Institutionalising wildfire planning in New Zealand: Lessons learnt from the 2009 Victoria bushfire experience

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Abstract

The Port Hills wildfire experience demonstrates the severity of wildfire risk on the periphery of urban areas in some parts of New Zealand, and highlights the need to build resilience to this peril. The current paper focuses on the role of land-use planning in reducing wildfire risk and building resilience at the wildland-urban interface – hereafter termed wildfire planning. It identifies and recommends strategies for institutionalising wildfire planning in New Zealand. Very little scholarly attention has been focused on this topic to date and little effort has been made to institutionalise wildfire planning in New Zealand. Extensive experience in wildfire planning in Australia, called bushfire planning, can inform future wildfire planning efforts in New Zealand, given local natural hazards planning provisions and experience. We reviewed publications, plans and policy provisions related to the post-2009 Black Saturday Victorian bushfire experience, alongside insights drawn from key informant interviews. Based on these insights, we have identified barriers and enablers for institutionalising bushfire planning and distilled particular lessons. The current article follows these findings with key topics for building a wildfire planning research and practice agenda in New Zealand, concerning measures to: (1) reduce wildfire risk; (2) mobilise and integrate domains of professional practice relevant to wildfire planning; (3) develop community-based wildfire planning capability; and (4) meet the needs of current and future generations by institutionalising wildfire resilient development pathways at New Zealand's wildland-urban interface.

Keywords: *land-use planning, wildfire risk, Port Hills fire, New Zealand, Victoria bushfires, Australia, institutional barriers, institutional enablers*

The 2017 Port Hills fires bring the significance of wildfire risk at the wildland-urban interface (WUI) in New Zealand[1] to the fore. This peril has been relatively neglected in New Zealand because of the imperative to deal with the impact of recent earthquakes, floods and other extreme events. Wildfire risk at the WUI is, however, escalating. It has become a global concern (Moritz et al., 2014), and a concern that has been raised in NZ in the past, due to the combination of development intensification at the WUI, climate change and mounting fuel loads (Jakes & Langer, 2012). The current article focuses on the role that land-use planning[2] can play in reducing wildfire risk and building resilience, hereafter called wildfire planning, at the WUI in New Zealand.

Land-use planning can play a crucial role in reducing natural hazard risk but this potential is seldom realised (Burby, 1998, 1999; Glavovic, 2010), especially for reducing wildfire risk (Galiana-Martín, 2017; Moritz et al., 2014). Spurred by recent disasters, institutional reforms are being introduced in New Zealand to improve fire risk management (Fire and Emergency New Zealand Act 2017, NZ), as well as emergency management and disaster risk reduction more generally (Resource Management Act 1991, NZ, as amended). Notwithstanding laudable efforts and recent reforms, much remains to be done to reduce natural hazard risk and build resilience in New Zealand, especially regarding wildfire risk. Very little scholarly attention has focused on the role of land-use planning in reducing wildfire risk in New Zealand, and New Zealand has had little experience in institutionalising wildfire planning compared to some other jurisdictions. In Australia for example, many decades of devastating fires have necessitated more focused attention. Consequently, insights drawn from Australian experiences can inform wildfire risk reduction and resilience-building efforts in New Zealand.

1 For more details please see the introduction of this Special Issue
2 The term 'land-use planning' is used here to distinguish the discipline and profession of planning (variously called spatial planning; urban and regional planning; town and country planning, etc.) from 'strategic and/or operational planning' undertaken in emergency management, the fire services, etc.

The current article starts by briefly outlining provisions for natural hazard risk reduction in New Zealand, and highlights the need to focus more attention on wildfire planning. Second, it provides a synopsis of post-2009 Black Saturday bushfire planning[3] in the State of Victoria, Australia. Attention has been focused on efforts to institutionalise bushfire planning, considering barriers and enablers for reducing bushfire risk. The current article concludes by drawing on insights from this experience, and knowledge about New Zealand natural hazards planning provisions and experience, to identify key topics for developing a research and practice agenda around wildfire planning in New Zealand.

