INCREASING THE COMPREHENSIVENESS OF BUSHFIRE RISK MANAGEMENT IN VICTORIA THROUGH THE PLANNING SYSTEM

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ABSTRACT

Settlement patterns and projected climate change impacts for Victoria are increasing the likelihood of bushfire exposure to human settlements. Urban planning is now considered an important component in disaster risk reduction and bushfire risk management; however, it has not always played such a role. Bushfire planning controls in Victoria have adapted to the threat of bushfires over time, but the changes have not been documented in detail. A review of past and present policy and regulations is needed to determine the comprehensiveness of Victoria's approach to bushfire risk management and to identify any gaps so that bushfire threats can be better addressed in the future.

This thesis seeks to examine the comprehensiveness of bushfire planning controls in Victoria between 2008 and 2018 and how changes to planning scheme regulations have modified the level of comprehensiveness over time. To determine comprehensiveness, bushfire risk management policy from the Victoria Planning Provisions were analysed at key time periods against a conceptual framework based on five accepted categories of approaches for reducing and adapting to hazards in human settlements. The five categories were hazard avoidance, hazard reduction, vulnerability reduction, preparedness for response and preparedness for recovery. Policy was analysed using a pattern matching technique and a simple time series analysis. The results indicate that Victoria's current approach to bushfire risk management is more comprehensiveness than that was in place in 2008 because risk, vulnerability and bushfire behaviour, and four of the five categories for reducing and adapting to hazards are better addressed through policy. Overall, current policy is not as comprehensive as policy that was introduced in 2011. This thesis concludes by highlighting gaps in current policy that should be addressed in the future to improve resilience to bushfire hazards and outlines recommendations for further research.

DECLARATION

This is to certify:

i) this research entitled 'Increasing the comprehensiveness of bushfire risk management in Victoria through the planning system' represents my original work.

ii) due acknowledgement has been made in the text wherever adapted from other sources.

iii) the thesis is within 10 percent of the 10,000 word limit, excluding the abstract, references, tables, appendices and figures.

Signature:

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Date: 29 October 2018

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TABLE OF CONTENTS

LIST OF FIGURES AND TABLES

ACRONYMS

BAL: Bushfire Attack Level

BPA: Bushfire-Prone Area

BMO: Bushfire Management Overlay

CFA: Country Fire Authority

DELWP: Department of Environment, Land, Water and Planning

DRR: Disaster Risk Reduction

FDI: Fire Danger Index

SPPF: State Planning Policy Framework

UNISDR: United Nations International Strategy for Disaster Reduction

VBRC: Victorian Bushfire Royal Commission

VPP: Victoria Planning Provision

WMO: Wildfire Management Overlay

CHAPTER 1: INTRODUCTION

BACKGROUND

The number of disasters occurring worldwide is increasing (Wamsler, 2014). There are two primary reasons for this increase – climate change and environmental degradation, and increasing populations living in vulnerable areas (Coppola, 2011). Human settlements are likely to face an increased threat from weather-related disasters and therefore need to become more resilient. One of the biggest disaster risks in Australia is bushfires. Between 1901 and 2011, there were 260 recorded bushfires across Australia, which resulted in 825 fatalities (Blanchi et al., 2014). Sixty-seven per cent of all fatalities during this period occurred in Victoria (Blanchi et al., 2014).

Bushfires are a normal part of the Australian environment. Victoria is particularly prone to bushfires because of the topography, build-up of flammable vegetation, and combination of hot and dry weather and occasional severe droughts (Harris et al., 2012). Bushfires are only hazardous when there is a risk that they will interact with human settlements. Population growth and expansion into urban fringe and semi-rural areas coupled with climate change projections that extreme weather events will occur more frequently is increasing the likelihood of bushfire exposure (Lucas et al., 2007; Opie et al., 2014).

The 2009 Black Saturday bushfires triggered a reform to bushfire planning controls in Victoria. The fires resulted in 173 fatalities and destroyed 2,133 houses (VBRC, 2010a). The Victorian Bushfire Royal Commission (VBRC) was established to determine the causes, impacts and response to the fires, and avenues for reducing bushfire risk so that such an event would not occur again (VBRC, 2010a). The tragedy of the Black Saturday bushfires highlighted that many Victorian settlements are particularly vulnerable to the threat and impact of bushfires. The VBRC handed down 62 recommendations, 18 of which were related to planning and building controls (VBRC, 2010a).

Urban planning is now considered an important component of disaster risk reduction (Burby et al., 2003; Glavovic, 2010; Wamsler, 2014) and bushfire risk management (Ellis, Kanowski & Whelan, 2004; Godschalk, 2010; Gonzalez-Mathiesen & March, 2014; Groenhart, March & Holland, 2012; March & Henry, 2007; Mell et al., 2010). Urban planning can help to reduce the vulnerability of settlements to the impact and consequences of bushfires by ensuring that bushfire protection strategies are implemented in new and existing settlements (Godschalk, 2010). The comprehensiveness of bushfire planning controls and the nature of bushfire management approaches have adapted over time as new threats, techniques, technology and societal expectations emerged. The development of bushfire planning policy in Victoria over time has not yet been documented in detail. An analysis of past and present bushfire planning controls through the planning system is needed to determine the comprehensiveness of Victoria's approach to bushfire risk management. The comprehensiveness of the current system cannot be determined without undertaking a review of current and past policy and regulations. Analysing past policies allows gaps in current policy to be identified and can therefore help to shape the direction of future policy (Patton & Sawicki, 2013). The comprehensiveness of bushfire risk management policy can be analysed using concepts from the fundamental ways settlements and humans deal with hazards.

AIM OF RESEARCH PROJECT

This research aims to document the development of bushfire planning controls in Victoria over time and to examine how comprehensive bushfire risk management is in Victoria through the planning system. This research does not seek to examine the effectiveness of policy or to conduct a risk assessment of the threat of bushfires to Victorian communities. It aims to examine how the planning system has adapted to the threat of bushfires over time and if or how the planning system can better address bushfire risk and impacts through policy in the future. While bushfire planning is considered in other planning documents and planning tools, such as strategic planning and master plans, the Victoria Planning Provisions (VPPs) have been the fundamental driver of change in terms of bushfire policy and are the primary planning tool for addressing bushfire risk in Victoria. Therefore, this research focuses on the VPPs.

RESEARCH QUESTIONS

This research project aims to answer the following primary question:

- How and in what ways has bushfire risk management become more comprehensive through urban planning and supporting systems in Victoria between 2008 to 2018 and what is yet to be done?

In addition, this research seeks to answer the following sub-questions:

- What have been the main changes to bushfire risk management in Victoria planning scheme regulations?
- In what ways have the main changes identified modified the level of comprehensiveness?

THESIS STRUCTURE

This thesis is divided into five chapters. Chapter two considers the literature and the conceptual framework used in this research. Chapter three outlines the research design. Chapter four outlines the findings and includes an analytical discussion on what the findings reveal about the comprehensiveness of bushfire planning controls in Victoria. Chapter five presents the conclusion.

CHAPTER 2: LITERATURE REVIEW

The literature review firstly defines key terms and concepts within the disaster literature that are important for understanding and planning for disaster risk reduction and bushfire risk management. These concepts underlie risk reduction and risk management processes in relation to climatic hazards. It then outlines how bushfires interact with human settlements, the role of urban planning in managing disaster and bushfire risk, and how the Victoria planning system manages bushfire risk. Finally, the literature review outlines the fundamental ways that humans and settlements deal with hazards.

HAZARDS

A hazard can be defined as a natural or human-made process that is likely to affect humans through injury or loss of life, or cause social, economic, property and environmental damages (UNISDR, 2017; Coppola, 2011). Human-made hazards arise from failures of technological innovation or from intentional behaviour (Coppola, 2011). Natural hazards include climatic and non-climatic hazards and can arise from natural processes or phenomena, such as a country's climate or geography (Coppola, 2011; Wamsler, 2014). There is usually a human-produced element that triggers or exacerbates most hazards – for example, human-induced climate change (Chapman, 1999; Wamsler, 2014). Each hazard has different levels of risk, probability and consequences depending on the location and intensity of the hazard (UNISDR, 2017). Disasters usually result from hazards, but not all hazards will result in a disaster.

DISASTERS, VULNERABILITY AND RISK

Disasters are a "serious disruption of the functioning of a community or a society at any scale due to hazardous events interacting with conditions of exposure, vulnerability and capacity, leading to one or more of the following: human, material, economic and environmental losses and impacts (UNISDR, 2017, p.13)." Disasters were once perceived as unavoidable "acts of God" or "acts of nature" and it was therefore believed that limited action could be taken to prepare for a disaster (Berg & De Majo, 2017). From the late 1980s, disaster understanding progressed to consider the role of humans in creating the conditions for disasters (Oliver-Smith, 1996). The concept of vulnerability emerged (Berg & De Majo, 2017).

Vulnerability refers to the conditions of which humans or settlements are able to anticipate, cope with and recover from the impact of a hazard (Wisner et al., 2004). Some settlements are more vulnerable to the impacts of hazards and are therefore more likely to experience greater consequences (Wisner et al., 2004). Vulnerability is influenced by social, economic and environmental factors, such as education, affluence, health, land-use patterns, construction methods, and access to resources (Cutter, Boruff & Shirley, 2003; Palliyaguru, Amaratunga & Baldry, 2014; Wamsler, 2014; Wisner et al., 2004). A disaster by its definition will not occur unless settlements are exposed to a hazard and there are vulnerable conditions that reduce the capacity of settlements to cope. The likelihood of a disaster occurring depends on levels of disaster risk and vulnerability.

