive ever in terms of economic and insured losses, with the four costliest catastrophes all being weather-related (Rauch, 2009). Strongly linked to climate change, bushfire is an increasingly common occurrence in many countries, not least in Australia, one of the world’s most fire-prone regions (Russell-Smith et al., 2007; Bowman et al., 2009). With the loss of 173 lives and approximately 2000 dwellings, the 7 February fires were of such unparalleled magnitude and ferocity that, in Campbell’s (2009, 7) words:

...we are now seeing unprecedented FDI’s (Fire Danger Index), and need to introduce a new fire danger rating above ‘extreme’ called ‘catastrophic’...against the background of climate change [these fires] herald a new era.
Melbourne – city in time, space and fire

Melbourne’s rural-urban fringe is among the most vulnerable in the world to the bushfire hazard. Climate change is increasing risk to human populations, property and natural systems. The expected increased frequency and intensity of fire from climate change has important implications for land use and development, explored in this paper. At around 1.8% per annum, the population of Victoria’s peri-urban areas is increasing at twice the rate of the rest of regional Victoria, rates that are comparable to population growth in metropolitan Melbourne itself (Buxton et al., 2008). Without greater attention to careful land use planning, this combination of increasing human population in areas of high fire risk is certain to lead to further loss of life and property. Land use planning can play a central role in reducing risk to populations from bushfire through wise locational decisions for dwellings and other developments in areas of medium and high fire hazard.

Understanding Melbourne’s urban form and extent can assist the development of appropriate policy and planning responses to the needs and goals of the city and its peri-urban region. Melbourne is a major urban metropolis situated in what fire historian Stephen Pyne (1998) calls a ‘colossal fire flume’. As the city grows, more people are located in its peri-urban region, both in the immediate metropolitan fringe, in regional towns, and spread across a variety of rural lot sizes in the rural balance areas. Fire to Melbourne is not unlike hurricanes and flood to New Orleans or earthquake to Tokyo. To continue to develop a major city and its peri-urban area without a full understanding of the gravity of its susceptibility to the natural disaster of extreme fire events is no different to urbanising an area prone to other major natural disasters such as hurricanes, mud slides, earthquake, flood and volcanic eruption.

Melbourne today is the product of rapid urbanisation and industrialisation over a comparatively short period of time. By comparison with pre-European occupation (Presland, 2008), much of this development has occurred in an era when little was understood of the natural ecology and constraints of land and water systems. Many assumptions about the nature of the Melbourne region by early non-indigenous settlers were inaccurate due to the lack of knowledge and information available and cultural notions learnt in other environments. While Victoria’s written history contains numerous fire events (including Black Thursday, 1851, and Ash Wednesday, 1983) until now the events of 1939’s Black Friday have been the most seminal; the time when an industrialised white settler society collided with the ecological reality of its natural context (Gill et al., 1981). The lack of understanding and knowledge preceding Black Friday was lamented by Judge Leonard Stretton in his Royal Commission findings when he wrote ‘They had not lived long enough’ (Stretton, 1939, 1). While Stretton used these words to describe the people who lived and worked in the forests of south-eastern Australia when they were engulfed by a catastrophic bushfire, he ‘was not commenting on the youthfulness of the dead: he was lamenting the environmental knowledge of both victims and survivors. He was pitying the innocence of European immigrants in a land whose natural rhythms they did not yet understand...He was indicting a whole society’ (Griffiths, 2001, vii).

Though Australia has been formed in fire, and its indigenous flora and fauna demonstrate an evolutionary response to major fire events, some areas are more susceptible than others. Victoria is the most vulnerable part of the most fire-vulnerable continent. Even though the State comprises only 3% of the country’s land mass, it has sustained around 50% of the economic damage from bushfires (McGee and Russell, 2003; Whittaker and Mercer, 2004), a proportion that will have increased after the Black Saturday fires. Andrew Campbell, former Executive Director (CEO) of Land & Water Australia, commented on the 2009 fires: ‘The way we handle fires for me is one of the key indicators for how well we are learning to live in this ancient continent. The Victorian fires, and in particular some of the media since the fires, suggest that we have a long way to go in improving the ecological literacy of Australians and the body politic’ (Campbell, 2009, 1).