The current synopsis of the 2009 Black Saturday bushfires and experience in operationalising bushfire planning in the State of Victoria draws mainly on doctoral and post-doctoral research, documented by Kornakova (2016) and Kornakova and March (2017). This research included desktop analysis of legislation, policies, plans and other provisions relevant to bushfire planning in the state, as well as key informant interviews. The interviews were conducted in 2014 and 2015 with 13 key senior stakeholders from planning department, fire science community, fire engineering, firefighting services and community representatives. Triangulation of data from diverse sources mitigated potential researcher biases. New data was collected in 2017, from 10 key informant interviews with professionals in the fire service (2 from a Country Fire Authority and 1 from the Fire Protection Association Australia), planning departments (3 planning professionals), private bushfire consultancies (3 planning consultants) and a politician (referred to as a public official).

This new data enabled reflections on changes made to Victorian bushfire practices in 2014. The interviewees included strategically positioned professionals identified through snowball referrals, starting with key informants in state and local governments. Desktop analysis was initially used to develop an overview of evolving bushfire planning practices and processes. Questions arising about barriers and enablers for institutionalizing bushfire planning were then explored through semi-structured interviews. Data were thematically analysed, and key barriers and enablers identified, before considering potential implications for wildfire planning research and practice in New Zealand.

3 The Australian term 'bushfire' is synonymous with 'wildfire' as commonly used in NZ; and hence the terms 'bushfire planning' and 'wildfire planning' are synonymous.

Caution is required when considering the transfer of lessons from one jurisdiction to another because institutional and other realities, opportunities and challenges can vary markedly. A key lesson in one setting might have little application in another. There is nonetheless a lot that can be learned from the Australian experience to inform a research and practice agenda for reducing wildfire risk at the WUI in New Zealand.

Institutionalising wildfire planning in New Zealand

Compared to other perils in New Zealand, like earthquakes, volcanic eruptions, and flooding, wildfire is considered a relatively minor risk by the Officials Committee for Domestic and External Security Coordination (ODESC)(2007). Wildfires have, however, wrought occasional devastation, including a wildfire that almost destroyed the central North Island town of Raetihi 100 years ago (Brenstrum, 2012). The 2017 Port Hills fires underscore the contemporary significance of wildfires at the WUI and pose the question: What institutional architecture is in place to manage wildfire risk at the WUI in New Zealand? The following section provides a succinct overview and references more detailed accounts, before highlighting the need to focus more attention on this topic.

Managing natural hazard risk in New Zealand

Statutory responsibilities for natural hazard risk management in New Zealand are chiefly borne at the local government level, with central Government being responsible for the overarching institutional framework. Important roles are also played by non-state governance actors, including the private sector organisations responsible for critical infrastructure, the insurance industry, as well as non-governmental organizations (NGOs), community-based organizations (CBOs) and the individuals who make up local communities, and research communities. Natural hazard risk management in New Zealand is a devolved and shared responsibility that requires effective horizontal and vertical collaboration to integrate an array of provisions that have a bearing on risk and resilience (Glavovic, 2010; ODESC, 2007).

Managing wildfire risk is an integral part of this approach to natural hazard risk management in New Zealand. At least six major New Zealand laws frame the management of natural hazard risk, including wildfires, with many ancillary and issue- and sector-specific

laws. First, emergency management falls under the Civil Defence Emergency Management Act (CDEMA) 2002 (NZ). Constructed around an all-hazards, reduction, readiness, response and recovery approach, the CDEMA fosters the sustainable management of hazards. Second, the Fire and Emergency New Zealand Act (FENZA) 2017 (NZ) was introduced to unify previously separate rural and urban fire services and, among other things, strengthen the role of communities while facilitating volunteer support for the provision of fire services. The latter includes the establishment of local advisory committees. Third, the Local Government Act (LGA) 2002 (NZ) defines the purpose, roles and responsibilities of local government in New Zealand, including the avoidance and mitigation of natural hazards. This act requires delivery of envisaged local authority activities and expenditure over a 10-year timeframe, as well as 30-year infrastructure strategies. These provisions have considerable potential to enable community-based wildfire planning that takes long-term WUI trends into account.