Risk is the probability of a hazardous event occurring multiplied by the expected consequences – e.g. death, property damage or injury – of that event should one occur (Coppola, 2011). Risk levels

increase with the probability and severity of the hazard and the severity of the consequences (Fedeski & Gwilliam, 2007). There are number of underlying disaster risk drivers that are increasing the risk of disasters occurring globally (UNISDR, 2017). One of these drivers is climate change. As the extent and frequency of extreme weather-related events increases, the likelihood of disasters occurring also increases unless urban areas and settlements can effectively manage risk and increase their capacity to cope and recover.

RESILIENCE

The concept of resilience has academic roots in engineering, psychology and systems theory (Alexander, 2013), and has since been applied to a range of disciplines. Numerous definitions have emerged, each with different dimensions depending on the discipline itself (Torabi et al., 2018). While the concept has been criticised for being vague and fuzzy (Davidson et al., 2016), it has become a popular concept in planning policy and practice (Torabi et al., 2018). Davidson et al. (2016, p.7) note that terms commonly applied to resilience definitions include “persistence, absorption, recovery, identity retention, self-organisation, adaptability, and transformation”. Within the disaster risk reduction and climate resilience fields, additional elements are often embedded in definitions, including “preparedness”, “vulnerability reduction”, “resilience building”, and “collective capacities and processes” (Davidson et al. 2016, p.7). Resilience is often referred to as a process rather than an outcome and is associated with adaptability rather than stability (Norris et al, 2008).

The UNISDR (2017, p.22) defines resilience as: “the ability of a system, community or society exposed to hazards to resist, absorb, accommodate to and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions.” Therefore, a more disaster-resilient system has the capacity to change and adapt in response to changed or threatening environments and requires ongoing involvement from people, communities and institutions so that resources and processes can continue to be maintained (Norris et al., 2008; Paton & Johnson, 2006).

DISASTER MANAGEMENT

Disaster management aims to reduce risk to life and property posed by actual and potential disasters, and to ensure public safety in the aftermath of a disaster (Alexander, 2002). Risk assessments form a key component of disaster planning, enabling the development of risk management policy and plans (O’Brien et al., 2006). Disaster management is generally centred around four phases of the disaster cycle: mitigation; preparedness; response; and recovery (Alexander, 2002; Godschalk, 2010). Historically, disaster management has focused on response and recovery rather than proactive approaches, such as preparing for and reducing the risk and impact of disasters (Oliver-Smith, 2017). Disaster management has shifted towards a more integrated approach that encompasses all four phases but with an emphasis on risk reduction and mitigation (Palliyaguru et al., 2014). This approach is referred to as disaster risk reduction (DRR). DRR aims to integrate skills, expertise and strategies from multiple actors, agencies and disciplines and can be implemented at various governing levels, including the community/individual level (Palliyaguru et al., 2014; UNISDR, 2015).

BUSHFIRES

Bushfires are a hazard when they pose a threat to human settlements. Bushfire disasters occur when extreme bushfire conditions interact with residential development, resulting in the ignition of multiple homes and the fire cannot be contained by emergence response systems (Cohen, 2000; Cohen, 2008). Bushfire disasters are more likely to occur in rural and urban fringe areas because of the conditions and fuel sources of the surrounding environment (Cohen, 2000; Mell et al., 2010). Fires in these areas can destroy hundreds of buildings within a few hours. In residential areas, fires are more easily contained to one house by emergency response systems.

A fire's capacity to burn depends on oxygen, fuel and heat (Mell et al., 2010). Weather, terrain, wind, fuel size and quantity, and moisture and energy content all impact on a bushfire's burning capacity (Sharples et al., 2016). Topography influences bushfire risk because slope can affect speed, fire spread patterns and flame length (Calviño-Cancela et al., 2017; Linn et al., 2010). Bushfires burn faster travelling uphill because the fuel bed higher up the slope has already been exposed to additional heat and ignites more quickly (Chapman, 1999; Linn et al., 2010). Wind impacts on bushfire behaviour through its effect on heat, speed and spread of the fire, and ember attacks (Sharples et al., 2016). Directional changes to wind drive fires into new areas, creating larger and more dangerous fire fronts (March & Rijal, 2015; Sharples et al., 2016).

Homes ignite in bushfires when there is sufficient fuel, heat and oxygen to maintain a fire (Cohen, 2008). Radiation and convection heating preheat the house for ignition, creating perfect conditions for flame contact, radiant heat and ember attacks to ignite the house (Mikkola, 2008). Ember attacks are one of the most prevalent causes of property loss in bushfires (Blanchi, Leonard & Leicester, 2006; Cohen, 2008). Because wind can carry embers for multiple kilometres, ember attacks pose a risk before the impact of the fire front, during impact and for a period after impact (Mikola, 2008). Building materials, structural design, site location and vegetation management can make a building more resilient or vulnerable to ignition during a bushfire (Cohen, 2008; Blanchi, Leonard & Leicester, 2006; Mikkola, 2008; Price & Bradstock, 2013).

ROLE OF URBAN PLANNING IN DISASTER AND BUSHFIRE MANAGEMENT

Hopkins (2001, p.xiii) refers to urban planning as "intentional interventions in the urban development process". Planners seek to shape or manage development in response to a problem or to achieve a particular outcome (Levy, 2011). Thus, a planner's key role is to integrate and co-ordinate the complex functions of urban environments in response to problems, changes and future possibilities on the basis of collective concern and public good (Hopkins, 2001; Hurlimann & March, 2012). For example, in terms of risk management, some developments in high-risk hazard areas may be prohibited on the basis of a community's overarching goal, such as improving community resilience against potential disasters. The role of urban planning, however, has and continues to evolve as new problems and challenges emerge. For example, while initially concerned with the physical form and structure of cities and buildings, the focus of planning now includes social and environmental issues, such as climate change and sustainable development (Couch, 2016; Hurlimann & March, 2012).

Scholars now agree that urban planning is an important component in reducing disaster risk (Mileti, 1999; Glavovic, 2010; Wamsler, 2014), including bushfire risk (Ellis, Kanowski & Whelan, 2004; Gonzalez-Mathiesen & March, 2014; Groenhart, March & Holland, 2012; O'Neill & Handmer, 2012; Mell et al., 2010). By implementing and using regulations based on the best spatial arrangement of land use, development and management, planning can significantly reduce the likelihood of a hazard interacting with human settlements and reduce the potential consequences of a hazardous event should one occur (March & Henry, 2007). Planning can achieve these outcomes by utilising a variety of planning tools – e.g. vision statements, strategic planning, policy and regulations, master planning and design, and projects and funding streams – from their respective planning systems. These tools are usually derived from legislation, providing planners with statutory force and decision-making powers (Hurlimann & March, 2012). Planners, therefore, are uniquely placed to make decisions involving competing interests and are guided by local circumstances and overarching visions and goals.

ROLE OF URBAN PLANNING IN MANAGING BUSHFIRE RISK IN VICTORIA

Developments in bushfire-prone areas (BPA) in Victoria are primarily controlled through planning and building regulations. The *Planning and Environment Act 1987* is the enabling legislation that forms the basis for the Victoria planning system. Land use and development is managed through local planning schemes, which set out the objectives, policies and provisions that relate to use and development in the area that the planning scheme applies. Local planning schemes consist of state-wide and local planning provisions, and are adapted from a set of standardised state-wide planning provisions called the VPPs. Each municipality, in constructing their planning schemes, must include certain VPPs – the State Planning Policy Framework (SPPF), general and particular provisions, and definitions. Only the state-standard zones and overlays that are of relevance to the municipality are included in their planning scheme. The Bushfire Management Overlay (BMO) is a state-standard overlay that is applied to land deemed to be at risk of bushfires. The BMO includes a state-wide mapping of bushfire hazard areas and triggers the need for a planning permit for certain developments in these areas. Developments in the BMO are subject to both planning controls and building controls. The *Australian Standard AS3959 2009 – Construction of Buildings in Bushfire-Prone Areas* (2009) outlines the construction standards for building in bushfire-prone areas.

The *AS3959* was first introduced in 1991 (Kornakova & March, 2017). The Wildfire Management Overlay (WMO) was introduced in 1997 and was the first statutory planning control to specifically address bushfire risk (Kornakova & March, 2017). Application of the WMO was slow. By 2009 only 35 of 82 local councils had the WMO in place (VBRC, 2010b). The 2009 Black Saturday bushfires triggered a reform to bushfire planning controls in Victoria. The BMO replaced the WMO in 2011, introducing significant changes to bushfire planning regulations. While there have been developments in bushfire planning policy, there is limited evidence on the overall effectiveness of bushfire planning controls in Victoria. This is partially due to the difficulty in assessing the effectiveness of certain regulations unless they have been exposed to and tested in bushfires, and because it is a growing area of research. Nonetheless, Hughes and Mercer (2008, p.124) analysed the uptake and efficacy of the WMO and found that challenges to adopting the WMO for local councils included "lack of political will, a distrust of 'over-regulation', lack of training of planning staff, and conflicts with vegetation conservation objectives." Holland et al., (2013) examined the effectiveness of the WMO in terms of dwelling losses following the Black Saturday bushfires, and

found that there is some evidence that building to WMO bushfire standards reduced the likelihood of property loss.