Since 1939, advances in science have led to the capacity to understand the nature and history of fire in Victoria as well as forecast future scenarios. However, urban and regional planning for the Melbourne peri-urban region has neither applied this knowledge through policies and regulations that minimise the location of new populations in areas of fire risk, nor anticipated a worsening fire environment (Hughes and Mercer, 2009).

The threat from fire cannot be totally eradicated from the peri-urban area. History demonstrates that fire events are not confined to...
burning in forested areas, but affect grassland and urban environments. Indeed when the McArthur Forest Fire Danger Index (FFDI) exceeds 50, it is the weather more than any other factor that will determine fire behaviour. Used as the basis for the declaration of ‘Total Fire Bans’, the FFDI was developed by A.G. McArthur at the CSIRO in 1966 to identify and empirically register the weather conditions associated with high and extreme fire danger and the difficulty of fire suppression. A reading of 50 or more is considered ‘extreme’ and the trigger for declaration of a Total Fire Ban. The FFDI readings for 7 February 2009 were in excess of 300. The increasingly rural residential nature of peri-urban areas, with their particular mix of rural aesthetic and human settlement, has led to a potentially lethal mix of an expanded population in areas susceptible to mega-fi res and increased fuel associated with housing (Mell et al., 2010).

Anthropogenic climate change: catastrophic bushfire more often

The CSIRO and Australian Bureau of Meteorology (2007) have evaluated future climate change for Australia from the results of 23 global climate models used by the Intergovernmental Panel on Climate Change (IPCC) in its 2008 Fourth Assessment Report. Temperatures are expected to increase in Victoria, while rainfall and soil moisture are expected to decrease. The decade, 1998–2007, recorded daily maximum temperatures 0.6 degrees C hotter than the 30 year (1961–1990) average, with 2007 being the hottest year on record for Victoria. By 2030, annual average temperatures are expected to increase by about 0.8 degrees C (0.6–1.2 degrees C) with increases greater in spring and summer; and by 2070 by 1.4 degrees C (0.9–2.0 degrees C) under a lower emissions scenario, or 2.7 degrees C (1.8–3.8 degrees C) under a higher emissions scenario. The incidence of frosts is expected to decline. The average annual number of days over 35 degrees each year under a high emissions scenario could rise significantly in Melbourne and the peri-urban area, for example, from 9 to 20 in Melbourne, from 4 to 12 in Ballarat and from 11 to 28 in Bendigo.

Rainfall decreased by 13%, but by as much as 20% in central Victoria over the decade 1998–2007. By 2070, annual average rainfall is likely to decrease by 6% (−14 to +2%) under a low emissions scenario, or by 11% (−25 to +3%) under a high emissions scenario. Evaporation is likely to increase by 2030, probably by about 3% (1–5%) with the largest increase in winter and by 2070 by 4% (1–8%) under a lower emissions growth scenario or 8% (2–16%) under a higher emissions growth scenario. The combination of higher temperatures, lower rainfall and higher evaporation has helped reduce yearly inflows to storages by about 30% over the last decade. By 2030, runoff to the peri-urban area is likely to be reduced by 5–40% and by 2070 by 5–50%. This combination of higher temperatures, lower rainfall, increased evaporation and reduced runoff, when combined with the expected increased number of extreme fire days, increases risk from bushfires considerably and requires a radically different policy response. The number of extreme fire days is likely to increase by 5–40% by 2020 (relative to 1974–2003), and by 2050 under a lower emissions growth scenario by 15–25% and, under a high emissions scenario, by 120–230%.