Fourth, the Local Government Official Information and Meetings Act (LGOIMA) 1987 (NZ) requires territorial authorities to provide a Land Information Memorandum (LIM) on request. This includes all council information about a property, including natural hazards, that is not available in a District Plan - effectively making this information available to prospective purchasers and insurers, among other interested parties. This provision can help to build awareness and understanding about wildfire risk. Fifth, sections of the Building Act (BA) 2004 (NZ) require that local government refuse to grant a building consent if land is prone to natural hazards or if building work will exacerbate natural hazards; unless satisfactory protective measures are in place, or proposed works will not worsen existing hazards.

Finally, risk reduction in the domain of land-use planning is chiefly addressed by the Resource Management Act (RMA) 1991 (NZ), which governs land-use through sustainable management of natural and physical resources, to meet the foreseeable needs of current and future generations. In the light of recent disasters, the RMA 1991 was amended to include “significant natural hazard risk” as a matter of national importance (RMA Amendment Legislation Act 2017, NZ, Section 6); strengthening the ability of local government to take proactive steps to control land-use in order to avoid or mitigate natural hazards. These steps include refusal to grant subdivision consents due to natural hazard risk.

Many other laws have an important role to play in managing natural hazard risks in New Zealand, including legislative provisions related to public finance, flood protection, insurance, and other aspects. Glavovic, Saunders and Becker (2010) found that the overall legislative framework for natural hazard risk reduction is robust, with an array of statutory and non-statutory tools for translating legislative goals into practice. However, translating laudable legislative intentions into well-aligned practical reality on the ground is far from simple. The laws outlined above were created and have been amended on a case by case basis, in different eras over time (Enfocus, 2014). There are inevitable gaps, inconsistencies and shortcomings.

In practical terms, risk reduction and resilience-building require different sectors and spheres of government to work together effectively, and collaborate with other governance actors and networks. There is a particular and recognised need to coordinate land-use planning and emergency management at the local level (Saunders, Forsyth, Johnston & Becker, 2007; Glavovic, 2010) but this has been difficult to achieve in practice (Saunders, Grace, Beban & Johnston, 2015). It is understandably difficult to align and coordinate related provisions across diverse laws as well as the operational practices of the many actors who shape exposure and vulnerability to natural hazards, including Māori, private and community stakeholders responsible for infrastructure, community development and social well-being.

Provisions at the local level, for enabling the coordination and integration of activities relevant to natural hazard risk, include CDEM groups as well as *lifeline groups*, which are voluntary groups that bring together infrastructure providers, the transportation sector, CDEM and the science community. However, these mechanisms tend to have a readiness, response and recovery focus. The active inclusion of land-use planners, who play a key role in reduction, is rare. There is also a need to strengthen the overarching national direction required to foster consistent local level decision-making regarding natural hazard risk.

Escalating wildfire risk at the WUI in a changing climate adds yet another dimension to these issues surrounding natural hazard risk reduction and resilience-building (Moritz et al., 2014). In the aftermath of the Port Hills fires, a lot of attention has been focused on ways to address wildfire risk at the WUI in New Zealand. A key question is: To what extent do emerging lessons align

with understandings of what needs to be done to improve overall natural hazard risk management?

The unrealised potential of wildfire planning in New Zealand – beyond the Port Hills wildfires

Much of the hard work on post-fire recovery has been done, while particular lessons have been drawn from the Port Hills experience, for example by the Australasian Fire and Emergency Services Authorities Council (AFAC)(2017), Christchurch City Council (CCC)(2017) and through the FENZA 2017. The independent review by AFAC (2017) on the Port Hills fires focused on the operations and performance of fire agencies. This review also outlined recommendations to improve their readiness, response and post-incident fire management. At the time of writing, it appears that Fire and Emergency New Zealand (FENZ) plans to fully implement the recommendations as well as their own observations through an Action Plan with NZ-wide relevance, outlined in the FENZA 2017. This Action Plan focuses on three main areas:

(i) Improved Interoperability;
(ii) Community at the Centre; and
(iii) Safety as a Priority.

Particular attention is given to improving communication, building capability and improving ways of working within FENZ and the emergency sector as a whole. These are important matters. However, surprisingly little attention has been focused on practical steps to reduce exposure and vulnerability to future extreme wildfire events. By contrast, lived and documented experience shows that reducing wildfire risk and building resilience, and an effective post-fire recovery, will only be achieved if wildfire planning, and natural hazards planning more generally, is recognised and institutionalised (Kornakova, March, & Gleeson, 2017).