Other studies have examined how environmental factors, such as dwelling distance to vegetation, slope, road layout and bushfire severity, influence dwelling loss and bushfire risk by analysing individual bushfires (Crompton et al., 2010; Ramsay, McArthur & Dowling, 1987; Leonard & Blanchi, 2005; Price & Bradstock, 2013) and data from multiple bushfires (Calviño-Cancela et al., 2017; Chen & McAneney, 2004, 2010; Blanchi et al., 2010; Harris et al., 2012; Syphard et al., 2012). Blanchi et al., (2018) examined the role of sheltering practices during the Black Saturday bushfires and the potential for shelters and contingency planning in bushfire planning regulations. Despite the recognition in the disaster literature of the link between social vulnerability and disaster risk, most bushfire research has focused on the physical characteristics that influence fire hazard, with less research exploring the social, cultural, economic and political factors that shape bushfire vulnerability (Whittaker, 2012).

REDUCING RISK AND ADAPTING TO HAZARDS

There are five accepted categories of approaches within the disaster literature for reducing and adapting to hazards in human settlements: hazard avoidance, hazard reduction, vulnerability reduction, preparedness for response and preparedness for recovery (Wamsler, 2014). The strategies used to reduce risk within each category might change depending on the particular hazard, but the five categories and their general principles remain the same (Wamsler, 2017). Table 1 provides an overview of the five categories and some strategies and general principles used to reduce risk within each category.

Table 1 Overview of the five categories for reducing and adapting to hazards in human settlements

Hazard avoidance	
Aim	Strategies
Avoid hazards that pose a threat to communities by directing new development away from hazardous locations to safer areas and by relocating existing settlements away from the hazard area (Godschalk 2003; Godschalk, 2010).	• Prohibit development in high-risk hazard areas; • Relocate existing settlements, structures and/or land uses to safer areas; • Relocate critical infrastructure, such as schools and hospitals, to safer areas; and • State buy-back schemes, land/property acquisition or land exchange programs (Burby et al., 2000; Godschalk et al., 1999; Godschalk 2003; Godschalk, 2010; Wamsler, 2014).
Hazard reduction	
Aim	Strategies
Reduce exposure to hazards and improve protection of existing settlements by modifying hazard risk on site (Godschalk, 2010; Wamsler, 2017)	• Control development to reduce hazard exposure – e.g. restrict new development in high-risk areas, enforce subdivision regulations and land-use plans, create buffer zones, and reduce and manage vegetation; • Control the hazard – e.g. slope stabilisation, seawalls, stormwater and drainage infrastructure, green infrastructure in urban areas; and • Protect natural mitigation features – e.g. dunes, rivers, wetlands (Burby et al., 2000; Godschalk et al., 1999; Godschalk 2003; Mileti, 1999; Wamsler, 2014).
Vulnerability reduction	
Aim	Strategies
Minimise the susceptibility of settlements to existing or likely future hazards and increase the capacity of communities to better withstand the impact of a hazard (Wamsler, 2014). Vulnerability reduction aims to create an environment where settlements can live with the hazard (Wamsler, 2017).	• Control development to reduce hazard vulnerability – e.g. limit and/or closely monitor development in higher risk areas, ensure appropriate setbacks, buffer zones, and safe siting of dwellings and developments; • Regulate building and construction standards – e.g. building on stilts in flood-prone areas, using fire retardant materials for development in bushfire-prone areas or including codes on insulation and shadowing to withstand heatwaves; • Retrofit or strengthening existing buildings and public facilities; • Construct physical structures to reduce the impact of hazards (Burby et al., 2000; Godschalk 2003; Godschalk, 2010; O'Neill & Handmer, 2012; Wamsler, 2014).
Preparedeness for response	
Aim	Strategies
Put in place effective response strategies and resources before a potential emergency or disaster occurs, ensuring that communities and emergency responders can react effectively during and in the aftermath of an emergency or disaster (Mileti, 1999; Coppola, 2011; Wamsler, 2014).	• Facilitate emergency response through urban planning ¬– e.g. ensuring site access for emergency vehicles, providing suitable evacuation infrastructure, maintaining static water supplies; • Train opportunities for disaster responders and community members; • Communication and awareness of disaster vulnerability; • Early warning systems, contingency planning and evacuation planning; • Preparation for temporary shelter and housing; • Accessible public buildings and public spaces; and • Back up energy systems (Coppola, 2011; Godschalk et al., 1999; Mileti, 1999; Wamsler, 2014).
Preparedeness for recovery	
Aim	Strategies
Ensure that communities have recovery mechanisms and structures in place before the emergency or disaster occurs (Wamsler, 2014). Planning for recovery allows communities to recover more quickly and safely following the impact of an emergency or disaster (Coppola, 2011; Mileti, 1999).	• Insurance policies to provide post-disaster compensation; • Use of construction materials that can easily be replaced; • Constructing houses that can be rebuilt; • Pre-selecting sites for temporary and longer-term housing; • Availability and distribution of emergency food and water; • Awareness raising campaigns; and • Providing and communicating information on how to respond to certain hazards (Coppola, 2011; Wamsler, 2014; Wamsler, 2017).

CHAPTER 3: RESEARCH DESIGN

The following research design outlines the procedural plan used for answering this thesis' research questions. Figure 1 outlines the main steps in the research process.

RESEARCH QUESTIONS

PRIMARY RESEARCH QUESTION:

- How and in what ways has bushfire risk management become more comprehensive through urban planning and supporting systems between 2008 to 2018 and what is yet to be done?

SUB QUESTIONS:

- What have been the main changes to bushfire risk management in Victoria planning scheme regulations?
- In what ways have the main changes identified modified the level of comprehensiveness?

CHOICE OF METHOD

This research used a qualitative case study design to examine the comprehensiveness of bushfire planning controls in Victoria and their progression over time. A case study method is suitable for research that seeks to intensively examine a single case (Bryman, 2016). Furthermore, research that seeks to explain the "how" and "why" of a phenomenon are typically suited to case studies, histories or experiments (Yin, 2009). A history or an experiment were not suitable because this research is examining the contemporary planning system and it is not possible to isolate or manipulate variables. The VPPs and the integrated building regulations are the primary planning mechanisms for managing bushfire risk in Victoria and have been the primary driver of change in terms of bushfire management policy. Therefore, the case study for this research is the VPPs. The VPPs were examined across a time series so the treatment mechanisms for bushfire risk management could be traced over time.

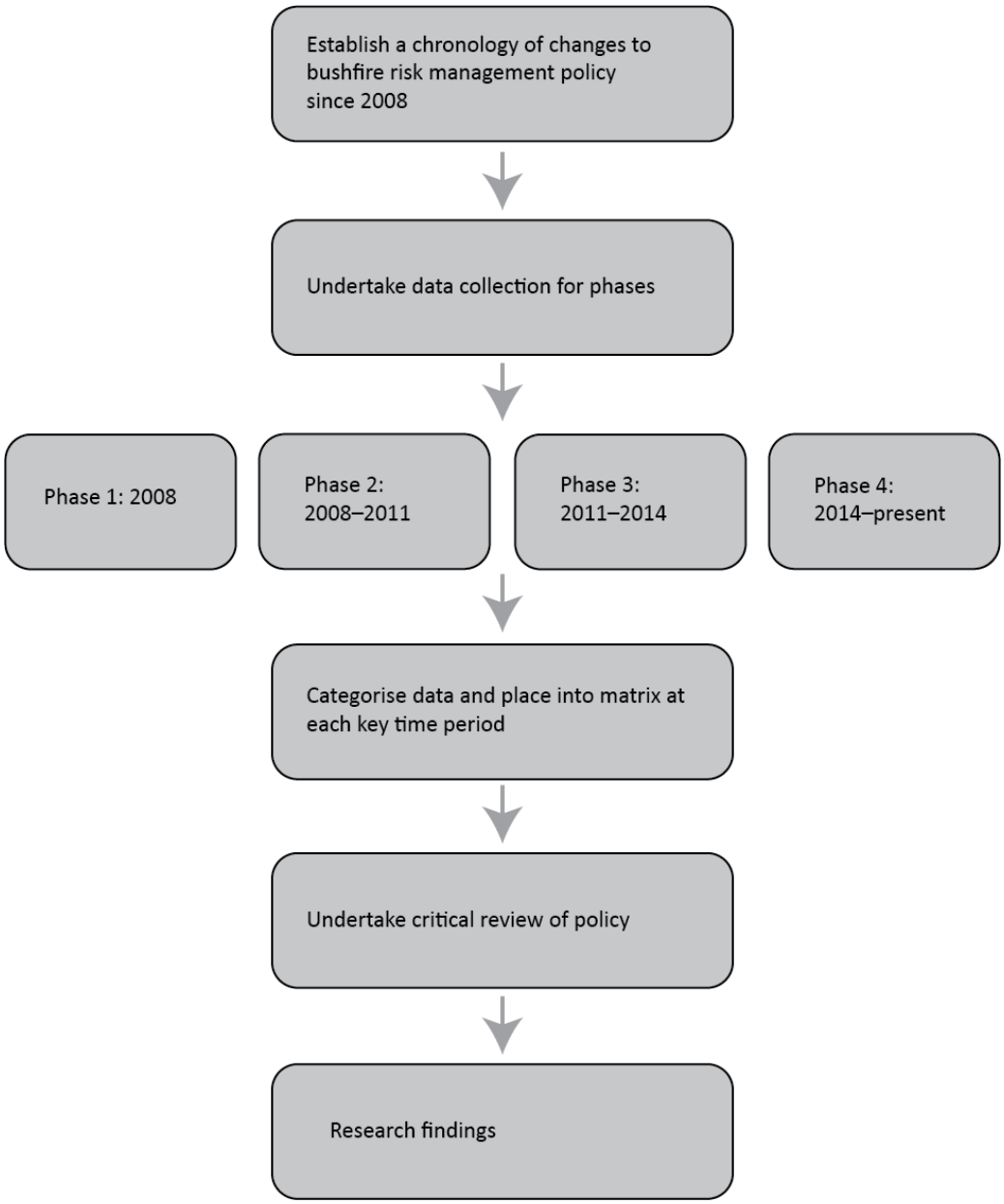
RESEARCH APPROACH

The unit of analysis was the changes over time in the treatment mechanisms for and comprehensiveness of bushfire risk management. The general analytic strategy was to rely on theoretical propositions. Yin (2009) argues that following theoretical propositions is the first and most preferred strategy for guiding case study analysis. The literature review set out five accepted categories for comprehensively reducing and adapting to hazards in human settlements:

1. Hazard avoidance
2. Hazard reduction
3. Vulnerability reduction
4. Preparedness for response
5. Preparedness for recovery

These categories provided the conceptual framework for guiding the case study and remained the same across the time series.