The Climate Institute of Australia, an independent climate research and advocacy centre, commissioned the CRC for Bushfires, CSIRO and the Australian Bureau of Meteorology to examine recent bushfire trends and projections under climate change. The resulting report, Bushfire Weather in Southeast Australia: Recent Trends and Projected Climate Change Impacts, established that anthropogenic climate change has exacerbated the risk to south-east Australia from increasingly frequent and severe bushfire events (Lucas et al., 2007). That report drew upon meteorological trends which highlighted increased average temperatures and protracted drought in south-east Australia developing over the past 50 years. It noted that the FFDI increasingly was being exceeded during summer.

John Connor, Head of the Climate Institute of Australia, notes that Sydney fire weather conditions in 1994 came close to 100 and the Canberra fires of 2003 peaked above that at 115 (Connor, 2009). The Special Climate Statement 17: The exceptional January-February 2009 heatwave in south-eastern Australia, released by the Australian Bureau of Meteorology National Climate Centre on 4 February and updated on 9 February, provides a detailed anatomy of the extraordinary heatwave that preceded the Black Saturday Fires. The Statement notes that record high temperatures for February were set over 87% of Victoria (Connor, 2009).
edented levels; as noted, in some parts of Victoria FFDI readings exceeded 300 (CSIRO, 2009). The threat from bushfire in Victoria, and events such as Black Saturday, are likely to not only recur, but to do so after shorter intervals. South-eastern Australia is not only an increasingly more active fire flume (Pyne, 2009) but prone to more intense fire events for longer periods of the year (Lucas et al., 2007).

The Victorian planning system

The Victorian Planning and Environment Act 1987 contains environmental objectives but no specific reference to climate change. The Act requires that a planning authority consider any significant effects a development application or planning scheme amendment may have on the environment, or which the environment might have on any use or development. The State Planning Policy Framework further emphasises the potential for consideration of the risk from bushfires to persons and property, stating that: ‘in consultation with relevant fire authorities, planning authorities must identify wildfire risk environments in planning schemes; and….

Fire hazards must be considered in planning decisions affecting wildfire risk environments to avoid intensifying the risk through inappropriately located or designed uses or developments’.

The current Victorian Planning System uses a suite of State standard planning provisions (the Victoria Planning Provisions – VPP) introduced from the mid-1990s. This relies on discretionary (permit required) uses and developments and reduced the number of prohibited uses particularly in rural zones, although revised rural zones strengthened controls for the inner peri-urban area in 2004 and for the outer peri-urban area in 2006. Additionally, some Victorian planning schemes had previously relied upon ‘tenement controls’ to limit dwelling construction on multiple lots by requiring a minimum land size for dwelling construction, or to a lesser extent, using a rural restructure zones. The VPP removed tenement controls allowing planning permit applications to be made for dwelling construction where previously they may have been precluded. Under the VPP, local and State planning policies, rather than specific provisions, were to guide the outcome of such applications. Subdivision controls in rural zones vary greatly. Some zones also allow small lots to be excised complementary to subdivision so increasing the potential for dispersed rural dwelling construction.

Local councils, and the Victorian Civil and Administrative Tribunal (VCAT) are only required to ‘consider’ rather than ‘apply’ local planning policies. This has the effect that no matter how well drafted or specific a policy is, it can be disregarded legitimately. This has been well-publicised and discussed as a result of Gory M v. Glen Eira CC [2001] VCAT 307 (28 February 2001) where the Tribunal Member questioned the value of the relevant Glen Eira local policy and disregarded it. This approach was subsequently upheld by the Supreme Court decision in Glen Eira City Council v. Michael Gory [2001] VSC 306 where the Court held that VCAT’s obligation was to ‘consider as appropriate’ the provisions of the planning scheme and that to ‘consider’ is not necessarily to adopt, apply or follow (Whitney, 2002).