There are compelling reasons to focus deliberately on wildfire planning at the WUI in NZ. Fire risks at the WUI differ from those in either the urban or rural settings alone, mainly because of changing demographic and development patterns, and increasing exposure and vulnerability in a changing climate. The WUI is typically characterised by more fuel sources, limited open space for evacuation and retreat, and higher risk of house-to-house ignition, among other issues. Wildfire planning has considerable potential to reduce wildfire risks at the WUI, if not eliminate them by avoiding new development in localities exposed to high wildfire risk (Bardsley, Weber, Moskwa, & Bardsley, 2015; Bhandary & Muller, 2009; Buxton, Haynes, Mercer, & Butt, 2011; Kornakova, March, & Gleeson, 2015; Miller et al., 2016). Land-use planning has tools that integrate diverse, and at times contending, interests and sectors, including: water supply, critical infrastructure, transportation planning, emergency management and fire services, as well as mechanisms to contribute to institutional capability building, community awareness, education and outreach.

Scholarly attention is being focused on natural hazards planning in NZ through the Resilience to Nature's Challenge National Science Challenge, among other initiatives. However, wildfire planning is under-researched, while the Port Hills fire highlights that this is a relatively neglected matter with considerably unrealised potential. Hence, there is merit in exploring what has been learned in other jurisdictions that have already focused on this issue.

The 2009 Black Saturday Fires

The State of Victoria, Australia, is one of the most wildfire, or bushfire, prone areas in the world, with fire playing an important role in its ecosystems (Bradstock, Williams, & Gill, 2012). Note that the latter term, *bushfire*, is commonly used in the Australian context. Rapid urbanisation is encroaching on places prone to bushfires, putting more people and associated development at risk (Buxton, Haynes, Mercer & Butt, 2011). The long history of bushfires and resulting devastation underscore the need to proactively address this peril and avoid putting people in danger. However, and despite relevant inquiries and some wildfire planning guidelines from as early as 1938, the State government has only recently included wildfires in planning regulations.

The Australian Standards number AS3959 was developed in 1991, to outline bushfire safety standards for building in areas with high fire risk. In 1994, the State of Victoria improved the designation of Bushfire Prone Areas (BPA) to identify areas of bushfire risk. This designation triggers a building permit requirement used to this day. The Wildfire Management Overlay (WMO) was introduced in 1997. This overlay provides a land-use planning framework for addressing the bushfire hazard. It was developed and implemented voluntarily by individual councils in collaboration with the Country Fire Authority (CFA) (Kornakova & March, 2017). The WMO has since triggered a planning permit requirement for a new property development. It has also helped ensure that building integrity does not solely rely on materials

and design, but also addresses topography and fuel on site. Over the following 12 years, the WMO was applied in 35 out of 82 municipalities covered by a Royal Commission addressing wildfires in the State of Victoria.

The 7th of February 2009 Black Saturday Bushfires resulted in significant economic and environmental losses, and 173 deaths. These events triggered an inquiry into the reasons for such significant impacts. Responding to the inquiry, the specially established Victorian Bushfire Royal Commission (VBRC) outlined 67 recommendations for future action, of which 19 directly targeted land-use, planning and building controls. One of the key recommendations was to improve bushfire risk mapping, and apply relevant overlays and planning provisions to the entire State (VBRC, 2010). As a result, in 2011, the WMO was replaced by the Bushfire Management Overlay (BMO). The main differences between the two are mandatory application of the BMO across the State and more stringent risk levels and safety requirements associated with the latter overlay. The BMO targets new residential development. It triggers a planning permit that requires a site assessment to determine the Bushfire Attack Level (BAL) and actions to reduce wildfire risk. At that time, permit applications required review by the CFA (Holland, March, Yu & Jenkins, 2013).

The new regulations also meant that many property owners were no longer allowed to develop their properties. This caused a community backlash, which manifested in public campaigns and the establishment of a community-led lobby group. These movements claimed that the new regulations violated their development rights and that risk levels assigned through the BMO were too high. Community campaigns and political pressure led to amendments to the regulations (Cotter, 2017). The regulations updated in 2014 provided easier development pathways for property owners, however they did not reduce the bushfire risk for existing housing stock. Fire professionals interviewed in 2017 stated that these changes satisfied individual property interests, rather than addressing prevailing policy shortcomings, and that additional amendments were needed to improve bushfire safety in the State of Victoria.