Figure 1 Main steps of research method



DATA COLLECTION AND SCOPE

Data was collected using a policy analysis approach (Paquette, 2002), based on documentary information. Data was collected from the VPPs that were in place at the time, the incorporated document *AS3595 2009 Construction of Buildings in Bushfire-prone Areas* (Standards Australia, 2009) and relevant ancillary or explanatory documents, such as the *Planning Permit Applications Bushfire Management Overlay Technical Guide* (State Government of Victoria, 2017). Given the size and scope of this thesis, the analysis of policy began from the policy that was in place prior to the 2009 Black Saturday bushfires to present. The 2009 Black Saturday bushfires triggered a reform to the bushfire planning controls in Victoria, and, as a result, significant changes were made to policy.

DATA COLLECTION PHASES

Data was collected across four phases (Table 2). The phases represent the different time periods being analysed. The time periods were chosen because they correspond with significant changes that occurred in policy.

Table 2 Data collection phases

Phase	Data collection included
1	• VPPs relating to bushfire risk management that was in place in 2008 prior to the 2009 Black Saturday bushfires. • Relevant ancillary or explanatory documents.
2	• Planning scheme amendments to bushfire risk management policy between 2008 and the introduction of the BMO in 2011. • VPPs relating to bushfire risk management in place in 2011. • Relevant ancillary or explanatory documents.
3	• Planning scheme amendments to bushfire risk management policy between 2011 and the introduction of the significant changes to the BMO in 2014. • VPPs relating to bushfire risk management in place in 2014. • Relevant ancillary or explanatory documents.
4	• Planning scheme amendments to bushfire risk management policy between 2014 and the introduction of the significant changes to the BMO in 2017. • Planning scheme amendments to bushfire risk management policy since 2017. • Relevant ancillary or explanatory documents.

DATA ANALYSIS

Data was analysed using a conceptual framework and a pattern-matching technique. Yin (2009) argues that pattern-matching logic is one of the most desirable case study analysis techniques. The framework for organising the case study analysis was the five categories for reducing and adapting to hazards. A simple time-series analysis was also conducted. Creswell (2009) states that an advantage of case study research is their capacity to trace changes over a sustained period of time. Therefore, this analysis involved measuring policy at different times against a pre-established conceptual framework.

Two primary phases of data analysis took place. The first phase involved categorising the relevant policy of the VPPs into a matrix. Appendix A is an example of the matrix and categorisation of policy. This part of the analysis was descriptive and allowed for the progression of bushfire planning controls to be documented in detail. The first phase of analysis examined policy through a lens of each of the five categories while considering the planning scheme as a whole.

The second phase involved undertaking a critical review of policy to determine the comprehensiveness of bushfire planning controls in Victoria. A *comprehensive* risk management system must include a combination and active consideration of the five types of categories (Wamsler, 2017). The five categories do not have to be equally represented, but the five categories

should be combined in the overall approach, and each category needs to be considered in relation to the specific hazard and level of disaster risk (Wamsler, 2017). If this does not occur, the overall comprehensiveness decreases. Findings from the first phase contributed to the critical review because the categorisation of policy identified areas of strength and areas that were lacking across the five categories. This method was the same across the different time phases being analysed.

LIMITATIONS

Case studies usually collect multiple sources of evidence (Creswell, 2009). Because of the size of this thesis, the research only relied on one form of evidence and did not triangulate with interviews. Furthermore, it did not seek to uncover the true intent behind the changes, consider the social implications of policy changes or examine the effectiveness of policy. This research only documented the changes made to policy over time and how the changes modified the level of comprehensiveness. Further research through qualitative interviews could be conducted to build on the findings and provide insight into these areas. On 31 July 2018, amendment VC148 was introduced, which made changes to the structure, function and operation of the VPPs. These changes were not included in this thesis because the amendment was introduced during the research phase of this thesis.

CHAPTER 4: FINDINGS AND DISCUSSION

This chapter outlines Victoria's approach to bushfire risk management through urban planning regulations between 2008 and 2018; the main changes to bushfire risk management policy in planning scheme regulations; and discusses how these changes have modified the level of comprehensiveness when assessed against the five categories for reducing and adapting to hazards in human settlements and bushfire behaviour more broadly. Figure 3 shows a diagrammatic representation of the changes to comprehensiveness over time when assessed against the five categories.

As described in the literature review, land use and development in Victoria is regulated through local planning schemes, which are adapted from the VPPs. Bushfire risk management is dealt with through policy in SPPF, the application of a state standard overlay and specific particular provisions relating to bushfire risk and planning. There have been some significant developments over time to bushfire planning controls in Victoria and this is reflected through changes that have been introduced into the VPPs, generally through VC amendments. VC amendments make changes to the VPPs and therefore all planning schemes.

PHASE 1: PRE-BLACK SATURDAY BUSHFIRE PLANNING POLICY

At the time of the 2009 Black Saturday bushfires, bushfire risk management was primarily addressed through the state planning policy Clause 15.07 Protection from wildfire in the SPPF and the state standard overly Clause 44.06 Wildfire Management Overlay. Bushfire planning and building regulations were only applied to areas identified as being at a high risk of exposure to bushfires, which were identified through bushfire hazard mapping (VBRC, 2010b). Bushfire building regulations were applied in areas designated as bushfire-prone areas (BPAs). Bushfire planning regulations were applied in areas within the WMO. Each municipal council was responsible for mapping and designating BPA, and for implementing the WMO (VBRC, 2010b). The mapping methodology for

bushfire hazards was limited; there were no clear criteria for designating BPAs (VBRC, 2010b). As a result, BPAs were applied to land across the state inconsistently, as was the WMO (VBRC, 2010b). The WMO could only be applied to land if it was introduced into planning schemes through a standard planning scheme amendment process, which was slow, costly and time consuming (VBRC, 2010b).

Clause 15.07 aimed "to assist the minimisation of risk to life, property, the natural environment and community infrastructure from wildfire (VPP, 2008a)." Policy guidance was provided through general implementation strategies. Planning authorities aimed to avoid intensifying fire risk through inappropriately located and designed uses and developments. Clause 44.06, the WMO, triggered the need for some developments within the WMO to obtain a planning permit. The WMO outlined the "minimum" fire protection outcomes to assist in protecting life and property (VPP, 2008b). The WMO outlined protection measures, objectives and outcomes that needed to be met in order for a permit to be issued, which included requirements for water supply, access, building and works, and vegetation management. Applications for subdivisions within the WMO also required a permit, and applications were required to outline how protective features – design, siting and layout, access, water supply, buffer zones and vegetation management – would be addressed. Both development and subdivision applications were required to be referred to the Country Fire Authority (CFA) and the CFA's recommendations were binding on the responsible authority.

The clearance of native vegetation for fire protection purposes were addressed through Clause 52.17 Native Vegetation. Where the following environmental and landscape overlays applied – Environmental Significance Overlay (Clause 42.01), Vegetation Protection Overlay (Clause 42.02), Significant Landscape Overlay (Clause 42.03), Erosion Management Overlay Clause 44.01) and Salinity Management Overlay (Clause 44.02) – any vegetation requirements stated were in addition to the requirements of Clause 52.17. These overlays also outlined the exemptions that allowed vegetation to be cleared without a permit for fire protection purposes.

The general provision Clause 65 Decision Guidelines required responsible authorities to consider "the degree of flood, erosion or fire hazard associated with the location of the land and the use, development or management of the land so as to minimise any such hazard" (VPP, 2008c). Additionally, in approving the subdivision of land, consideration needed to be given to "the design and siting of buildings having regard to safety and the risk of spread of fire (VPP, 2008c)". Some general fire protection measures, such as the provision of fire hydrants, and ensuring water supply and safe access for emergency vehicles were addressed through the particular provisions Clause 56.06 and Clause 56.09.

COMPREHENSIVENESS OF 2008 BUSHFIRE PLANNING POLICY

The comprehensiveness of bushfire planning policy at the time of the Black Saturday bushfires was limited in terms of how well the VPPs considered the five types of categories for reducing and adapting to hazards, and the depth and guidance provided by the VPPs for assessing developments in BPAs. Relevant VPPs were mostly distributed across the hazard reduction, vulnerability reduction and preparedness for response categories. No VPP was allocated to the preparedness for recovery category. The general implementation strategies of Clause 15.07 were brief and provided little guidance in terms of policy direction and bushfire protection objectives and strategies. The general implementation strategies did not consider the different levels of risk of bushfire hazards to life and

property. Therefore, bushfire risk was not appropriately addressed because the consequences of the bushfire hazard were not required to be considered. The consequences of a hazard are a key factor in determining risk and the outcome of a disaster (Coppola, 2011). Furthermore, the SPPF provided no overarching guidance on more specific planning considerations for developments in high-risk areas, such as bushfire risk reduction, settlement planning and hazard identification strategies. The poor application of the WMO significantly impacted on the comprehensiveness of the system because regardless of how comprehensive policy was, many developments in areas at high risk of bushfires were not subject to any disaster management or bushfire risk reduction strategies.