The VPP’s discretionary and permissive approach has led to a high degree of contestability in the decision-making process for land uses and developments and inconsistent decisions. When examined against their original objective, the current VPP-based system has resulted in the opposite of what it sought to achieve, that is, it has led to increased complexity, uncertainty, size of planning schemes, and cost of administering schemes (Buxton, Goodman and Budge, 2003). This system has led to a proliferation of rural residential development in the peri-urban area, where biodiversity values are significant, agriculture may be practised and the bushfire risks are at their greatest.

The need for a philosophical shift in the Victorian Planning System, as a result of the Black Saturday fires, is no less deserving of scrutiny and reform than are operational and land management processes. After ten years without formal review of the system itself, at the Direction of the Premier, the Department of Planning and Community Development (DPCD), is currently undertaking a review of the Planning and Environment Act 1987. However, this review does not encompass the VPP (see Modernising Victoria’s Planning Act Discussion Paper March 2009, available at www.dpcd.vic.gov.au). A more anticipatory and prescriptive planning system for risk mitigation in the peri-urban areas is not being considered as part of the planning review process.

The outer peri-urban area and Murrindindi Shire case study

For the purposes of demonstrating the planning issues in relation to the events of 7 February
2009, we have chosen to analyse housing trends and fire risk in the rural areas of Murrindindi Shire, along with some data and commentary for the outer peri-urban region more generally. Despite the limitations of the VPP suite of standardised, permissive planning tools for rural areas, their full use would assist in preventing inappropriate and possibly dangerous land uses. In particular, it is important that the most appropriate land use zone and overlay controls over land are used. However, in general, the use of planning controls in Melbourne’s peri-urban area is not well matched to land characteristics. Figure 2 shows that the zone with the strongest controls on land use and development, the Rural Conservation Zone, has been applied rarely in the outer peri-urban region, except by Macedon Ranges Shire. The Farming Zone covers the largest area, affecting 88% of the area of the three rural zones. The Rural Living Zone is used typically for smaller areas, including formalised ‘estate’ style rural residential areas. Overlay controls, such as for native vegetation and significant landscape protection, are poorly matched to land characteristics.

Extensive land fragmentation has occurred in the region. In the outer peri-urban region, over 52,000 lots exist without dwellings (Buxton et al., 2008). Subdivision under schedules to the rural zones, and lot excisions could add considerably to this total. A range of lot sizes engaged in commercial and small-scale agriculture, rural residential and a range of other land uses make up peri-urban landscapes. This presents the possibility of considerable increases to development under the current planning regime. Zones are often matched inadequately to lot and property size, and to land uses, reflecting the dynamic nature of development in these areas, and the contested values and expectations for current and future land uses. Most lots in the Farming Zone are subdivided below the specified minimum subdivision size for the zone. For example, in the Farming Zone in Murrindindi, 27%, or 2185 lots, of the total number of lots are sized 0–2 ha. Most other municipalities in the peri-urban region include a high proportion of lot and properties of 0–2 ha in the Rural Conservation Zone. The possibility of dwelling construction on the large number of existing rural lots poses a serious future risk to life and property from fire.

The pattern of existing small lots has led to incremental, unplanned, ad-hoc dwelling construction throughout the rural areas of peri-urban councils typical of business-as-usual reactive policy practice. In the absence of a change to current policy and practice, many thousands more people will build on existing small lots and newly subdivided lots in dangerous locations in the peri-urban area. Through a process prioritising private property rights over the public interest, between 1997–2007, 4,181 dwellings were approved in the rural zones of five peri-urban councils, Moorabool, Macedon Ranges, Murrindindi, Mitchell and Surf Coast, 75% on lots less than 20 hectares in area, and almost 60% on properties less than 8 hectares. In the Farming Zone, over 60% of all housing approvals occurred on properties under 20 ha in the area, despite the majority of planning schemes generally nominating larger minimum lot sizes for subdivision. This is invariably inconsistent
with the objectives and strategic intent of each of the relevant planning schemes and planning objectives and policy which seek to discourage the amount of development on small lots between townships, particularly in the Farming Zone, and concentrate development into designated areas.