Despite these shortcomings, overall Victorian bushfire planning provides a relatively good example of how to institutionalise bushfire planning in Australia and internationally. Victoria State experiences can inform wildfire planning in other countries, including New Zealand. The next section explores barriers and enablers for institutionalizing bushfire planning in Victoria, drawing on the experience and perspectives of key informants. These reflections inform the development of a research and practice agenda for wildfire planning at the WUI in New Zealand.

Institutionalising bushfire planning in Victoria, Australia: Barriers and enablers

The discussion presented below draws mainly from the most recent research conducted in 2017, and builds on previous doctoral and post-doctoral research by Kornakova outlined in the introduction to the current article. The barriers and enablers for institutionalising bushfire planning presented below were outlined by key informants, and identified using thematic analysis. Identified Barriers were identified and strongly endorsed by all participants, while enablers typically reflected key informant expertise. For example, planning professionals highlighted enablers in the planning skillset and domain, while fire professionals noted the significant role of the CFA and other agencies.

Establishing formal mechanisms for coordinating activities between fire and land-use planning agencies

Fire is one of the most unpredictable and dangerous natural hazards at the WUI, because of diverse fire sources and the clash between urbanisation and changing environmental conditions. To address these interconnected issues, and institutionalise bushfire planning, there is a compelling need to align and integrate formal and informal provisions related to bushfire management and emergency management more generally, as well as land-use planning, infrastructure provision, community development, and environmental management (Gazzard, McMorrow, & Aylen, 2016; Kocher & Butsic, 2017; Kornakova & Glavovic, 2017). A particular barrier to bushfire risk reduction and resilience building is ineffective formal coordination mechanisms between agencies and professionals responsible for hazard risk assessments and land-use planning regulations. This point was made during interviews with three planning professionals, and one CFA professional.

It is important to recognise and address important differences between the domains of planning and fire professionals, including differences in culture, purpose and timeframes, which make coordination and integration

more difficult. In Victoria, the aforementioned differences have caused inter-agency tensions (Kornakova & Glavovic, 2017). For example, planners have a long-term, large-scale spatial vision, including a focus on avoiding putting people and the things they value in danger. The main goal of the fire services is saving lives and properties, chiefly through preparedness or readiness and response measures. Less attention is given to risk reduction and longer-term development imperatives. According to one 2017 interviewee, both shorter- and longer-term perspectives are important but they need to be more effectively coordinated (Planning Professional 1).

One of the bushfire planning professionals interviewed in 2014-2015, who has worked with both CFA and planning departments, pointed out that the existence of both the BPA and BMO maps in the State of Victoria is indicative of continuing disparities between fire services, building and planning institutions. It was stated that, "…we need one map for all Victoria...that includes the bushfire planning, building, prescribed burning or burning up, the community…Which is what you've got is they're all in complete isolation". This statement was corroborated by interviewees in 2017, one of whom stated that, "… CFA will always strive for zero risks, but it is unrealistic for communities" (Planning Professional 2). Planning professionals interviewed in 2017 suggested that one enabler to improve coordination is to establish a third-party agency, or boundary organisation, that can formally bridge the fire service and planning domains, and even bridge to other actors. This organisation could assist with collecting and analysing data, and developing appropriate and aligned wildfire planning strategies that help to avoid and mitigate risk.

In addition to the aforementioned institutional differences between different professional domains, some interviewees noted that existing inter-agency connections rely on personal relationships. These relationships and the connections they represent can be terminated when people leave a job. One of the planners interviewed in 2017 stated that, "if I left tomorrow then there is no one there. And in fact, it would rely on people in a fire area knowing what they needed to ask" (Planning professional 2). Another comment was from a CFA professional who mentioned, "when they [senior planning and CFA employees] had some personal conflict, we stopped working with the planning department closely" (CFA Professional 2). This comment demonstrates a reliance on informal relational connections, and highlights the need to establish more formal mechanisms to coordinate land-use planning alongside fire service provisions and practices.