HAZARD AVOIDANCE

Development was only advised to be avoided in identified coastal hazard areas susceptible to bushfire – through Clause 15.08 Coastal Areas – and this was more of a general strategy acknowledging the potential impacts of climate change in these areas rather than high-level policy advice for bushfire management specifically.

HAZARD REDUCTION

Most of the VPPs that referred to hazard reduction strategies were related to subdivision requirements and vegetation management. Overall, vegetation management for fire protection purposes was inadequately addressed. For example, an objective of Clause 52.17 Native Vegetation stated, “to manage vegetation near buildings to reduce the threat to life and property from wildfire (VPP, 2008d).” However, the circumstances where native vegetation clearance was allowed for defendable space purposes without a permit were confusing, and there was no mention in the decision guidelines for planning authorities to consider fire hazard or fire protection when assessing permit applications for the removal of native vegetation. There was also no mention of fire hazard or fire protection in the decision guidelines of the environmental and landscape overlays. Within the WMO, vegetation management measures required applicants to establish a building protection zone through landscaping; however, no specific measures were provided. Furthermore, only focusing on the individual site is a narrow perspective because other factors, such as proximity of forests and neighbouring properties and roads, can impact on the spread and speed of bushfires, and likelihood of ember attacks (Blanchi, Leonard & Leicester, 2006; Mikkola, 2008; Price & Bradstock, 2013). These factors were not considered. Subdivision requirements included basic hazard reduction features such as using public open space where appropriate to act as a buffer zone, managing vegetation and utilising topographical features.

VULNERABILITY REDUCTION

Vulnerability reduction was addressed primarily through the WMO’s building and works permit and application requirements; however, no specific measures were provided. Building design and siting, and consideration of topographical features only needed to minimise fire risk to life and property. Construction features only needed to reduce the likelihood of ember and direct flame contact. Some areas are more at risk of bushfire hazards than others, depending on a range of factors, such as topography and proximity and density of forests and vegetation (Blanchi et al., 2010). While the use of more minor bushfire protection measures might be appropriate for sites of lower risk, they are not adequate on sites of extreme risk. One-size-fits-all protection measures cannot be considered a comprehensive strategy, particularly if they are lacking in detail, because the areas most at risk of

bushfire exposure cannot reduce their vulnerability through strategies that are ill-equipped to deal with the conditions of high bushfire risk areas. Alterations or extensions to existing buildings used for accommodation that were less than 50 percent of the existing building's floor area, and "building or works with a floor area of less than 100 square metres ancillary to a dwelling not used for accommodation" did not require a permit (VPP, 2008b). These exemptions are in conflict with the purpose of the overlay because they could increase vulnerability and risk to life and property by providing fuel and ignition sources next to or in close proximity to dwellings.

PREPAREDNESS FOR RESPONSE

Preparedness for response was addressed through the WMO application requirements that referred to access and water supply. A static water supply was required to be maintained and accessible for domestic and fire-fighting purpose and there needed to be sufficient road access for emergency vehicles to use in the event of a fire. Subdivision applications within the WMO were also required to achieve similar outcomes.

PHASE 2: BLACK SATURDAY RECOVERY PERIOD

AMENDMENTS TO BUSHFIRE PLANNING POLICY BETWEEN 2009 AND 2011

In November 2011, amendment VC83 introduced some significant changes to bushfire planning policy. Eight amendments relating to bushfire planning were introduced between 2008 and VC83. Of these eight amendments, the most notable in terms of bushfire planning policy included:

- changes to the WMO that allowed landowners affected by the Black Saturday bushfires to be exempt from requiring a permit when replacing a destroyed or damaged dwelling if the dwelling was to be sited at the same location; and
- the introduction of two new particular provisions: Clause 52.39 - 2009 Bushfire - Replacement Buildings; and Clause 52.43 - Interim Measures for Bushfire Protection.

Clause 52.38 - 2009 Bushfire Recovery was also introduced as a new particular provision; however, the clause focused on assisting with temporary recovery operations from the Black Saturday bushfires as opposed to being introduced as a permanent recovery mechanism.

Clause 52.39 - 2009 Bushfire - Replacement Buildings was introduced to assist landowners rebuild their homes or buildings that were damaged or destroyed in the 2009 Black Saturday bushfires. Under Clause 52.39, a permit was not required where landowners were rebuilding for the use of a dwelling, dependent person's unit or a building used for agriculture, provided a site plan was developed for and approved by the responsible authority.

Clause 52.43 - Interim Measures for Bushfire Protection clarified the process involved for clearing vegetation around existing buildings used for accommodation, along fence lines on property boundaries and on roadsides for fire protection purposes.

AMENDMENT VC83

Amendment VC83 brought a number of changes to the way bushfire risk management was addressed through the VPPs. A key change to policy was focussing on the protection of human life. In addition, the amendment:

- introduced new state planning policy in the SPPF at Clause 13.05 to replace the previous Clause 13.05, which referred to wildfire risk.
- replaced Clause 44.06 Wildfire Management Overlay with Clause 44.06 Bushfire Management Overlay.
- introduced two new particular provisions: Clause 52.47 Bushfire Protection: Planning Requirements; and Clause 52.48 Bushfire Protection: Exemptions; and
- made changes to several clauses regarding vegetation removal when creating defendable space.

Clause 13.05 outlined the new state-wide planning objectives, strategies and policy guidelines for bushfire risk management in Victoria. New bushfire protection strategies were introduced across four areas: bushfire hazard identification and risk assessment strategies; strategic and settlement planning strategies; planning scheme implementation strategies; and development control strategies.

Clause 44.06 introduced new policy regarding the purpose of the BMO, mandatory conditions for subdivision applications, and outlined the new application requirements for developments within the BMO, which included providing a locality and site description, and a bushfire management statement. All applications within the BMO had to be referred to the CFA. The locality and site description had to describe the existing conditions of the site and surrounding environment for at least 250 metres from the site's boundary (State Government of Victoria, 2011). The bushfire management statement had to include a bushfire site assessment and a report outlining how the relevant objectives, standards and decisions guidelines of the associated particular provision Clause 52.47 would be met. The bushfire site assessment had to include an assessment of the site's characteristics, such as slope and surrounding vegetation types, in relation to the potential location of the new development. The outcome of the site assessment determined the level of bushfire risk, and therefore the defendable space requirements and corresponding construction standards for new developments (State Government of Victoria, 2011).

Clause 52.47 outlined the objectives, standards and decision guidelines for the use and development of land within the BMO. All development applications were required to meet the established standards that were set out in the clause in relation to subdivisions; location, layout and siting of buildings; defendable space; and water supply and access. Clause 52.47 included standards and mandatory standards. All standards were required to be met; however, alternative bushfire protection measures may be considered by the responsible authority. All mandatory standards were required to be met and alternative measures would not be considered.

Clause 52.48 Bushfire Protection: Exemptions set out the exemption criteria for clearing vegetation without a permit for land within the BMO. Clause 52.17 Native Vegetation and the relevant environmental and landscape overlays were also updated. Creating defendable space for fire protection measures was now a point of consideration in the decision guidelines. The exemptions

outlined in Clause 52.17 for clearing native vegetation were removed. Landowners were instead required to submit a statement explaining why native vegetation clearance was required for defendable space and bushfire mitigation purposes.

COMPREHENSIVENESS OF 2011 BUSHFIRE PLANNING POLICY

The depth and detail provided in the 2011 VPPs indicated a significantly more comprehensive approach to bushfire risk management than what was provided in 2008. Relevant VPPs were distributed relatively evenly across the hazard avoidance, hazard reduction and vulnerability reduction categories, with a smaller number of VPPs allocated to the preparedness for response category. No requirements for preparedness for recovery were introduced. The 2011 VPPs placed a greater emphasis on hazard avoidance. Bushfire risk management was addressed in more detail in the SPPF, providing improved guidance in terms of bushfire protection objectives and strategies. As outlined above, Clause 13.05 described the new bushfire protection policy across four areas. The policy guidance provided under these categories was more comprehensive in terms of the level of detail provided and because a combination of four of the five categories for reducing and adapting to hazards were key points of consideration within the policy. The category exception was preparedness for recovery. Policy stated, among other things, that site-based assessments would be required to determine appropriate protection measures for each site, the creation of defendable space through the clearance of vegetation around buildings should not be prevented, and development should only be permitted where "the risk to human life, property and community infrastructure from bushfire can be reduced to an acceptable level" (VPP, 2011). This was the first time in Victoria that development applications in areas at a high risk of bushfires could be refused based on the policy provided.

The 2011 VPPs also included some conflicting provisions, which weakened the overall comprehensive of policy at this time. Clause 52.39 allowed landowners affected by the Black Saturday bushfires to replace a building without a permit, provided a site plan was submitted to and approved by the responsible authority. Furthermore, between March 2009 and the introduction of VC83 (November 2011), landowners did not need a permit if they were replacing a dwelling destroyed in the Black Saturday bushfires, provided the dwelling was built on the same location and constructed before 31 March 2011. The inclusion of these provisions undermined the changes introduced through VC83. Disasters can temporarily provide an opportunity to implement changes to disaster prevention and risk reduction strategies (Kornakova & March, 2017). Rather than increasing community resilience to bushfire hazards, the conflicting provisions allowed the pre-disaster vulnerable conditions to be reintroduced. While Clause 52.39 addressed some bushfire protection measures through requiring landowners to submit a site plan, these applications were not subject to the same standards and mandatory standards as development applications in other BMO areas. Therefore, some landowners within the BMO could build without a permit, whereas others were subject to highly stringent controls and in some cases were prohibited from building at all.