Figure 3 maps the fragmented pattern of lots and the process of incremental dwelling approvals for the Shire of Murrindindi, against the areas affected by the recent fire, and the use of the Wildfire Management Overlay (WMO) (Hughes and Mercer, 2009). These data demonstrate the vulnerability of dwellings constructed on small rural lots to bushfire, and the associated risk to dispersed, rising rural populations. Dwellings constructed on small lots north of Kinglake and Marysville were affected directly by the fire. However, a large number of new rural dwellings that have been constructed recently north of the fire extent were equally vulnerable but not affected because of wind and other factors. This figure also demonstrates the inadequate use of the Wildfire Management Overlay. This overlay was applied to most of the area affected by the fire north of Marysville, but not to the rural area affected north of Kinglake and not to the Kinglake township.

In Murrindindi there is almost a complete absence of the use of the Rural Conservation Zone, the zone with the strongest controls over rural uses. Limited use was made of the Wildfire Management Overlay (WMO). Table 1 also demonstrates the vulnerability of small lots in the 7 February 2009 fires, along with the potential for limiting the proliferation of further dwellings on existing rural lots. Most existing rural lots in Murrindindi are jointly owned, a situation broadly repeated over most of the rural Shires in Victoria. Properties (that is, singly owned lots or combinations of lots held jointly), 40 hectares or larger, comprise almost 28% of all properties. The construction of dwellings on lots currently jointly owned, and closer subdivision of properties in areas of high fire risk will increase the number of dwellings exposed to serious bushfire danger. These larger properties also remain important for agriculture and biodiversity, containing most of the remaining vegetation on private land. Their retention is compatible with

Figure 3  New Dwelling Approvals Murrindindi 1997–2007 (Rural Living Zone, Farming Zone, Rural Conservation Zone) (Sourced: DSE, 2009 (VMADMIN, VMPLAN, VMPROP, Interim Fire Extents)).

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the precautionary principle by retaining a range of future options. Although some Victorian rural councils have inserted a local policy provision aimed at controlling rural dwelling construction on jointly owned, or even individually owned separate lots, these controls are discretionary under the VPP and do not regulate a reduction of potential dwelling numbers and therefore reduced risk to persons and property that previous tenement controls required. Consequently, applications are dealt with inconsistently within and between local councils and are appealable to the VCAT with the result that many permits for dwellings continue to be issued.

Rural dwelling construction and other development is inadequately related through policy and statutory planning provisions to remnant native vegetation. The importance of retaining remnant native vegetation for landscape, biodiversity, water and land protection and other reasons has been recognised through statutory planning controls for 20 years. But a picture emerges of dwellings continually constructed in close proximity to remnant native vegetation, and the approval of subdivisions on land containing significant native vegetation. Both types of action result in the exposure of rising numbers of people to increasing risk from fire by introducing developments and uses into vegetated areas, while constantly degrading, reducing or eventually eliminating remnant native vegetation. In rural areas, the risk from introducing uses and developments which are incompatible with native vegetation should be recognised by limiting or preventing dwelling construction and further subdivision of vegetated land. Many examples of cumulative developments can be found over time.

**Planning for bushfire and flood risk: a comparison**

The similarities and differences between the planning regimes for bushfire, flood and sea level rise under the VPP are revealing. The Wildfire Management Overlay (WMO) has been designed to reduce dwelling ignition from ember attack rather than direct flame and radiant heat (which are addressed through the Building Code of Australia). The WMO does this by introducing a number of vegetation and siting requirements aimed at increasing setbacks to create enough distance to ensure that a dwelling is likely to be clear of bushfire’s ember attack zone. Under the VPP, the WMO is a control that regulates ‘development’ of land rather than its ‘use’ which is controlled by zoning rather than overlay controls. It is assumed that the suitability of a particular land use (including suitability for residential purposes) would have been considered in the original selection and application of the relevant VPP land use zone.