Emergency Management Victoria was established in 2013. This organisation was intended to be a boundary-spanning agency that could align different parties in more coordinated effort to manage bushfire risk. However, Emergency Management Victoria mainly consists of response team professionals, who do not have the skillset required for land-use planning. According to planning professionals interviewed in 2017, this organisation also appears to lack explicit provisions to include community stakeholders in their strategic planning processes (Planning Professionals 1, 2 & 3).

Building capability in bushfire planning

Another significant barrier to bushfire risk reduction is limited professional capability in bushfire planning; a barrier identified by the VBRC (2010). The need to employ a more diverse range of well-qualified and capable specialists was also identified by the full range of interviewees in the research informing the current article. According to 2017 interviewees, the lack of capable professionals at the time when the BMO was first introduced resulted in a significant number of "poor applications" (CFA Professional 1) to the CFA, which (anecdotally) was specified as a referral agency in the planning regulations. The CFA did not have sufficient resources and "had to train on the spot" (CFA professional 1,).

In 2014, a tertiary course was developed to provide formal education and accreditation for bushfire planners (University of Melbourne, 2014). According to one 2017 interviewee, this course has led to an improvement in the quality of bushfire assessments (CFA professional 2). Training in bushfire planning is, therefore, a potential enabler. However, while it aims to build capability in bushfire planning, the State of Victoria does not require professional accreditation to carry out bushfire assessments. Furthermore, according to one 2017 interviewee, some professionals choose not to do the course because, "it is expensive, time consuming …. I simply don't need it to keep working" (Planning Consultant 2). A bushfire planning consultant, who had completed the course, commented that improvement is needed as, "there is no support, no knowledge sharing network beyond the course. Science changes quickly and we have no access to it" (Planning Consultant 3). In sum, it appears that training needs to be available,

required and continued in order to become an effective and meaningful enabler. Such training could be realised through joint efforts by both land-use planning and fire service providers.

Identifying meaningful alternatives to reduce bushfire risk

Current planning regulations in Victoria, and in many other jurisdictions, target new development in bushfire-prone areas. They do not address existing housing stock unless owners want to make significant changes to the structure – constituting a major barrier to reducing bushfire risk. Reasons for this restricted focus include the lack of regulatory tools that could provide alternative, feasible solutions and incentives for residents to move, change the layout of their properties, or increase the structural integrity and safety of their houses in the face of very high bushfire risk.

Buy-back schemes are one such regulatory tool and enabler. These schemes can enable government to purchase properties in at-risk areas and develop them for temporary uses that minimise risk exposure, for example recreational activities, or use them as buffer zones, or for conservation purposes. After the 2009 bushfire season, a buy-back scheme was available for three years. It was volunteer-based, had strict eligibility criteria and properties were not strategically targeted. Planning professionals interviewed in 2017 found that this timeframe was insufficient because, "some people need more than three years to cope with losses, let alone sell your house" (Planning Professional 2). Moreover, "buyback must be in the planning toolkit at all times" (Planning Professional 1). Strict eligibility criteria enabled only significantly affected properties to be sold, which, when coupled with the voluntary nature of the scheme, meant that only a small percentage of willing residents were eligible to apply. Furthermore, the lack of a strategic plan led to a "cookie cutter approach", where some chose to stay and some to go, resulting in empty lots in neighbourhoods and potentially compounding risks affecting the remaining properties (Planning Professionals 1, 2 & 3; CFA professional 1).

Shifting from ad-hoc to integrated decision-making

Disasters can be seen as focusing events (Birkland, 1996) or windows of opportunity for change (Birkmann et al., 2008). After Black Saturday, however, some rapid decisions and apparently ad hoc actions resulted in the adoption of building codes that were already in progress at the time. These included a mapping system that overestimated bushfire risk in some areas. A fire specialist interviewed in 2017 stated that Standard AS3959 was still under revision when it was adopted by the Australian Standards Board in May 2009. It failed to address ember attacks, which are responsible for about 90 percent of house losses, and was still primarily focused on the performance of façades and building envelope integrity.