HAZARD AVOIDANCE

A greater emphasis on hazard avoidance was evident in the 2011 policy in the SPPF and through the requirements of the BMO and associated clauses. Clause 13.05, Clause 44.06 and Clause 52.47 all

included policy advising decision makers to restrict development where risk to life and property could not be reduced to an acceptable level. All applications were required to meet the mandatory standards outlined in the clause. Mandatory standards were applied to defendable space requirements, and water supply and access requirements through Clause 52.47. A clear framework for refusing development applications was established through the use of mandatory standards.

Each site within the BMO was required to be individually assessed to determine its bushfire risk – i.e. Bushfire Attack Level (BAL) – and corresponding construction standards. Properties at greater risk of bushfire exposure will have higher a BAL and require stricter construction standards. The methods used to calculate defendable space and constructions standards were based on the *AS3959-2009*, which considers factors such as radiant heat, wind, embers and flame exposure. However, for planning purposes, the Fire Danger Index (FDI) – a considering factoring in determining BAL ratings – was calculated based on an FDI of 120 instead of the recommended FDI of 100 as specified in the *AS3959-2009*. Therefore, planning regulations in Victoria were more risk averse than the *AS3959-2009*. The BMO aimed to achieve development outcomes – i.e. allow new developments to occur – to a BAL-29 standard or less. Sites that could not achieve a BAL-29 standard, and therefore had to rely on BAL-40 or greater defendable space and construction requirements, were advised to be carefully considered, and it was expected that this would rarely occur (State Government of Victoria, 2011).

HAZARD REDUCTION

A greater number of VPPs considered hazard reduction in their approach. The depth, detail and guidance provided in hazard reduction policy also increased. This was potentially because of the increased recognition of the need to manage vegetation around buildings as an important bushfire mitigation strategy. Managing vegetation to reduce bushfire risk is one of the main ways planning can mitigate bushfire risk in existing settlements (VBRC, 2010b). Overall, vegetation management was addressed more adequately under the BMO than the WMO. Previously, the WMO only required a bushfire protection zone to be established. It did not consider broader fire behaviour and landscape features beyond individual and neighbouring properties. The BMO and Clause 52.47 set specific defendable space requirements and corresponding construction standards, and these differed depending on the bushfire risk of the individual site. Defendable space requirements were applied to two zones: an inner zone – the immediate area closest to the building; and an outer zone – the area between the inner zone and the unmodified vegetation (State Government of Victoria, 2011). These requirements were mandatory for all applications within the BMO. Permit exemptions for clearing vegetation within the BMO were also simplified in an attempt to make it easier for landowners to create defendable spaces on their properties.

VULNERABILITY REDUCTION

Vulnerability reduction was also addressed in more detail. Measures for vulnerability reduction were evident in the BMO's permit and application requirements, and relevant objectives, standards and decision guidelines of Clause 52.47. Construction standards were specified for new developments based on the bushfire risk of each site. Regulating construction standards for different hazards is a recognised vulnerability reduction strategy (Godschalk, 2010). The requirement for a locality and site description under the BMO meant that landowners and the responsible authority were required to consider a range of bushfire protection measures and bushfire risk factors – e.g. access to existing

infrastructure and roads, individual site conditions and broader landscape features relevant to bushfire risk – when preparing or deciding on an appropriate location of a new development. This is a more comprehensive consideration of bushfire behaviour and potential consequences than the narrow perspective provided in the 2008 policy. Clause 52.47 outlined two standards in relation to location, layout and siting. Safe setbacks and siting of dwellings can reduce vulnerability to bushfire exposure (Gonzalez-Mathiesen & March, 2014). “Reasonable siting options” that achieved “acceptable bushfire protection measures” were required, such as siting development as far as practical from the bushfire hazard, minimising the need for long access and egress routes through hazardous bushfire areas, locating dwellings close to property entrances where possible and ensuring access for emergency vehicles (VPP, 2011). Some of these measures are also critical for evacuation planning and ensuring effective preparedness for response mechanisms are in place prior to a bushfire event.

PREPAREDNESS FOR RESPONSE

Preparedness for response was addressed in the SPPF through Clause 13.05 and through the requirements of Clause 52.47. Previously, there was no policy guidance provided for preparedness for response in the SPPF. Clause 52.47 set standards for the provision of static water supplies and safe access for emergency response vehicles in relation to subdivision applications, and siting and layout objectives of new developments. Clause 52.47 included a mandatory standard for water supply and access. Therefore, all developments had to meet to these specified requirements for the application to be approved.

PHASE 3: POLITICAL BACKLASH

AMENDMENTS TO BUSHFIRE PLANNING POLICY BETWEEN 2011 AND 2014

There was considerable community backlash in response to the changes that were introduced through amendment VC83 (Kornakova & March, 2017). Some landowners who had owned land prior to the changes and could have developed their land under the previous regulations, now had land that could potentially not be built on at all. Amendment VC109 was introduced in July 2014, which eased some of the more stringent controls and allowed almost all landowners in BPAs to build. Four amendments relating to bushfire risk management were introduced between VC83 and the introduction of VC109; however, these amendments were minor, with most extending the timeframes for interim clauses.

AMENDMENT VC109

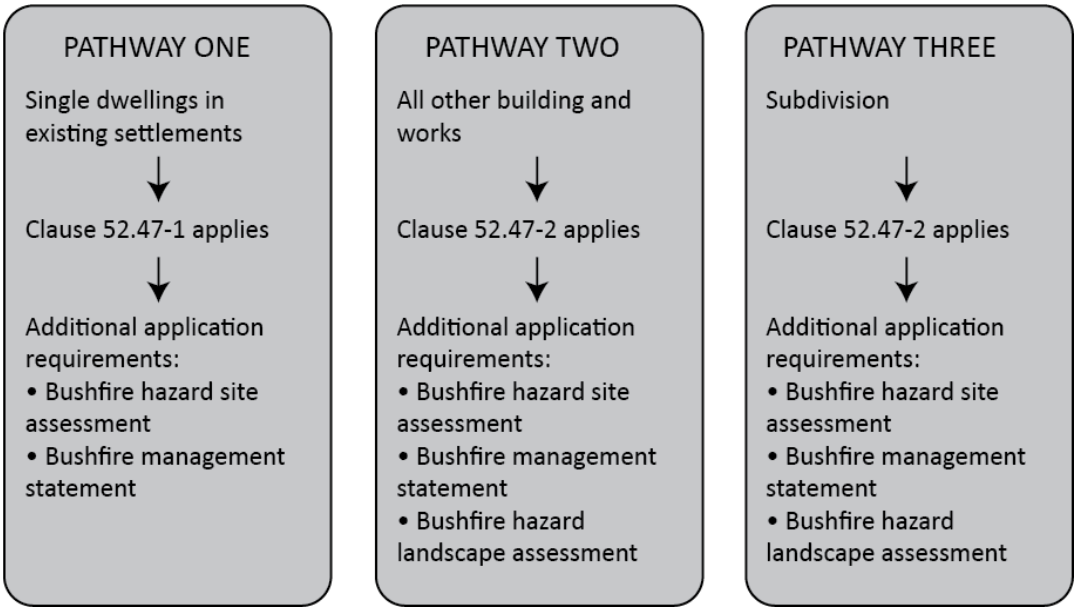
No major changes were made to the SPPF. The majority of the changes were related to Clause 52.47, now titled “Planning for Bushfires”. A notable change was the changing of the status of the referral authority (the CFA) for some developments within the BMO from a determining referral authority to a recommending referral authority. The CFA became a recommending referral authority for dwelling and subdivision applications within the BMO and a determining referral authority for all other applications within the BMO and for subdivisions outside the metropolitan fire district. The decision of a recommending referral authority is not binding on the responsible authority. This provides the responsible authority with more flexibility in their decision-making regarding developments in BPA.

On the one hand, planners by their profession are better placed to make decisions on the appropriate use, development and management of land where there are competing interests at play. On the other hand, bushfire management is complex and decision makers need a skill set to better understand bushfire behaviour and manage bushfire risk (March & Rijal, 2015). Without this skill set, the comprehensiveness of any bushfire risk management approach is compromised.

Clause 52.47 outlined the new application and operation requirements for building within the BMO. Three application pathways were introduced (Figure 2). The type of application determined the appropriate application pathway.

Figure 2 Application pathways for development applications within the BMO

(Adapted from State Government of Victoria, 2014)



Applications under Clause 52.47-1 had to meet all the approved measures stated in the clause. If an application could not meet all the approved measures, Clause 52.47-2 was then applied. Clause 52.47-2 included alternate measures that could be considered by the responsible authority for applications that could not meet all the approved measures.

Applications under Clause 52.47-2 were also required to include a bushfire hazard landscape assessment. The requirement for a bushfire hazard landscape assessment is an example of a more comprehensive approach to bushfire risk management because it ensures that the broader landscape and circumstances of the area – important factors for determining bushfire risk – become key considerations in decision making. Clause 52.47-2 outlined bushfire protection objectives across three areas: landscape, siting and design; defendable space and construction; and water supply and access. Applications were required to demonstrate either how all the approved measures were met or how relevant alternative measures satisfied the clauses' objectives.

Allowing alternate measures essentially eased some of the more stringent development constraints that were restricting landowners from obtaining permits under the previous policy. The notable alternate measures included:

- BAL based on FDI of 100 (previously 120) for planning purposes to be line with the *AS3959-2009*;

- allowing landowners who could not meet the minimum defendable space requirements to build provided construction met BAL Flame Zone standards;
- allowing landowners to build to the next lower corresponding BAL provided they met the defendable space requirements and a private bushfire shelter was built on the same land as the dwelling; and
- adjoining land could count towards defendable space provided the space will remain or continue to be managed to the same cleared condition.