The WMO therefore does not regulate whether or not a parcel of land is suitable for a use for a dwelling but rather the siting of a dwelling and any associated vegetation clearing. Where the zoning allows the use of an allotment for a dwelling, the presence of the WMO rarely has led to refusal of planning permission for development of land for a dwelling. The WMO has had no discernable impact on the continued intensification of rural residential development in the case study area. Moreover, as the WMO

<table>
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<th>Rural Living</th>
<th>Rural Conservation</th>
<th>Farming</th>
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<tbody>
<tr>
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<td>Property</td>
<td>Parcel</td>
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<tr>
<td>Fire</td>
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<tr>
<td>Under 2 ha</td>
<td>177 129</td>
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</tr>
<tr>
<td>2–4 ha</td>
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<tr>
<td>4–8 ha</td>
<td>34 99</td>
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<td>8–20 ha</td>
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<td>20–40 ha</td>
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<td>40–100 ha</td>
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<td>2 4</td>
<td>0</td>
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<tr>
<td>Total</td>
<td>276 390</td>
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Table 1 Murrindindi Shire: parcels and properties. Number and percentage by size ranges (ha) by zones and non-fire/fire affected areas.
cannot be applied retrospectively, its requirements are only triggered for the development of new dwellings on larger sites. After the fires of February 2009, this requirement has been waived altogether, even though a planning permit may often have been triggered by other parts of the relevant planning scheme. As shown earlier, dwellings are continuing to be approved in areas affected by the WMO.

In contrast to the one provision for fire (the WMO), there are three flood overlays (the Land Subject to Inundation Overlay, LSIO; Floodway Overlay, FRO; and the Special Building Overlay, SBO) as well as a Zone (the Floodway Zone, FZ) that can be applied throughout Victoria. Each of these controls aims to ensure the safe passage of flood waters, and minimisation of damage to property and life. The three overlay controls have been developed to address different contexts and risks (i.e. rural, urban, flash flooding, etc). Further, the Floodway Zone is one of the strictest provisions in the suite of VPPs and prohibits new residential land use and development within it.

The use of the suite of flood controls is based on highly detailed and complex scientific flood modelling and mapping. They are coordinated by Melbourne Water and the various local water authorities throughout the State. Moreover, their application is consistent throughout the State, perhaps due to the corporate lineage of the Water Authorities being the once powerful Melbourne Metropolitan Board of Works (MMBW). Administrative municipal boundaries have no impact on the application of the suite of flood management controls. This is due to the comprehensive programme undertaken by Melbourne Water to ensure that the controls are applied consistently, the use of detailed flood physical risk modelling, and adequate resourcing to ensure that the relevant planning scheme amendments are processed as efficiently as possible. An official acceptance that flood water is generated by physical systems and does not respect municipal or other administrative boundaries, has led to their application regardless of municipal boundaries. For climate change impacts in coastal areas (that is, sea level rise and storm surge events) State Planning Policy and Practice through clause 15–08(2) and the related practice note, mandates the application of the ‘Precautionary Principle’.

In comparison, the WMO has been applied inconsistently. Municipal boundaries have a significant impact on its extent. It is also clear that while some Councils have applied it to public land, this is not the case in all situations. Administrative and governance factors, not physical science, account for such inconsistent application of the WMO. While it can be argued that fire is more uncertain in its occurrence and behaviour than flood, there is enough known about fire ecology and behaviour to provide a sophisticated level of physical risk modelling. Siting and design controls require that the WMO can only be applied to larger lots. In areas on the rural-urban interface where lots are semi-rural, it cannot be applied. A robust research and regulatory regime is required for risks from bushfire, equivalent to the level of research and knowledge applied to flood, and a more prescriptive response that controls development regardless of the other qualities of the land, such as the response used for flooding.