Initial BMO mapping provides another example of apparently ad hoc decision making. Bushfire risk levels were based on the CFA assessment of what was labelled a worst-case scenario. However, the problem outlined by a 2015 interviewee was that, "when you map out in terms of an area reaching in effect the [Fire Danger Index] 120 in that parcel of land that might only happen once every 200 years or 20 years, but CFA says' nope, all land is going to be 120 irrespectively" (Planning Professional 2). While the risk level was reduced to 100 in 2014 (State of Victoria, 2014), it was still not accurate for all areas within the State. Moreover, while the WMO was not an ideal overlay, fire professionals and fire engineers interviewed argued that the approach it used to individually address fire risks in council was more rigorous and realistic in terms of risk assessment. This suggests that enabling effective use of a post-disaster window of opportunity depends on having effective bushfire risk reduction solutions on hand before a disaster strikes. This requires officials' understanding and foresight, to pursue robust risk reduction strategies rather than simply adopting readily accessible provisions.

Raising public awareness and improving community involvement in bushfire planning

Adverse community reactions to the proposed planning regulations of 2011 demonstrate the significant influence the public can have on planning and decision-making processes. A government official, interviewed in 2017, commented, "people should be able to build where they want given they understand the risks." An FPA Professional, also interviewed in 2017, stated that some communities in Victoria live in the face of extreme weather, near bushland, and have sophisticated and complicated systems for responding to wildfires. However, many people tend to underestimate wildfire risks, often assume these risks will never affect them, and react negatively to regulations that may affect their property rights.

Together, these common assumptions can form a significant barrier to bushfire risk reduction. Changes

made to bushfire planning regulations in 2014 by and large supported the property development interests of individuals, and generally increased bushfire risk in the State of Victoria, while failing to reduce the bushfire risk to existing residential and non-residential building stock. This point was made by an FPA professional, planning professionals, and CFA professionals interviewed in 2017. Much remains to be done to improve public understanding about wildfire risk and to institutionalise more meaningful ways for communities to constructively participate in land-use planning processes that reduce bushfire risk and build resilience.

Where to from here? Towards a research and practice agenda for New Zealand WUI wildfire planning

A research and practice agenda for wildfire planning at the WUI in New Zealand can be informed by integrating insights from Victorian bushfire experience, together with knowledge about New Zealand natural hazards planning provisions and practices, and lessons learned from the Port Hills experience. These elements can be integrated in terms of the FENZ Action Plan (FENZ, 2017) which focuses on interoperability, community at the centre, and safety . Based on the current research, we identify the following priority agenda topics.

Focus attention on wildfire risk reduction

This is consistent with complementing wildfire readiness, response and recovery efforts, as outlined in 2017 RMA amendments. Escalating wildfire risk at the WUI in a changing climate adds yet another dimension to the multi-faceted problem of natural hazard risk reduction in New Zealand. There is a compelling need to strengthen national direction and guidance to foster consistent and localised decision-making for natural hazard risk reduction. Among other things, it would be helpful to have a National Policy Statement (NPS) on natural hazard risk (Glavovic, 2010). This has long been mooted and may be developed under the 2017 coalition government. Relevant questions include:

– How might wildfire risk reduction at the WUI be addressed in such an NPS?
– What are the most promising ways to institutionalise wildfire risk reduction in New Zealand?
– What role might land-use planning play in stemming escalating wildfire risk at the WUI in New Zealand?
– On a practical level, what are the best ways to identify areas prone to wildfire risk?

Lessons from Victoria bushfire experience are informative. Among other things, the inaccuracy of specified risk levels in BMO mapping created significant problems. This underscores the need to define acceptable risk levels, through wildfire planning processes that are locally credible and salient. Moreover, and as highlighted by the Victoria experience, such provisions need to be aligned and consistently applied in the array of local plan provisions under the RMA 1991, LGA 2002, BA 2004, CDEMA 2002 and the FENZA 2017.

Mobilise and integrate domains of professional practice relevant to wildfire planning

This relates to inter-operability in the FENZ action plan. Integration of interconnected domains of professional practice relevant to wildfire risk forms one of the main barriers to institutionalising bushfire planning in Victoria. Similarly, in New Zealand, there is an urgent and compelling need to better integrate land-use planning, emergency management and fire risk management, as well as other domains of professional practice. Currently, roles and responsibilities are compartmentalised through provisions in the RMA 1991, LGA 2002, CDEMA 2002, BA 2004, and FENZA 2017 legislation, among others. This is compounded by sectoral and professional practice compartmentalization within and between government agencies, and between risk governance actors more generally. Experience in New Zealand and Australia, and elsewhere (e.g. Muller & Schulte, 2011; Reams, Haines, Renner, Wascom, & Kingre, 2005; Sapountzaki et al., 2011) demonstrates unequivocally that the goal of wildfire risk reduction will remain elusive without better coordination between relevant domains of professional practice.