The use of private bushfire bunkers as a strategy to allow dwellings to be built to the next lower corresponding BAL contradicts the objectives of the clause. Certain sites are at an extreme risk of bushfire and therefore appropriate design and construction standards are required to reduce the vulnerability of dwellings on those sites in the event of a bushfire. Allowing construction standards to be reduced increases vulnerability to property, and, potentially, life if the property's residents are forced to shelter in the house or the fire bunker is inaccessible during a bushfire. On the other hand, in extreme bushfire conditions, a regularly maintained and monitored fire bunker may be a suitable last resort option where late evacuation is not possible (Blanchi et al., 2018).

Amendment VC109 simplified further the approvals process for clearing vegetation for defendable space purposes. Vegetation management was now solely dealt with in conjunction with the BMO requirements. No further planning permission was required to clear vegetation if a planning permit was being issued under the BMO. The requirement for outer zones of defendable space around buildings was also removed.

COMPREHENSIVENESS OF 2014 BUSHFIRE PLANNING POLICY

The distribution of the VPPs across the five categories for reducing and adapting to hazards was relatively similar to the distribution of the 2011 policy, but with a slight reduction in the number of VPPs allocated to hazard avoidance. Hazard reduction and vulnerability reduction had the highest allocation of VPPs in their respective categories. A smaller number of VPPs were allocated to the preparedness for response category and no VPP was allocated to the preparedness for recovery category. The process for preparing and assessing development applications was not fundamentally altered through amendment VC109. Therefore, the five categories were addressed through the VPPs in much the same way as the 2011 VPPs. In this sense, the comprehensive of the 2014 policy remained at a similar level to 2011 policy. However, the clear framework that amendment VC83 introduced in 2011 for refusing development was reduced through the introduction of alternate measures, thereby reducing the level of comprehensiveness overall. Policy in the SPPF and the purpose and decision guidelines of Clause 52.47 still referred to the need to reduce bushfire risk to an acceptable level before permitting development. This wording suggests that these guidelines would be classified as a hazard avoidance strategy by not permitting development; however, when considering the planning scheme as a whole and the changes introduced to the bushfire protection requirements specified in the bushfire protection clauses, the refusal of development applications appears unlikely.

By allowing almost all developments to proceed, the focus of the bushfire risk management system shifted. Previous policy introduced in 2011 incorporated hazard avoidance measures, which allowed decision makers to either avoid development deemed to be too high-risk or allow development but

reduce risk to an acceptable level. The 2014 policy reduced decision makers' capacity to consider avoiding development. The emphasis is then on implementing strategies that create an environment where settlements can live with the hazard as best as possible rather than avoiding development altogether (Wamsler, 2017). It is less comprehensive system because little or no weight is placed on hazard avoidance as a risk reduction strategy.

As outlined above in the discussion on the comprehensiveness of 2011 policy, the comprehensiveness of the planning system to address bushfire risk is compromised by the conflicting clauses that remain in the VPPs. For example, under Clause 52.39, landowners affected by the Black Saturday bushfires seeking to replace a dwelling still did not require a permit provided a site plan was submitted to and approved by the responsible authority. Landowners within other areas of the BMO were required to obtain permits. Similar permit exemptions for ancillary buildings remained.

PHASE 4: REFINING BUSHFIRE RISK MANAGEMENT

AMENDMENTS TO BUSHFIRE PLANNING POLICY BETWEEN 2014 AND 2018

Three amendments relating to bushfire risk management have been introduced since amendment VC109 in 2014:

- VC119 (April 2014);
- VC132 (September 2017);
- GC13 (October 2017); and
- VC140 (December 2017).

A GC amendment makes changes to multiple planning schemes but not the VPPs. Amendment VC119 was minor, extending time frames for interim clauses relating to Black Saturday bushfire recovery. Amendment VC132 mostly included administrative corrections to and changes clarifying the requirements of Clause 13.05, Clause 44.06 and Clause 52.47.

Amendment GC13 updated and inserted BMO maps into 64 planning schemes, and inserted schedules to Clause 44.06 in 47 planning schemes. The BMO maps identified high bushfire hazard areas across Victoria and determined where the BMO would be applied. This ensures that planning approval is therefore required for all development applications in Victoria that are a high risk of bushfire exposure. A standardised approach was used to map bushfire hazard based on hazard data developed by DELWP and a map verification process involving the CFA and local councils (State Government of Victoria, 2013). Schedules are used in planning schemes to allow state-standard zones or overlays to be adapted to the local circumstances of individual municipalities. Schedules can specify different permit requirements. Prior to GC13, schedules were not widely used to manage bushfire risk in the Victoria planning system. The use of schedules allows for the local circumstances of individual municipalities – e.g. proximity of township, roads and safe areas – to be considered in assessing bushfire risk. The potential for the schedules to introduce inconsistency regarding the application of bushfire protection measures is low because the same mapping methodology and criteria were used to map the land where the BMO schedules were applied.

The schedules inserted into Clause 44.06 introduced a simplified permit application pathway for some developments within the BMO. The new BMO maps identified land where the BMO schedules would be applied. The bushfire protection requirements for land within a BMO schedule are pre-determined and specified, removing the requirements for individual site assessments. The BMO schedules apply to applications in the following circumstances:

- the application is for a single dwelling on a lot;
- all the requirements set out in the schedule are met; and
- no alternative measures can be included (State Government of Victoria, 2017).

Provided applications within a BMO schedule met the above requirements, the application is no longer required to be referred to the relevant fire authority. All other applications within the BMO, including subdivisions, are assessed based on their capacity to demonstrate how they meet the application requirements of the BMO and the objectives, approved measures and alternate measures set out in Clause 52.47. These objectives and measures mostly remained the same as those introduced through VC109 in 2014.

Amendment VC140 updated the SPPF at Clause 10.04 Integrated decision making and Clause 13.05 Bushfire. Clause 10.04 is the overarching test that all decision makers apply when assessing permit applications. Amendment VC140 introduced an additional line to Clause 10.04, stating: “However, in bushfire affected areas, planning authorities and responsible authorities must prioritise the protection of human life over all other policy considerations” (VPP, 2017a). Amendment VC140 also made some substantial changes to the SPPF’s planning strategies and policy guidelines. Bushfire protection strategies were now grouped across five strategy areas: protection of human life; bushfire hazard identification and assessment; settlement planning; areas of high biodiversity conservation value; and use and development control in a BPA.