**Paradigm shift... a glimmer of hope?**

Lagadec (2009) has recently called for a paradigm shift in the way we think and act in relation to hypercomplex crises such as bushfires. Much of this paper has focused in some detail on what we see as the dramatic failings of the ‘old’ paradigm of land use development and ‘planning’ in the parts of Melbourne’s peri-urban hinterland affected by the February 2009 fire. Institutional and policy fragmentation is hampering the ability of governments at all levels to develop anticipatory policies which can assist the peri-urban region to adapt to rapid and fundamental change. This fragmentation is characterised by division between Commonwealth, State, Regional and Local levels of government, within large multi-sectoral government agencies, such as the Department of Sustainability and Environment and between sectoral State agencies. Fragmented institutional arrangements lead to fragmented policy responses. Regional strategic planning is rare in Australia. Where it has been practised, for example, in the Upper Yarra Valley and Dandenong Ranges for 20 years from the mid-1970s, it has involved government intervention, institutional integration and cross-sectoral planning and policy development across a defined spatial area. A cross-sectoral approach requires that sectoral agencies consider the conceptual and methodological approaches of other sectors in framing proposals, and build in reciprocal sectoral impacts of proposals to decision-making processes through integrated assessment criteria. The current environmental, social and
economic policy framework does not provide the means to develop far-sighted, integrated, strategic measures which effectively anticipate the potential impacts of rapid, radical changes to conditions.

In the latter part of this paper we argued that a positive development would be to take a precautionary approach to planning for the fire risk in Victoria by emulating the robust regulations and approach already in place for the flood risk. We conclude this section by drawing attention to a recent ruling by the State’s Civil and Administrative Tribunal (VCAT).

The Victorian Civil and Administrative Tribunal (VCAT) has become the de facto body for the development of planning policy interpretation precedents under the current planning system. Precedents are particularly important in a highly discretionary and consequently contestable planning system where decisions are made on a case-by-case basis. Gippsland Coastal Board v South Gippsland Shire Council & Ors (VCAT 1545 29 July 2008) was the first decision to recognise and respond to climate change and planning for risk management in the face of its possible impacts by applying the precautionary principle (Calver, 2001). Though it does not relate to the increased bushfire risk, but rather potential sea-level rises with associated increased storm surges and flooding, it elucidates the broader public policy approach and the possible responses under the current planning system to climate change impacts. It also resulted in the December 2008 release of a General Practice Note (Managing Coastal Hazards and the Coastal Impacts of Climate Change) by the Department of Planning and Community Development (DCPD). This re-emphasised, but did not mandate, the need to invoke the precautionary principle and introduced the option for responsible authorities to require coastal vulnerability assessments when considering planning applications. The analysis of risk in this judgement applies also to other risks associated with climate change, including from bushfires. When delivering its reasons for determining not to grant permits for ten developments of six dwellings on existing small lots within the Farming Zone in South Gippsland, VCAT Deputy President Helen Gibson and Member Ian Potts concluded:

... that the impacts that the environment may have on these dwellings are unacceptable and make the land unsuited for the proposed development. (VCAT 1545 29 July 2008, 31)

Conclusion
Risk management for climate change, should no longer be ad-hoc and left to legal argument within a discretionary land use planning system. A more comprehensive approach to risk management within the planning system is needed as well as a review of the capacity of the relevant controls to manage risk. A more systematic and scientific approach that mandates use of the precautionary principle and anticipates change and uncertainty is essential to minimise risks and avoid damage and loss of life from bushfire. Ad-hoc, reactive, case-by-case decision-making, assuming a continuation of linear trends, cannot satisfactorily consider the impacts of rapid, irreversible, fundamental climate change. The continued proliferation of rural residential development and dwelling construction within the peri-urban region in areas of increased and extreme bushfire threat from climate change (measured in terms of intensity, frequency and duration), and the outcomes from the Black Saturday fires of loss of life and biodiversity (Gill et al., 2002), property damage, human suffering and the economic cost of reconstruction, demonstrate ‘regulatory failure’ under the current planning system.

ACKNOWLEDGEMENTS
The authors wish to acknowledge the assistance of Alex Lechner in the production of the maps and figures as well as the comments of two referees.

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