Establishing a new boundary-spanning agency such as Emergency Management Victoria (EMV) may not be appropriate in New Zealand, but we can ask: How might intra- and inter-agency wildfire planning coordination be achieved here? Is this a potential role that the proposed Local Government New Zealand (LGNZ) Risk Agency could assume, champion and operationalise? Such an entity could play a vital role in better coordination and integration as well as in capability building for wildfire planning. We can also ask: What are the best ways to improve coordination and integration of professional practices relevant to wildfire planning in New Zealand?

Develop community-based wildfire planning capability

This can be achieved by involving Māori as Treaty of Waitangi partners, as well as other stakeholder groups and the public, in local planning, decision-making and practical wildfire risk management. This type of approach is referred to as *Community at the Centre* in the current FENZ action plan (FENZ, 2017). In addition to enabling more effective vertical and horizontal coordination, authentic and meaningful community participation in wildfire risk reduction and resilience-building efforts is essential. This has been observed in the aftermath of Victoria bushfires. Provisions are available in virtually every applicable New Zealand law. The challenge is to operationalise these provisions in a meaningful, effective and cohesive manner. Victoria-based experiences highlight the tensions and contradictions that can arise when seeking to reconcile short-term private property interests and concerns about public safety, community resilience and sustainability. Wildfire planning has the potential to reveal these tensions and explore locally appropriate ways to resolve divergent interests. We can therefore ask: How might wildfire planning be institutionalised in New Zealand so that local communities are at the centre of wildfire risk reduction and resilience-building?

Make provision for the needs of current and future generations by institutionalising wildfire resilient development pathways at the WUI

This relates to *Safety plus Resilience and Sustainability* in the FENZ action plan. Institutionalising provisions that avoid new development in localities prone to wildfires is essential. Provisions in the RMA 1991 amongst other legislation can help realise this risk reduction imperative –challenging as it may be in practice. An even more challenging issue, highlighted by bushfire planning efforts in Victoria, is what to do about development that is already located in dangerous zones; considering apparently limited options for reducing the risk facing non-residential and residential building stock.

Community concerns about safety, resilience and sustainability need to take precedence over individual property interests if wildfire risk at the WUI is to be contained. Reconciling these divergent drivers is difficult but essential, and wildfire planning has a crucial role to play. Victoria-based experiences show that short-term measures include garnering support to implement innovative risk reduction strategies, such as more defensible spaces, and measures to improve structural integrity and safety in the face of bushfires. Additional incentives can be offered to increase engagement from communities. One of the most effective but challenging long-term solutions is a strategic buy-back scheme. This process will naturally be carried out over an extended period of time due to high costs and complex issues around transferring land rights. In short, if faced with extreme wildfire risk, we can ask: What managed retreat options might be explored and how might such processes be operationalised? On a more positive note, we can ask: How might wildfire resilient development pathways be identified and enabled in the face of escalating wildfire risk at the WUI in New Zealand?

Conclusion

The current paper shines the spotlight on the need to address wildfire risks in New Zealand through land-use planning. This topic has received scant scholarly attention. Furthermore, there is little local experience on the ground for institutionalising wildfire planning that bridges land-use planning, emergency management and fire risk management, among other relevant domains of professional practice.

Although caution is necessary when considering the transfer of lessons from one jurisdiction to another, experience with bushfire planning in Victoria and New Zealand experience in natural hazard planning, together with emerging lessons from the Port Hills, provide a foundation for building a research and practice agenda for wildfire planning at the WUI. This analysis draws attention to the importance of: (1) reducing wildfire risk through land-use planning; (2) mobilizing and integrating domains of professional practice relevant to wildfire planning; (3) developing community-based wildfire planning capability; and (4) making provision for the needs of current and future generations by institutionalising wildfire resilient development pathways at the WUI.

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