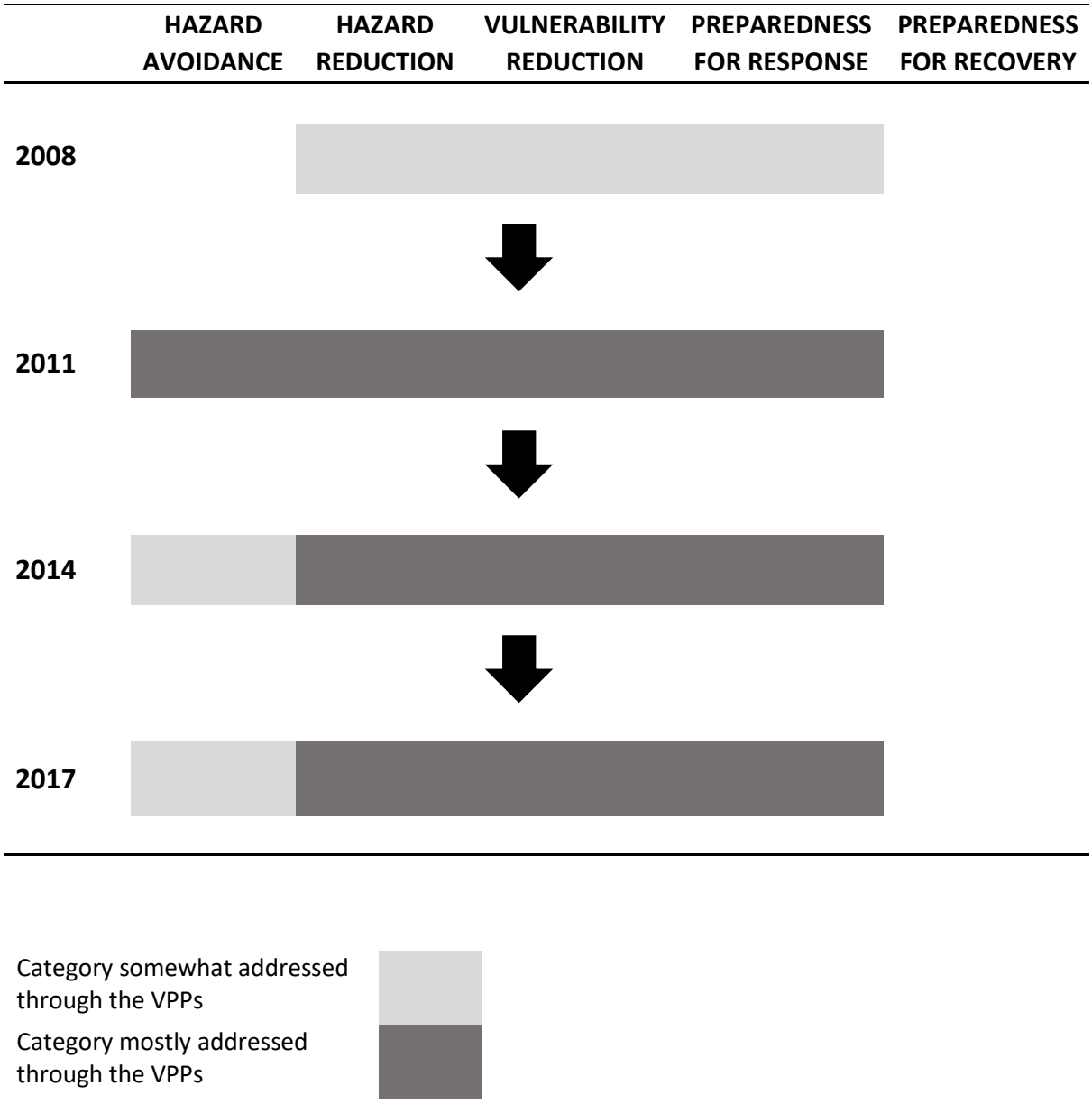
COMPREHENSIVENESS OF 2017 BUSHFIRE RISK MANAGEMENT POLICY

There was little change to the allocation of VPPs across the five categories for reducing and adapting to hazards. The changes introduced were not core changes to the way development applications within the BMO were prepared and assessed. The main change was that applications for developments in lower-risk areas were simplified through the use of schedules. The amendments refined more than fundamentally changed previous policy introduced in 2014 and to some extent 2011. In this sense, the level of comprehensive of the 2017 policy was altered more through changes to the content of clauses and what effect the content changes may have on the distribution of weight given to the five categories for reducing and adapting to hazards and therefore how the planning scheme works as a whole. The reference to bushfires in Clause 10.04 slightly shifts the overall emphasis of policy. No other planning area is specifically referred to in this clause. Because Clause 10.04 is such a high-level policy guidance tool for decision makers, the reference to bushfires within the clause potentially reopens the door for the refusal of applications if it is considered that the risk to human life to too high. The changes introduced through VC140 in the SPPF is a further step up from the substantial changes introduced in 2011 in terms of the level of detail and guidance provided.

The strategies provided in Clause 13.05 refer to four of the five categories for reducing and adapting to hazards, with the exception being preparedness for recovery. Protection of human life was

allocated its own subheading and makes specific mention of directing population growth and development to low-risk locations. Clause 13.05 also included a new reference to areas of high biodiversity value. Growth and development are discouraged where unacceptable biodiversity impacts result from the implementation of bushfire protection objectives. This potentially provides a further mechanism for implementing hazard avoidance measures into bushfire planning policy in the future; however, the strategy states "discourage" development rather than avoid. And the biodiversity reference is likely to have a greater impact on developments in new settlements rather than existing settlements. The 2017 bushfire planning policy is more comprehensive than the 2014 policy because of the updating bushfire hazard maps – ensuring that the BMO is applied consistently across the state to all areas at a high risk of bushfires – and the changes to content within the state planning policy.

Figure 3 Diagrammatic representation of the comprehensiveness of bushfire risk management in Victoria through the planning system over time



CHAPTER 5: CONCLUSION

Urban planning can be an effective mechanism for reducing the vulnerability of settlements to hazards and increasing community resilience (Godschalk, 2010; Wamsler, 2014). Analysing the VPPs over a time series against a conceptual framework for reducing and adapting to hazards in human settlements has revealed that changes to policy have modified the level of comprehensives of bushfire risk management in Victoria over time. It has also identified policy gaps, which, when addressed, could better prepare settlements for the potential threat and impacts of bushfires. The following concluding paragraphs summarise the ways in which bushfire risk management has become more comprehensive at certain time periods and what is yet to be done.

The comprehensiveness of policy at the time of the Black Saturday bushfires was limited. There was inconsistent application of the WMO and bushfire protection measures. Risk and vulnerability, which are key determinants for the likelihood of a disaster occurring (Wisner et al., 2004), were not adequately addressed through the VPPs because the bushfire protection measures were not reflective of the individual risk of each site or settlement. Hazard avoidance was not addressed specifically in relation to bushfires. Hazard reduction, vulnerability reduction and preparedness for response were somewhat addressed but with a one-size-fits-all approach that also did not adequately consider the risk of different locations and individual sites. Preparedness for recovery was not addressed in the VPPs.

In 2011, substantial policy changes were made to the way development applications were prepared and assessed. Clear standards were established for prohibiting development in high-risk bushfire areas. Avoiding development in high-risk areas, regardless of the hazard type, is an important hazard management approach (Byrne et al., 2009; Godschalk, 2010; Wamsler, 2014). There was a clear lack of this approach in previous policy. Disaster risk was better addressed because sites were assessed to determine site risk levels based on improved understandings of bushfire behaviour; corresponding protection and construction measures were established based on the risk levels identified. Hazard reduction, vulnerability reduction and preparedness for response strategies were more substantial in terms of the number of mechanisms included and the detail and guidance provided. Preparedness for recovery was not addressed.

In 2014, policy changes weakened the level of comprehensive because it reduced the system's ability to prohibit development in high-risk areas. There was an increase in the mechanisms for and a greater reliance on vulnerability reduction to offset the removal of some of the more restrictive controls. It is a less comprehensive system because little or no emphasis is placed on hazard avoidance as a risk reduction strategy and there is an overemphasis on one category.

The 2017 policy changes refined existing policy rather than fundamentally changed the approach. The level of comprehensiveness increased from 2014 policy through the changes to the content of the high-level decision-making clauses and by ensuring a consistent application of the BMO across the state through revised bushfire hazard mapping. Overall, policy was not as comprehensive as the 2011 policy

No VPPs have been allocated to preparedness for recovery, which indicates a gap in the comprehensiveness of the system when assessed against the five categories. A more resilient settlement has the capacity to recover from the effects of a hazard in a timely manner (UNISDR,

2017). With no recovery mechanisms in place, it is difficult for settlements to prepare for the recovery phase. In the event that a bushfire results in property loss, the planning system is the primary tool for the approval of new development and replacement buildings. It seems logical that in areas at a high risk of bushfire, planning mechanisms could be put in place to assist recovery prior to a bushfire occurring, particularly if there continues to be less emphasis on hazard avoidance strategies.

The policy changes over time show that policy has difficulty managing risk for existing settlements that are a very high risk of bushfires. This may be because of competing interests such as landowners in high-risk areas wanting to develop their land and bushfire protection measures that restrict development in these areas. Or there may be other factors at play. A limitation of this research was this it did not seek to understand why changes were made to policy at different time periods. It also did not look at the social implications of changes to policy and how this may be affecting policy development and implementation.

The absence of preparedness for response mechanisms in the VPPs and a watered-down emphasis on hazard avoidance is compromising the overall comprehensive of bushfire planning policy. To improve the comprehensiveness of Victoria's approach to bushfire risk management through the planning system, preparedness for recovery mechanisms should be considered, along with how to better manage risk in existing settlements. This could include hazard avoidance strategies such as government buy-back schemes, land acquisitions or land exchange programs. These are common strategies used by cities around the world for reducing exposure to a variety of hazards (Wamsler, 2014). Furthermore, as outlined in the literature review, limited research has explored the social, cultural, economic and political factors that shape bushfire vulnerability (Whittaker, 2012). A better understanding of these factors could help shape policy development within the VPPs and the planning system more generally to improve the resilience of Victorian communities to bushfires. Further research that could build on the findings of this thesis include examining why policy changes were or were not introduced over time; factors affecting the system's ability to implement hazard avoidance strategies – for example, fairness and equity concerns for affected landowners – and how to overcome these hurdles; and exploring potential options for incorporating preparedness for recovery strategies into the Victorian planning system.

APPENDIX

APPENDIX A: EXAMPLE OF MATRIX USED FOR DATA COLLECTION AND DATA ANALYSIS

Risk reduction categories	Planning mechanisms	
Hazard avoidance	Clause 13.05-1 Bushfire planning. Strategies. Protection of human life. Give priority to the protection of human life by: • Directing population growth and development to low risk locations and ensuring the availability of, and safe access to, areas where human life can be better protected from the effects of bushfire.	Clause 13.01-1 Coastal inundation and erosion. Strategies. • Avoid development in identified coastal hazard areas susceptible to inundation (both river and coastal), erosion, landslip/landslide, acid sulfate soils, bushfire and geotechnical risk.
Hazard reduction	Clause 52.47-1 Dwellings in existing settlements – Bushfire protection objectives. Approved measure 1.1: A building is sited to ensure the site best achieves: • The maximum separation distance between the building and the bushfire hazard. • The building is in close proximity to a public road.	Clause 52.47-2.2 Defendable space and construction objective • Defendable space and building construction mitigate the effect of flame contact, radiant heat and embers on buildings
Vulnerability reduction	Clause 13.05-1 Bushfire planning. Strategies. Settlement planning. Plan to strengthen the resilience of settlements and communities and prioritise protection of human life by: • Ensuring the bushfire risk to existing and future residents, property and community infrastructure will not increase as a result of future land use and development.	Clause 52.47-2.1 Landscape, siting and design objectives. • Development is appropriate having regard to the nature of the bushfire risk arising from the surrounding landscape. • Development is sited to minimise the risk from bushfire. • Development is sited to provide safe access for vehicles, including emergency vehicles. • Building design minimises vulnerability to bushfire attack.
Preparedness for response	Clause 52.47-1 Dwellings in existing settlements – Bushfire protection objectives. Approved measure 1.1: A building is sited to ensure: • Access can be provided to the building for emergency service vehicles.	Clause 52.47-2.3 Water supply and access objectives. • A static water supply is provided to assist in protecting property. • Vehicle access is designed and constructed to enhance safety in the event of a bushfire.
Preparedness for recovery		

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